



2009

Lviv
Radio Engineering
Research Institute
State Enterprise



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Lviv Radio Engineering Research Institute *State Enterprise*

INFORMATION ABOUT ENTERPRISE



Lviv Radio Engineering Research Institute State Enterprise (LRERI) belongs to the strategic enterprises of defense industry of the Ministry of Industrial Policy of Ukraine and is the leader in Ukraine in development, production and modernization of radio engineering and radio electronic products for military and double use.



Lviv Radio Engineering Research Institute *State Enterprise*

INFORMATION ABOUT ENTERPRISE

The enterprise was founded in 1956 as a specialized design office (SDO) for development of radio measuring and special purpose equipment. One of the tasks of the SDO was modernization of serial articles produced by the Lviv Radio Equipment Association.

In 1966 SDO was renamed to the Lviv Designer Office (LDO). In 1969 the Lviv Radio Engineering Research Institute (LRERI), which was subordinated to the Ministry of the Radio Industry of the USSR, was established on the base of the LDO. When Ukraine was proclaimed an independent State, the Lviv Radio Engineering Research Institute State Enterprise became subordinate to the Ministry of Industrial Policy of Ukraine.



INFORMATION ABOUT ENTERPRISE

In the 60-70-s, the LRERI developed the radio measuring equipment including tens of types of measuring and test instrumentation. Among them, Ч3-12 first field counting-type electronic frequency meter, C1-35 compact semiconductor oscilloscope, Ч4-22 first in the USSR field frequency converter, XIII-56 broadband attenuator, the device for television channels adjustment ПНТ-59, КЧ-1 frequency calibrator, C1-13 first in the USSR multifunctional oscilloscope, C1-43 automated oscilloscope, C1-64 universal oscilloscope, C1-104 500 MHz transistor oscilloscope.

At that time a number of universal counting-type electronic frequency meters and voltmeters (Ч3-30, Ч3-32, Ч3-33, Ч3-34, Ч3-35, etc.) with consumer characteristics which were not inferior to the best world samples, were developed.



INFORMATION ABOUT ENTERPRISE

Space and missile technology development from the beginning of the 60-s required stating in the LRERI the works on creation of command-telemetering complexes and means. Close scientific and technical cooperation at that time existed between the LRERI and the leading research enterprises of the USSR: OKB MEI (Special Research Bureau of Moscow Power Engineering Institute), ENERGIA (S.P. Korolev Rocket and Space Corporation), CNII "Cometa", etc.

The prototypes of the command-telemetering equipment created by the LRERI: onboard equipment for gathering, storage and transfer of special information to the ground measuring complex from the Space 3Я-40 series satellites which were successfully applied according to their purpose.



INFORMATION ABOUT ENTERPRISE

The new stage in the development of the LRERI is connected with performance of works on creation of a new generation of radio systems for trajectory measurements, and also highly-dynamic air object mutual position measuring means for testing the new equipment prototypes. Works on creation of radio path measurement aids finished with the introduction in batch production the КАМА-ИК coherent pulse radar system (in two variants: stationary and mobile) and the VEYER multichannel phase-meter system.

Works on creation of the passive ship station for measuring the parameters of foreign perspective weapons during their testing on the remote sea test areas (Prostor-K article) became the turning point in creation of a new generation of radio systems which used the advanced microelectronics and computer facilities.



INFORMATION ABOUT ENTERPRISE

At the end of the 70-s in the LRERI began to work on creation of the Volnoretz article equipment which solved the problem of measuring the parameters of the aerodynamic object trajectory in the course of the controlled experiment using the aircraft command-measuring post, and also to work on modernization and development of the radio command control equipment: ground and helicopter guided missile weapon complexes (guided missiles of Cobra (Agona), Storm (Ataka) complexes). In a short period of time the 9M113, 9M114 airborne anti-tank missile control equipment prototypes were modernized with the essential improvements of technical and technological parameters. The 9Б511М, 9Б59М articles were the result of this modernization. In the course of these works being performed it was possible to solve the problem of equipping the guided weapon ground and helicopter complexes with miniature radio command links.

The distinctive characteristic of radio control equipment of the Agona and Ataka complexes is their operation in the radio wave millimeter band.



INFORMATION ABOUT ENTERPRISE

Works on creation of the radio wave millimeter radar equipment and radio electronic systems for the armored vehicle were the subsequent stage of the development of the LRERI.

In 1980 the LRERI was appointed the Leading organization in the Ministry of Radio Industry of the USSR in the millimeter-wave band technology development and creation of perspective radio electronic systems for armor equipment and high-precision weapon systems. In the mid-eighties the LRERI began the works on information management systems for the perspective tank.

In the course of performing of some R&D works the system structure was developed and the prototypes of its components were made and developed:

- onboard information management complex (OIMC) – T6A1 article;
- millimeter-wave band radar equipment for solving the tasks of weapon aiming, ballistic firing support and tank movement support in a column - T6A2, T6A3, T6A4 articles;
- ground mobile object navigation equipment.



INFORMATION ABOUT ENTERPRISE

From the early eighties the LRERI began to work on creation of the millimeter-wave band (MMW) radar aids designed for search, detection and high-precision measurement of coordinates of ground targets as a component of ground and onboard weapon complexes; navigation safety control of ground aids, helicopters, sea and river vessels, ballistic preparation fire support.

These aids expand the high-precision weapon combat capabilities by:

- all-day and all-weather application unlike the optical and infra-red band aids
- high security and noise immunity unlike the RF longer-wavelength means
- small dimensions and weight of the equipment, allowing to install it on carriers of all classes (ground vehicles, airborne and missile, ammunition)
- Integration with optical and infrared band means.



INFORMATION ABOUT ENTERPRISE

The Institute has developed production of the MMW short wavelength (SW) radar equipment. To this end:

- wide co-operation of developers and manufacturers of base components and metrological support has been created
- widespread investigations of the characteristics of the ground target and background radar portraits for the radar equipment construction optimization have been carried out
- principles of construction and technology of solid-state coherent pulse, pulse and Doppler radars and their components (antenna-feeder devices, transceiver paths, signal and control processor modules) have been developed
- large-size anechoic chamber (AEC) for developing the MMW radars and their components (50 x 12 x 8 m) has been created and equipped.



INFORMATION ABOUT ENTERPRISE

The LRERI has developed the prototypes of the radio wave millimeter radar equipment:

- Radio wave millimeter radar measuring complex allowing to register ground target characteristics at ranges of up to 5 km with the range resolution of 15 cm and Doppler resolution of 1.6 Hz with various polarizations of a probing signal in the 1.5 GHz frequency band.
- Surveillance-and-fire control radar intended for search, detection, high-precision measurement of coordinates and automatic tracking ground moving and fixed targets. The radar is joined to weapon control systems. The development of radar prototypes was carried out by including them as a component in a tank, antitank artillery system and an antitank missile complex. In the radar there are realized coherent-pulse operating mode, monopulse method of automatic angle target tracking, digital signal processing in time and spectral regions, completely solid-state design.



INFORMATION ABOUT ENTERPRISE

- Solid-state pulse collision-avoidance radar (CAR). CAR realizes a low-contrast object detection mode by using high range and angular resolutions (including high-voltage power lines with the wire diameter of up to 10 mm), can provide safety of low-level helicopters. CAR has passed successful tests in the Chinese People's Republic. Radar tests on the Navy ships have shown the possibility of its successful use for anti-mine and anti-diversion defense.
- The unified muzzle velocity measuring device (Muzzle Velocity Radar). It is designed for measurement of the muzzle velocity of the projectile exiting from the barrel for the subsequent fire correction with the independent use or when included as a component of tanks, self-propelled and towed artillery systems. The measuring device was developed on the tank and a self-propelled howitzer.



INFORMATION ABOUT ENTERPRISE

- The unified radar-tracking measuring device for measuring the movement parameters of ground objects. It is intended for use on mobile objects as a part of measuring, navigation and controlling complexes for various purposes. It was developed on wheeled and caterpillar vehicles.
- Radar seekers. They are designed for homing the guided projectiles and missiles of 100 mm caliber and greater on ground objects for armored vehicle destruction.

The features of the radar means developed by the Institute, are:

- capability of interfacing to standard means of various objects (tank, artillery system, missile complex, ship, helicopter) by analog and digital communication links;
- possibility of increasing the power and information potential as in designing there was used the basic approach;
- severe operation conditions of the application (military-track vehicles, aviation, vessels, missiles, ammunition).



INFORMATION ABOUT ENTERPRISE

When Ukraine became independent, the LRERI was recognized as the main enterprise in Ukraine in development of information management systems for the armored vehicles and creation of automation means complexes for Rocket Forces and Artillery (RF&A).

The LRERI is a leading enterprise in Ukraine in the development of information management systems (IMS) for the armored vehicles and cryptographic data security devices.

The LRERI is included in the Bronetehnika Ukrainy Concern where it is the developer and the supplier of modern electronic information management systems for armored vehicle and tank trainers.

The LRERI is a leading enterprise in Ukraine on creation of automation means complexes for Rocket Forces and Artillery (RF&A) for perspective control systems for operating-tactical and tactical RF&A units, reconnaissance means, artillery and missile complex control systems as well as modernization and additional equipping of control systems for self-propelled and trailer artillery systems and salvo fire reactive systems.



INFORMATION ABOUT ENTERPRISE

The LRERI developments for the last years are as follows: creation of the prototype of the small-base passive complex for space radio monitoring and positioning of radio-frequency radiation sources of air and ground objects and the MMW radar-seeker for the aircraft air-to-surface missiles.

Presently, the enterprise has won strong positions on the market of scientific and technical production by creating the following: information management systems for the armored vehicles, forces automated control complexes, MMW radio and radar systems, space radio monitoring systems, onboard and ground telemetry systems, friend-or-foe identification aviation systems.

The Institute has licenses for economic activity related to the development, making, realization, repair, military equipment modernization, space equipment component parts and works on technical information security. The LRERI is certified as a research institution and it is included in the state register of research institutions.



INFORMATION ABOUT ENTERPRISE

The enterprise occupies an area of more than 7 hectares.

The material and technical base of the enterprise includes:

- six-storey administrative building (area of 5100 square meters)
- four-storey research-and-production building (area of 12850 square meters)
- social and auxiliary structures.

The research, technical and production personnel of the enterprise numbers 500 employees.

In the LRERI there are two Doctors of Technical Science, 15 candidates of Science.



Lviv Radio Engineering Research Institute

State Enterprise

INFORMATION ABOUT ENTERPRISE

The LRERI is decorated with the state awards as follows:

- 1985 – Order of the Red Banner of Labour;
- 1981 – Certificate of Honour of the Presidium of the Supreme Soviet of the USSR;
- 1981 – Certificate of Honour of the Presidium of the Supreme Soviet of the Ukrainian Soviet Socialist Republic.



Specialists of the Institute are awarded:

- 1974 – State Prize of the Ukrainian Soviet Socialist Republic
- 1976 – Lenin Komsomol Prize
- 1981 – Prize of the Council of Ministers of the USSR
- 1999, 2004 - State Prizes of Ukraine in science and technology.





Lviv Radio Engineering Research Institute *State Enterprise*

INFORMATION ABOUT ENTERPRISE



Employees of the Institute have taken out more than 2500 certificates of authorship and certificates for production prototypes, over 50 patents of Ukraine for inventions and production prototypes, 9 patents in foreign countries, 2 certificates for production prototypes.

Over 1900 articles and abstracts have been published in scientific and technical journals, in particular 40 – in foreign publications, 18 monographs and 9 textbooks have been published.



Lviv Radio Engineering Research Institute *State Enterprise*

INFORMATION ABOUT ENTERPRISE



For participation in the project “Business image of Ukraine. Achievements. Experience. Recognition”, great contribution to the development of international cooperation, popularization competitive home-made products the enterprise is decorated with the Diploma of the MFA of Ukraine, the medal and silver statuette.



INFORMATION ABOUT ENTERPRISE

Basic departments of the enterprise:

◆ *Radio System Development Department*

Radio, radar, radio telemetry systems and devices which are developed by the department are intended for creation of new prototypes of weapons, military technology and double-purpose scientific and technological production.

◆ *Information-Management System (IMS) Development Department*

Radio electronic articles which are developed by the Department are designed for creation of new prototypes of armored vehicles control IMS apparatus and RF&A control automation complex apparatus.



INFORMATION ABOUT ENTERPRISE

◆ *Design Department*

The Department develops the working design documentation and implements the developments in the pilot production.

◆ *Production and Processing Department*

The Department develops a technological documentation, makes the prototypes using R&D works makes small lots of research and technological production. The Department provides: machining, molding of parts from plastic and rubber, machine and assembly works, electroplating of parts, making of precision waveguide and antenna units, radio wave MMW radiotransparent domes, chemical and technological process (filling, encapsulation etc.), making of winder assemblies and also assembly and wiring operations.



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INFORMATION ABOUT ENTERPRISE

The enterprise has developed the thin-film technology which allows to make any passive components of microwave units with holding the dimensions to a high degree of accuracy, SAW acoustic electronic devices, secondary microelectronic power supplies.

The independent Department “*Zaporizhia Airborne System Specialized Design Office*” is included in the enterprise and is specialized in the development and implementation of airborne friend-or-foe transceiver systems.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

Basic research and technological products:

- Passive radio systems
- Radars
- Telemetry equipment and miss measuring equipment
- Airborne transceivers
- Command radio lines and radio communication aids
- Information-management systems for armored vehicles
- RF&A automatized control complexes
- Data processing and transmission equipment



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Passive radio systems:

- *Small-base passive complex for space monitoring and positioning of radio-frequency radiation sources*



The small-base passive complex for space monitoring and positioning of radio-frequency radiation sources is intended for detection, positioning of air, ground and sea surface objects and measurement of their signal frequency and time parameters upon their electronic equipment radiation.



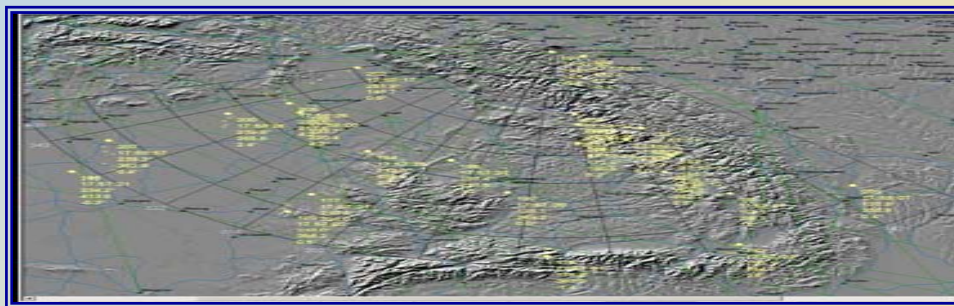
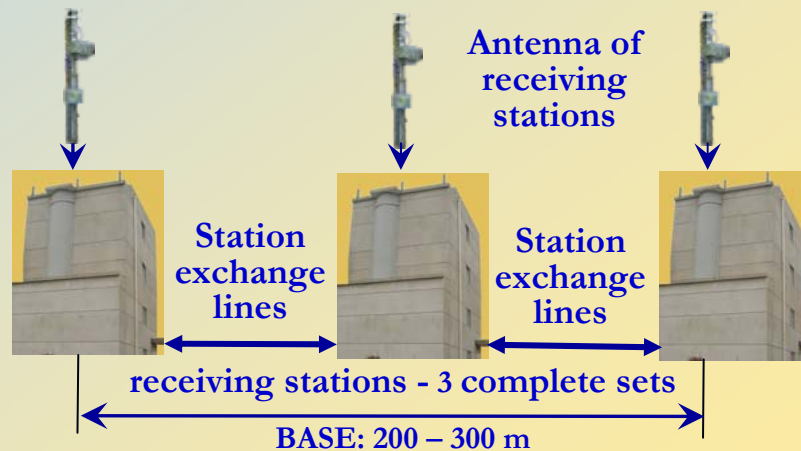
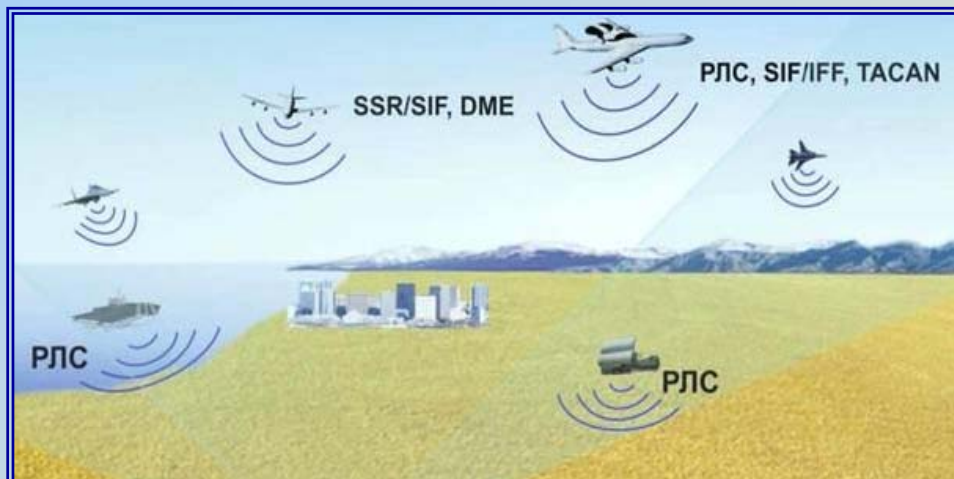
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LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Passive radio systems:

- Small-base passive complex for space monitoring and positioning of radio-frequency radiation sources

Application: electronic reconnaissance





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Passive radio systems:

- *Small-base passive complex for space monitoring and positioning of radio-frequency radiation sources*

Basic performance data:

Monitoring zone:

- in distance - of 10 to 400 km
- in azimuth - 120°
- in elevation - of -2° to +45°

Frequency range: 1000 - 1250 MHz

Mean square measurement error:

- range (with a base of 100 to 300 m) - $\leq 1\%$
of the rating (at a range of 150 km)
- azimuth - $< 1^\circ$ (RMS)
- elevation - $< 1^\circ$ (RMS)

Capacity of 100 objects simultaneously.

5000 objects database.

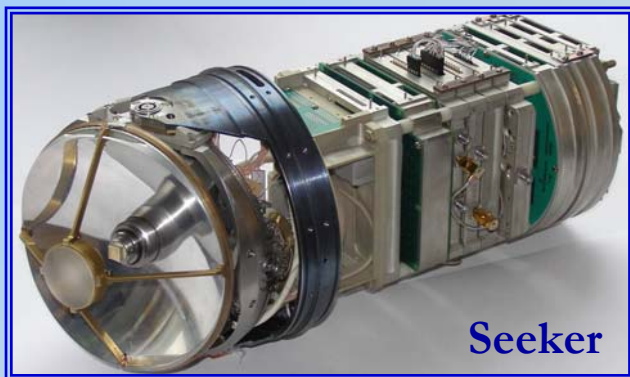
Observation session display mode.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

❑ Radars:

○ Radio wave MMW radar seeker



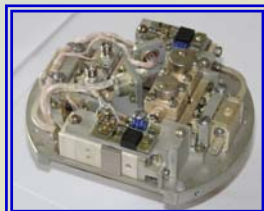
Sensor unit



Processing unit



Antenna



Transceiver

Radio wave MMW radar seeker is intended for tank target detection lock-on and tracking and for generation of terminal air-to-surface aircraft missile guidance signals.



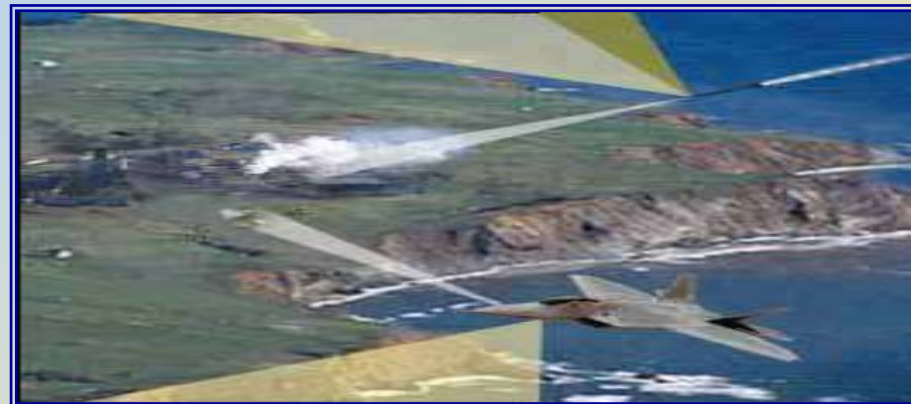
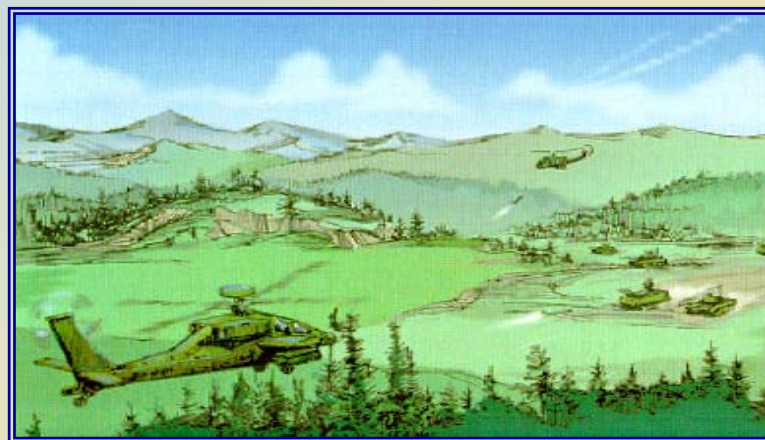
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LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

☐ Radars:

○ Radio wave MMW radar seeker

Application: Air Forces, antitank missile complexes





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

☐ Radars:

○ Radio wave MMW radar seeker

Basic performance data:

Frequency band:	- millimeter
Operating mode:	- active - passive
Maximum target detection and lock-on range	- 3 km
Range measurement error	- ± 3 m
Angular target tracking rate	- $0.1 - 10^\circ/\text{sec}$
Angular rate measurement error	- not more than 5%
Tracking angle range:	
- in azimuth	- ± 27 degrees
- in elevation	- ± 15 degrees
Dimensions:	
- diameter	- 170 mm
- length	- 400 mm
Mass	- 8 kg.





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

☐ Radars:

○ Ballistic radar (muzzle velocity radar)



Ballistic radar

Ballistic radar is intended for projectile muzzle velocity measurement for subsequent fire correction with the autonomous use or when complete with the ballistic calculator of the weapons systems.

The distinctive features are high accuracy of Doppler frequency shift measurements of the signal reflected from the projectile; security and high electromagnetic compatibility with the group use due to the operation in the RF millimeter wave band; possibility of measuring the muzzle velocity of a projectile regardless of the time of the day and weather conditions.



Commander console



Data handling computer



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

☐ Radars:

○ *Ballistic radar (muzzle velocity radar)*

Application: artillery armament for Land Forces, armored vehicles, Navy



Muzzle velocity
radar

Application objects



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Radars:

○ Ballistic radar (muzzle velocity radar)

Basic performance data:

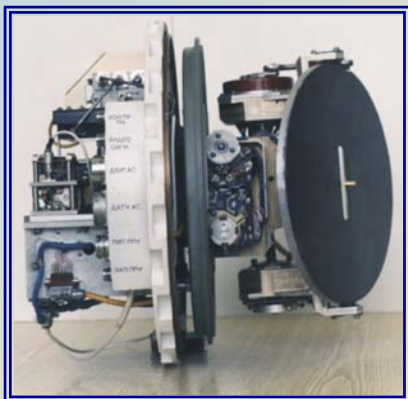
Operating frequency band	- millimeter
Projectile calibers	- 30 - 155 mm
Muzzle velocity range	- 50 - 2000 m/sec
Working measuring zone:	
- in distance	- <150 m
- in azimuth	- ± 2 degrees
- in elevation	- ± 2 degrees
Motion time measurement error	- 2 msec
Muzzle velocity measurement error, m/sec	- 0.1 %
Exchange line with a processing unit	- RS-232, RS-422.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Radars:

○ *MMW Collision Avoidance Radar (CAR)*



The CAR is intended for operation as a component of the helicopter radar for all-day and all-weather collision avoidance of a helicopter with stationary obstacles such as supports and high-voltage power lines, towers, high buildings, etc.

The CAR can be used for a short-range navigation of ships in severe weather conditions, as well as for anti-mine and anti-diversion ship defense.



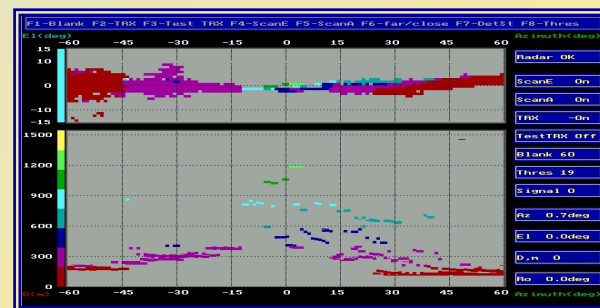
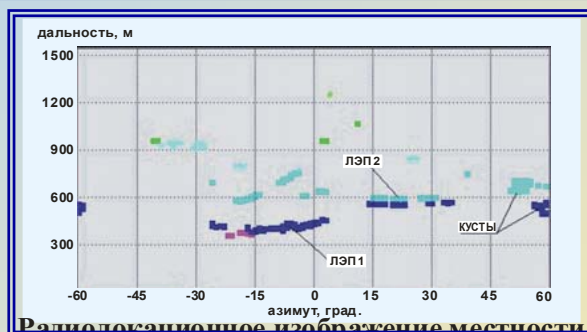
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LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

Radars:

MMW Collision Avoidance Radar (CAR)

Application: Air Forces, Navy



Display of detected targets, obstacles



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Radars:

○ MMW Collision Avoidance Radar (CAR)

Basic performance data:

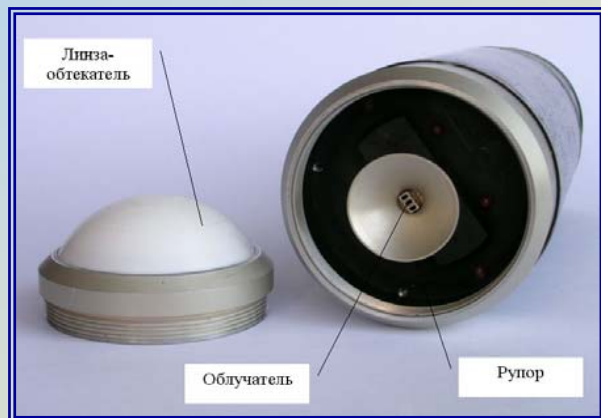
Operating frequency band	- millimeter
Working measuring zone	
- in distance	- 45 - 2200 m
- in azimuth,	- ± 60 degrees
- in elevation	- ± 15 degrees
Resolution	
- in distance	- 7.5 ... 10 m
- in angular coordinates	- $1^\circ \pm 0.1^\circ$
Mean-square error in angular coordinate measurement	- 0.5 degree
Operating temperature range	- minus 50°C ... $+55^\circ\text{C}$;
Mass	- 20 kg.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

☐ Radars:

○ Radar coordinator



The radar coordinator is intended for application as a component of all-weather and all-day self-guided (self-aiming) combat elements.

Principle of construction is combination of an active radar channel with a passive (radiometer) channel.

Structure: antenna; transceiver module; processing, control and supply module.

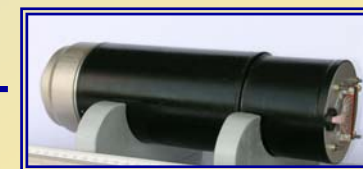


LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

❑ Radars:

○ Radar coordinator

Application: artillery systems, antitank missile complexes, missile volley fire systems



Radar coordinator



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Radars:

○ Radar coordinator

Basic performance data:

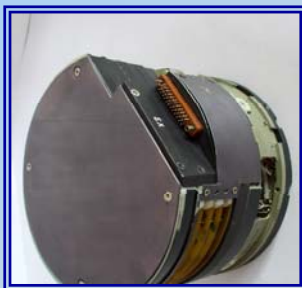
Operating frequency band:	- millimeter
Object midsection:	- 100 mm and more
Target lock-on range with a scattering cross-section not less 10 square meters (tank-type) with an antenna diameter of 80 mm:	
- active channel	- 600 - 1000 m
- passive channel	- 200 m
Angle lock-on zone in course and pitch with regard to a construction axis:	- $\pm 15^\circ$
Target types:	- ground moving and immobile vehicles.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

☐ Radars:

- *All-aspect millimeter wave band radiometric sensor*



Radiometric sensor



The radiometric sensor is intended for realization of all-aspect (in one plane) radio-thermal acquisition of spatial-distant objects with fixing their aspect angle to the appropriate quadrant.

The sensor contains four identical radiometric channels.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

☐ Radars:

- *All-aspect millimeter wave band radiometric sensor*

Application: air-to-air, surface-to-air missiles



Destruction object



Installation object



All-aspect measuring device



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

☐ Radars:

○ All-aspect millimeter wave band radiometric sensor

Basic performance data:

Operating frequency band:	- millimeter
Acquisition zone, angle degree:	- 360×30
Threshold sensitivity with integration time 2 msec, °K	- not more 3
Acquisition of radio-thermal signals of spatial-distant objects with thermal contrast of 15 °K:	
probability of true acquisition, not less	- 0.98
probability of false alarm, not more	- 0.01
Mass	- 2.35 kg.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- ❑ Telemetry equipment and miss measuring equipment
 - *Airborne small-size telemetry equipment*



Airborne unit



Components of the unit

The airborne small-size telemetry equipment designed in conformity with the Standard IRIG 106-04.

The equipment is intended for installation on guided missiles and artillery projectiles with their experimental development, for remote monitoring of the operating condition of the engineering systems of these objects, and for transmission of the information to the ground monitoring aids.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Telemetry equipment and miss measuring equipment

- *Airborne small-size telemetry equipment*

Application: missiles



Telemetry information
receiving post





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Telemetry equipment and miss measuring equipment
 - *Airborne small-size telemetry equipment*

Basic performance data:

Number of signals from sensors:	- 100
Signal interrogation frequency:	- up to 32 kHz
Signal conversion code:	- 16-bit NRZ-L
Overall self-descriptiveness :	- up to 2.0 Mbit/sec
Video code structure – in accordance with	IRIG STANDARD 106-04
Supply voltage:	- 28 V \pm 10%
Power consumption:	- 2.5 W
Equipment volume:	- 0.021 dm ³
Mass	- 0.5 kg.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Telemetry equipment and miss measuring equipment
 - *BRS-4 Breskul telemetry system radio signal receiving equipment*



Receiving antenna



Receiving apparatus

BRS-4 telemetry system radio signal receiving equipment is intended for telemetry missile-carrier launch control.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Telemetry equipment and miss measuring equipment

- *BRS-4 Breskul telemetry system radio signal receiving equipment*

Application: missiles



BRS-4 telemetry system
radio signal receiving
equipment



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Telemetry equipment and miss measuring equipment

○ *BRS-4 Breskul telemetry system radio signal receiving equipment*

Basic performance data:

Number of telemetry signal receiving channels - 2

Separation and generation of measurement information from a telemetry signal

Information transmission to a user:

- analog video

- parallel 8-bit binary code

Frequency letters: - 044, 054, 064, 070, 080, 090

Supply voltage: - 220 ± 22 В; 50 ± 10 Гц

Power consumption: - not more 60 W

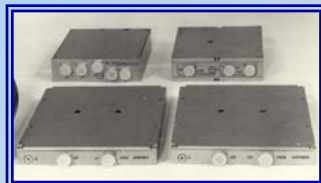
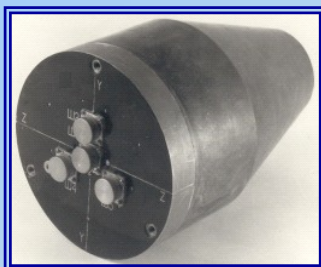
Mass - not more 20 kg.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Telemetry equipment and miss measuring equipment

○ *Complete set of the airborne miss measuring equipment*



Target equipment



Destruction means
equipment

The complete set of the airborne miss measuring equipment is intended for all-aspect measuring of mutual position parameters of a destruction object and a target and for delivery of the current information about measured parameters to the airborne telemetry target equipment for the purpose of transmission and calculation of the following data by the ground processing means:

- *relative range R between objects during their approach*
- *sighting angles μ between a longitudinal axis of a destruction object and a sight line „destruction object - target”*
- *coordinates (X, Y, Z) of a certain point of the destruction object (in the target coordinate system);*
- *time instant of explosion.*



Lviv Radio Engineering Research Institute State Enterprise

LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Telemetry equipment and miss measuring equipment
- Complete set of airborne mutual position measuring equipment

Application: air targets, missiles



Receiving ground post



Target



Air borne equipment





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Telemetry equipment and miss measuring equipment

○ Complete set of airborne mutual position measuring equipment

Basic performance data:

Measured parameters - R, X, Y, Z, μ

R, X, Y, Z measurement range, m - 1 – 80

μ measurement range, degree - 0 – 180

Mean square error in R measurement, m, not more

with: $1 \leq R \leq 20$ - 0.5+8 % R

$20 \leq R \leq 40$ - 0.8+10 % R

$40 \leq R \leq 80$ - 1.0+10 % R

Mean square error in sighting angle μ measurement, degree, not more

with: $10^\circ \leq \mu \leq 70^\circ$ - 4 – 7

with: $70^\circ \leq \mu \leq 170^\circ$ - 3 – 5

Mean square error in R operative measurement

a board the target, m, not more - 1 + 15 % R

Mean square error in measurement of a time instant of break in a circuit

msec, not more - 0.5



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Airborne transceivers

○ Parol-M airborne friend-or-foe identification system transponder



Pulse unit with
a control panel



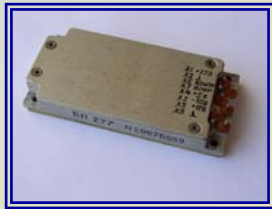
Super high-frequency
transmitter



Antenna-feeder



Supply unit of
the transmitter



Supply unit of
the receivers

The transponder is intended for use in airborne friend-or-foe identification systems.

Completely corresponds to the specifications of the Parol system 680 article with a considerable reduction of dimensions and weights. Characterized by high reliability and mechanical strength.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Airborne transceivers

○ *Parol-M airborne friend-or-foe identification system transponder*

Application: avionics, marine electronics, Navy ships, antiaircraft guided missile systems



Objects for installation of the friend-or-foe identification equipment



Friend-or-foe identification system equipment



Lviv Radio Engineering Research Institute
State Enterprise

LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Airborne transceivers

○ *Parol-M airborne friend-or-foe identification system transponder*

Basic performance data:

Received signal type	- signals of the Parol friend-or-foe identification system
Generated signal type	- signals of the Parol friend-or-foe identification system
Mean time between failures, hours	- 1500
Overall dimensions, mm	- 150 x 200 x 300
Mass, kg:	- 10.5
Construction	- ARING 600.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Airborne transceivers

○ *L-band radar transceiver*



The radar transceiver is intended for application in electronic countermeasures (ECM) systems for manned aircraft protection in bombardment by surface-to-air, air-to-air missiles.

The transceiver forms power radio pulse trains alternately by four transmitters and transmits them to four antennae with reception by each channel in intervals between pulse trains.

Transceiver



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Airborne transceivers

○ L-band radar transceiver

Application: airborne electronic countermeasure (ECM) systems



ECM equipment objects-carriers



Airborne ECM equipment



Transceiver



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Airborne transceivers

○ *L-band radar transceiver*

Basic performance data:

Operating frequency band:	- 20-centimeter
Transmitter peak power:	- > 240 W
Radio pulse parameters:	
- pulse train duration:	- 50 ms
- interval duration between pulse trains:	- 150 ms
- maximum pulse duration:	- 16 mcs
- repetition frequency of pulse trains:	- 16 Hz
Weight of a dual-channel transceiver unit:	- 7.4 kg
Total weight of the power unit and four transceivers:	- 19.2 kg.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Air-borne transceivers

- *Superhigh-frequency TV signal radio receiver (PII-7.000K)*



TV signal receiver

The receiver is intended for application in airborne systems for remote television guidance of air-to-surface aircraft missiles and winged missiles.

The receiver provides reception and demodulation of carrier frequency FM television signals and AM signals.

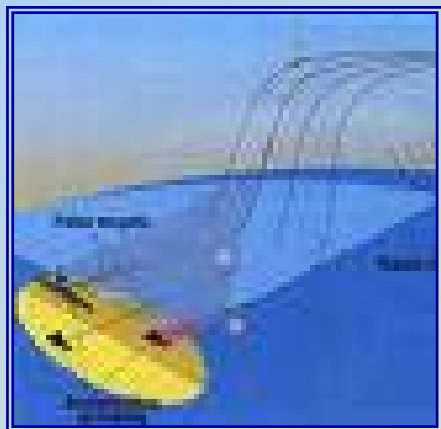


LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Airborne transceivers

- Superhigh-frequency TV signal radio receiver (ПП-7.000К)

Application: radio command guidance links



Destruction objects



Installation objects



TV signal
receiver



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Airborne transceivers

○ *Superhigh-frequency TV signal radio receiver (PΠ-7.000K)*

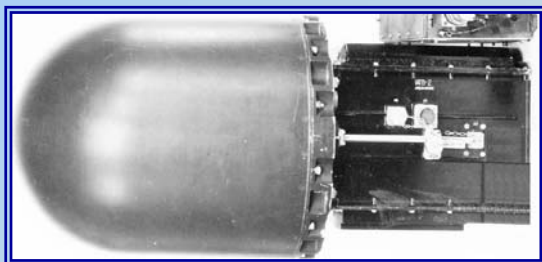
Basic performance data:

Operating frequency band:	- centimeter
Signal type:	- FM television signal
Number of receiving channels:	- 4
Receiver sensitivity (with signal/noise ratio of 26 dB at the output):	- not more minus 117 dBW
Continuous input power handling ability at the receiver input:	- 25 mBT
Power supply:	- 115 V AC, 400 Hz, +27 V
Power consumption:	- not more 25 W
Mass:	- 9.5 kg
Operating temperature range:	- minus 60°C to +60°C.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Radio command links and communications facilities
 - Miniature radio command link for antitank complexes



Helicopter equipment

The miniature radio command link is intended for radio command control of antitank guided missiles and Shturm, Ataka – type and other projectiles.

The radio command link includes:

- Command transmission equipment (CTE);
- airborne shockproof receiving equipment;
- Monitoring-and-test equipment.

Missiles equipment

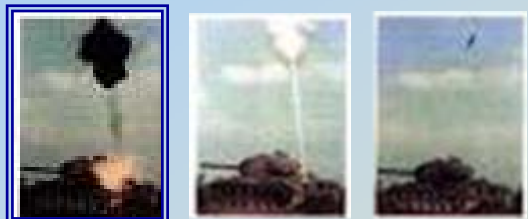


LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Radio command links and communications facilities

○ Miniature radio command link for antitank complexes

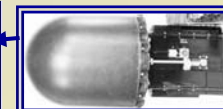
Application: radio command guidance links



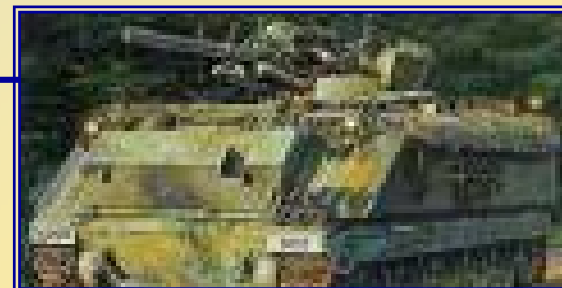
Destruction objects



Missile equipment



Helicopter and ground equipment





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

❑ Radio command links and communications facilities

○ Miniature radio command link for antitank complexes

Basic performance data:

The radio command link includes:

- command transmission equipment (CTE) mounted on a carrier (helicopter, boat, ground installation);
- airborne shockproof receiving equipment mounted on a missile (projectile);
- monitoring-and-test equipment for CTE monitoring;
- monitoring-and-test equipment for monitoring the missile (projectile) receiver.

Operating frequency band:

– millimeter

Radio control range:

– up to 8 km

Universal application (Air Forces, Navy and Land Forces), compact and miniature design, high noise immunity.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Radio command links and communications facilities

○ Digital radio relay station



Subset #1



Subset #2

The miniature radio relay station (RRS Contact) is intended for deriving the local duplex communication channels in a Ku band to receive-transmit by the air the information stream at a rate of 2.048 Mbit/sec or 8.448 Mbit/sec.

Information streams: IKM-30 digital telephony standard signal (PCM-30, European Standard E1 or PCM-120, European Standard E2), digital signal meeting the G703 ITU-T or V35 interface requirements.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Radio command links and communications facilities

- Digital radio relay station

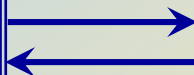
Application: digital communication systems



Civil communication



Subset # 1



Military communication



Subset # 2



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

☐ Radio command links and communications facilities

○ Digital radio relay station

Basic performance data:

Communication range (with transmitter power up to 50 mW):	- up to 30 km
Number of duplex channels:	- 1
Operating frequency band:	- Ku-band
Number of tuning frequency channels:	- 12
Radio channel frequency spectrum standards :	MCЭ-p, Recommendation F.387-6
Linear polarization:	- vertical or horizontal
Modulation type:	FSK (Frequency three-level manipulation without phase discontinuity)
Information stream coding:	- HDB-3 or AMI or NRZ
Information stream rate:	- 2.048 Mbit/sec (8.448 Mbit/sec).



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Test base for new millimeter-wave article prototypes

○ *Integrated anechoic chamber-based stand*



Anechoic chamber

Integrated anechoic chamber-based stand is intended for testing new radio MMW antenna, transceiver and radar prototypes.



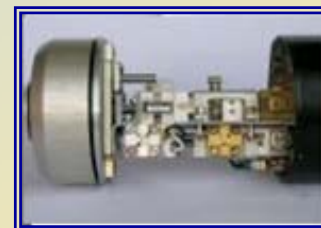
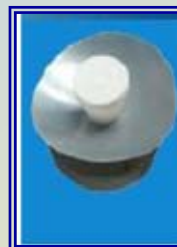
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LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

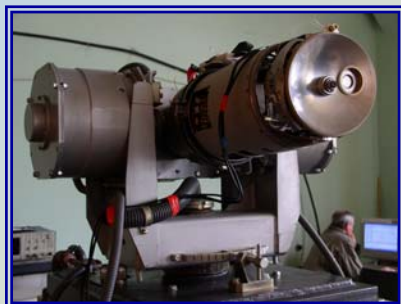
❑ Test base for new millimeter-wave article prototypes

○ *Integrated anechoic chamber-based stand*

Application: testing of millimeter-wave article prototypes



Under test and stand equipment





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Test base for new millimeter-wave article prototypes
 - *Missile angular motion simulator*



Angular motion simulator



Control racks of the angular motion simulator

Three-axis angular motion simulator is intended for physical simulation of missile roll, pitch and yaw angles, target tracking angles in detection and tracking modes during laboratory tests of radar seekers and their components.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Test base for new millimeter-wave article prototypes

○ Missile angular motion simulator

Basic performance data:

Seeker loaded mass:

- 10 kg

Angular displacement (relative to the appropriate axes of the platform construction coordinate system) within:

- in angles of roll: – not less $\pm 15^\circ$
- in angles of pitch: – not less $\pm 30^\circ$
- in angles of yaw: – not less 30°

Angular sinusoidal vibrations (relative to set mean values of platform position angles):

- in angles of roll: – not less $\pm 10^\circ$ with 1 ~ 3 Hz frequency
- in angles of pitch: – not less $\pm 8^\circ$ with 1 ~ 3 Hz frequency
- in angles of yaw: – not less $\pm 8^\circ$ with 1 ~ 3 Hz frequency

Simulator-external computer data exchange: – digital communication channel
RS-422

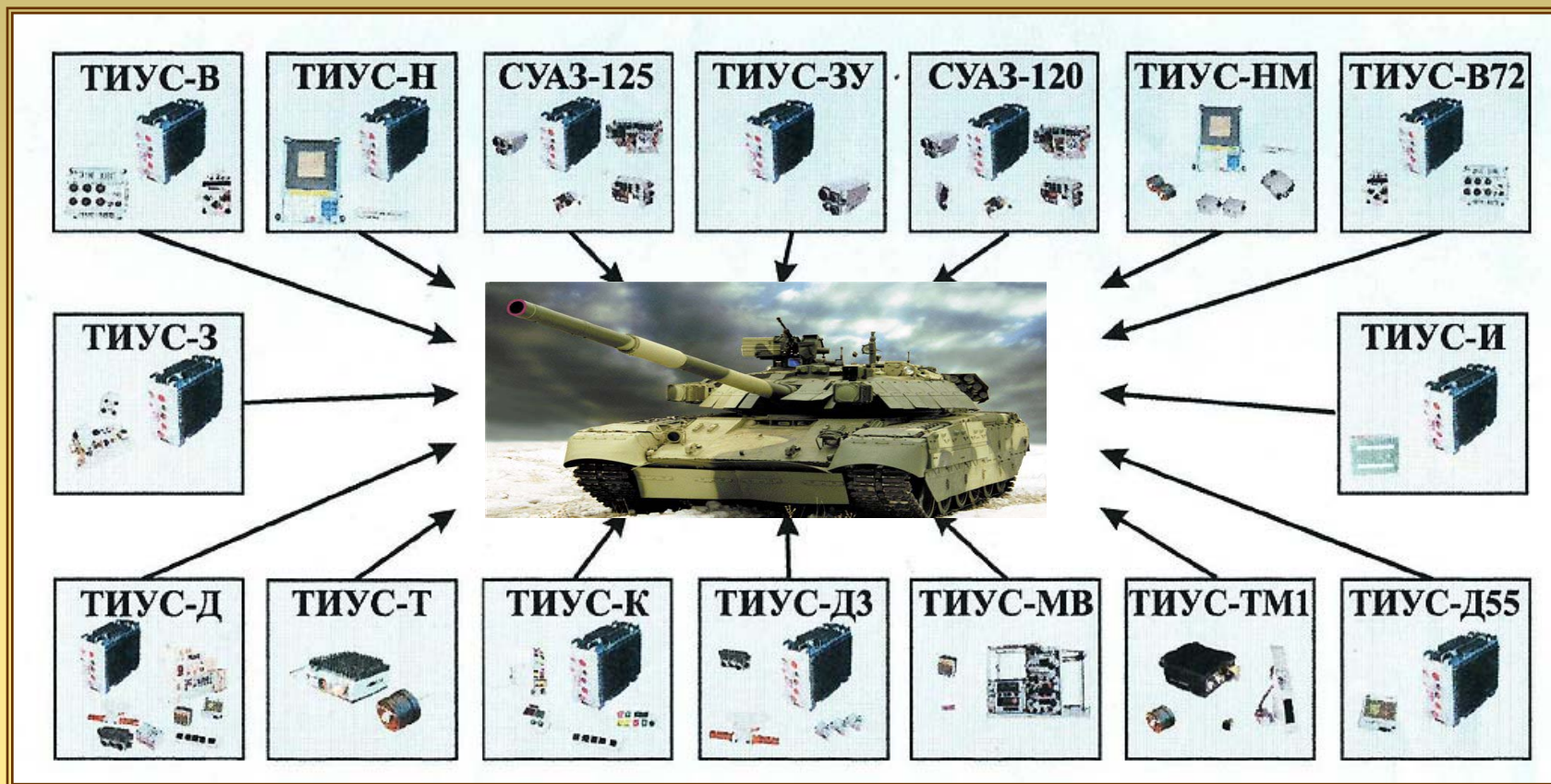
Rate of data exchange between the simulator and the external computer: – not less
56 Kbit/sec

Power supply – 380 V 50 Hz.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles

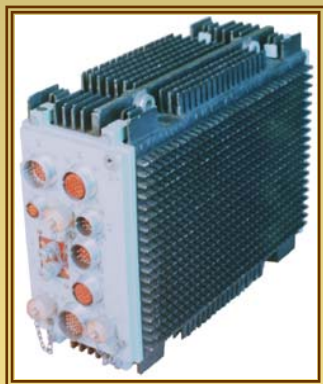




LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

- Movement control systems: tank movement, engine and transmission control equipment



Parameter monitoring unit



Movement conditions panel



Alarm signaling panel



Control panel



Road signaling panel



Separate system panels

The equipment is intended for the tank mobility characteristics improvement due to the following automation processes: fuel feed, movement HIGH/LOW gear shift, turn control, and also transmission actuator control in accordance with the formed laws for providing the most optimum modes of engine and transmission operation, current and emergency parameter monitoring and indication.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Movement control systems: tank movement, engine and transmission control equipment

Application: tank electronic systems



Placing in a tank



Installation object



Engine-transmission unit



Movement, engine and transmission control equipment



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

- Movement control systems: tank movement, engine and transmission control equipment

Main functions:

- monitoring of current and emergency parameters of the main engine and auxiliary systems of the tank
- main engine emergency operation interlock
- control of road signaling, heating and cleaning of monitoring devices, outside and inside illumination control (similar to the functions of the road signaling switching unit and the driver panel of the T80-YΔ article);
- air intake tube control with displaying its position;
- control of starting, stopping, motoring round and preservation of the auxiliary engine of the power generating unit and display of the operating modes of the power generation unit.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

- Movement control systems: *tank movement, engine and transmission control equipment*

Main functions (continuation):

- prestart preparation, main engine start, as well as signal formation for the main engine manual start and autonomous device control
- control of the heating boiler of the main engine (ME), heating of a tank living compartment
- thermo-smoke equipment magnet control
- display of a fuel level in tanks and oil level in a tank oil system
- control of fuel feed for the engine (459МБ, 498А) equipped by an electromechanical controller.



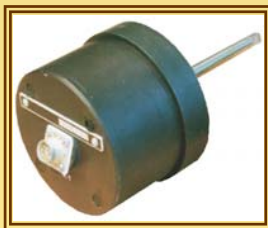
LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

- Movement control systems: *tank reversing transmission control equipment*



Automation reversing transmission unit



Traversed path and speed sensor unit

The reversing transmission control equipment is intended for:

- control of the tank reversing transmission
- shift from the basic mode to the reverse mode and vice versa
- interlock of the low gear engaging with the appropriate motion speeds
- tank speed measurement and its display on the speedometer
- monitoring of the speed sensor unit communication line.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Movement control systems: *tank reversing transmission control equipment*

Application: tank electronic systems



Installation object



Engine-transmission unit



Tank reversing transmission control equipment





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

- Movement control systems: tank reversing transmission control equipment

Basic performance data:

Readiness time for service after energizing, sec	- 32
Continuous operation time (with a subsequent interruption for 1 hour), hours	- 12
Operating temperature range with a permissible measurement error of $\pm 2\%$, °C, up to	- minus 40...+55...
Relative humidity at a temperature of +25 °C, %, not more	- 95 ± 3
27 V mains power, W, not more	- 12
Overall dimensions ± 2 mm:	
- reversing automation unit, mm	- $140 \times 60 \times 188$
- traversed path and speed sensor unit, mm	- 85 diameter \times 168
Weight of the article with a permissible measurement error of 10%:	
- unpacked, kg, not more	- 4
- packed, kg, not more	- 10



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

○ Movement control systems: tank power generating unit control equipment



Parameter monitoring and control unit



Information management panel

The auxiliary power generating unit (ЭА-10М) engine control equipment is intended for automation of starting and stopping of the auxiliary power generating unit engine, monitoring and signaling of current and emergency parameters of the auxiliary power generating unit engine, control of the process of producing the electric power by the power generation unit, as well as automatic interlock of emergency operating modes.



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LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
- Movement control systems: tank power generating unit control equipment

Application: tank electronic systems



Installation objects



Power generating unit



Power generating unit
control equipment



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

○ Movement control systems: tank power generating unit control equipment

Basic performance data:

Readiness time for service after energizing, sec, not more	- 5
Continuous operating time (with a subsequent interruption for 1 hour), hours	- 24
DC stabilizing voltage, V	- 27.5 ± 1
Ripple voltage, V, not more	- 0.75
Generator excitation winding current, A, not more	- 7
Supply voltage, V	- $27^{+1,5}_{-4,5}$
Mains power, W, not more	- 50
Operating temperature range, °C	- minus 30...+55
Relative humidity at a temperature of +25 °C, %, not more	- 98
Overall dimensions:	
parameters monitoring and control unit, mm	- 380 × 350 × 120
driver power panel, mm	- 100 × 104 × 87
Weight of the article unpacked, kg, not more	- 13.1



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Movement control systems: tank transmission interlock control equipment



Automatic transmission control unit



Traversed path and speed sensor



Transmission monitoring panel



Transmission interlock display panel

The equipment is intended for providing the interlock of the controls controlling the transmission of the armored vehicle objects of different types to protect the transmission from the wrong actions of the operator (driver) and also for controlling the speedometer.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Movement control systems: *tank transmission interlock control equipment*

Application: tank electronic systems



Installation object



Engine-transmission
unit



Tank transmission interlock
control equipment





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

○ Movement control systems: *tank transmission interlock control equipment*

Main functions:

- automatic determination of the types of the object and transmission on which the article is set up
- control of transmission actuators included as components of the object
- interlock of low gear engagement with the appropriate object motion speeds
- measurement of the object motion speed and its display on the speedometer
- monitoring, processing and testing of data from sensors and transmission actuators of the object
- display of the state of the sensors and transmission actuators of the object.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

- Movement control systems: control equipment for controlling the tank systems and modes of the main engine and auxiliary systems.



Tank system
and mode control equipment

The system is intended for optimization of the operator (driver) operation due to automation of prestart preparation and start of the main engine (ME), control of the operating modes and protection systems of the ME, providing the operation of the road signaling and display of the current parameters of the ME and auxiliary tank systems.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Movement control systems: control equipment for controlling the tank systems and modes of the main engine and auxiliary systems.

Application: tank electronic systems



Installation object



Tank system
and mode control equipment





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

- Movement control systems: control equipment for controlling the tank systems and modes of the main engine and auxiliary systems

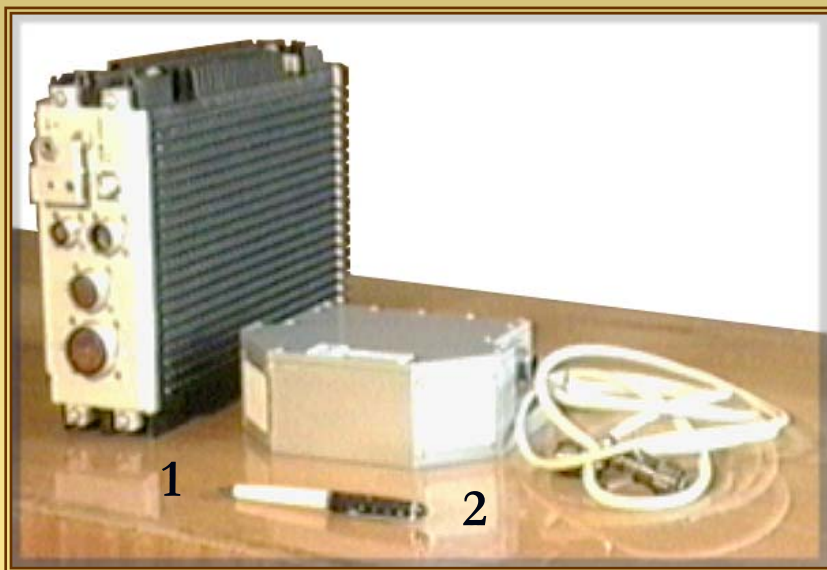
Main functions:

- digital display of the tank engine and system modes and states
- emergency state indication
- control of the main engine prestart and start
- selection of movement conditions
- control of road signaling
- indication of the fuel level indicator.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Movement control systems: *unified radar motion speed meter*



Unified radar meter for measuring the ground object movement parameters is intended for mounting on vehicles, all-purpose wheeled and caterpillar vehicles, armored vehicle objects, armored carriers with the purpose of creation on its basis measuring, navigation and control complexes.

1. Transmitter-receiver unit
2. Measuring unit with the RS-232 two-way interface.



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LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Movement control systems: *unified radar motion speed meter*

Application: tank electronic systems



Tanks on the march



Radar measuring device



Installation object



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

○ Movement control systems: *unified radar motion speed meter*

Basic performance data:

Relative speed measurement error	- 0.1%
Relative traversed path measurement error	- 0.13% (per kilometer)
Relative movement time measurement error	- 0.1%
Refresh rate	- 10 Hz (or 1 Hz on request)
Power supply: on-panel direct current mains	- 24 V, 12 V, 110 V
Power consumption	- not more 50 W
Overall dimensions, mm:	
- Transceiver	- 185 × 140 × 65
- Measuring unit	- 330 × 225 × 70
Operation in the environment of conditions	- minus 40° C to +50° C

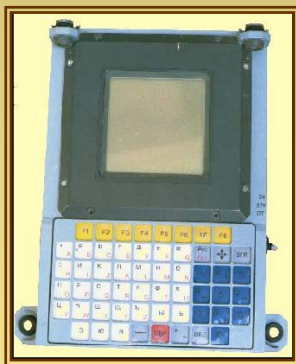


LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Navigation equipment: comprehensive navigation monitoring and operative interaction equipment



Processing unit



Display panel



GPS signal
recept
equipment



Control panel

Navigational support and interaction equipment is intended for solution of tactical tasks of controlling the fighting vehicles of the unit up to the battalion inclusive.

Vehicle current time and position coordinates measured by the satellite navigation system, are used to calculate the movement direction and speed and with the given destination to calculate, angles of additional turn and arrival time.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Navigation equipment: comprehensive navigation monitoring and operative interaction equipment

Application: tank electronic systems



Placement in a tank



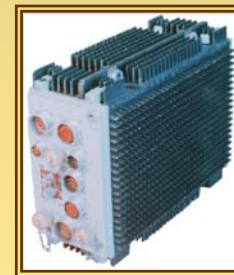
Installation object



GPS receiver



Angle sensor



Processing, control and display equipment



Speed sensors



Radio station





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

- Navigation equipment: comprehensive navigation monitoring and operative interaction equipment

Basic performance data:

Time of the article availability for service after energizing, sec, no more	- 180
Continuous operating time, hours	- 12
Supply voltage, V	- 27
27 V mains power, W, not more	- 50
Overall dimensions : - processing unit, mm	- 224 × 123 × 296
- display panel, mm	- 300 × 263 × 113
- control panel, mm	- 160 × 42 × 17
- GPS equipment (type CH-3700) consisting of:	
▪ receiving-computing unit, mm	- 205 × 144 × 57
▪ antenna unit, mm	- 73.6 × 119.4 × 1028
Article mass: - unpacked, kg	- 17.5
- packed, kg	- 52.5



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Fire control systems: *ballistic calculator*



Ballistic calculator unit



Parameter input panel



Display panel

The tank ballistic calculator is intended for automation of correction input in the tank fire control system to increase the probability of hitting the target.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

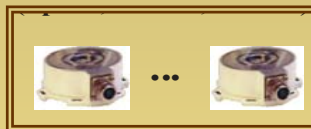
□ Information management systems for armored vehicles

- Fire control systems: *ballistic calculator*

Application: tank electronic systems



Installation object



Position angle and speed sensor



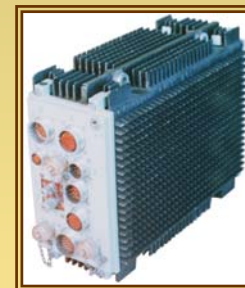
Barrel bend sensor



Sight



Atmosphere parameters sensor



Ballistic calculator



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

○ Fire control systems: *ballistic calculator*

Basic performance data :

Accuracy of calculation and formation of angles of sight signals and lateral lead advance of a gun and a machine-gun, angular minutes	- 0.052
Time of the article availability for service after energizing, sec,	- 10 ± 0.53
Continuous operating time, hours	- 12
Operating temperature range, degrees	- minus 40...+55
Supply voltage, V	- 27
27 V mains power, W	- 20 ± 0.5
Overall dimensions :	
- ballistic calculator unit, mm	- $224 \times 123 \times 296$
- parameter input panel, mm	- $209 \times 166 \times 160$
- indication panel, mm	- $125 \times 200 \times 70$
Mass of the article, kg	- 15



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Fire control systems: *loading gear control equipment*



Commander panel



Gunner control panel



Control unit



Loading panel



Power switching unit



Tank body conveyor control unit

The loading gear control equipment is intended for creation of military equipment having the increased firing rate.

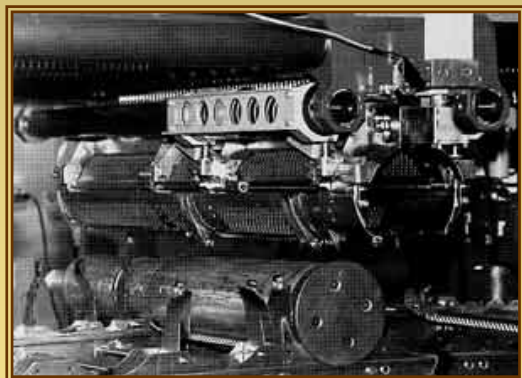
The distributed microcontroller system forms by a special algorithm the signals for the loading gear control depending on the state of the controls and on the state of the loading gear position sensors.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Fire control systems: *loading gear control equipment*

Application: tank electronic systems



Loading gear



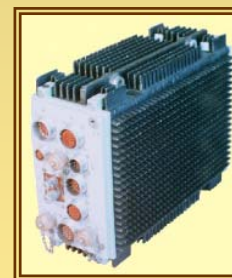
Commander panel



Gunner control panel



Tank body conveyor
control unit



Control unit



Loading panel





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Fire control systems: *loading gear control equipment*

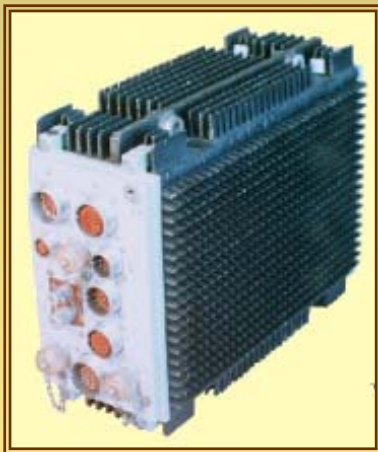
Basic performance data :

Types of usable projectiles:	hollow-charge, armour-piercing, guided	
Number of different types projectiles:	in turret conveyor	- 22
	in tank body conveyor	- 14
Time of availability for service after energizing, sec, not more		- 10
Continuous operating time, hours, not more		- 12
Supply voltage, V		- +(21.5...29.5)
27 V mains power, W, not more		- 40
Overall dimensions, mm:		
- commander panel		- 340 × 164 × 80
- gunner panel		- 240 × 136 × 77
- loading panel		- 100 × 155 × 110
- tank body conveyor control unit		- 224 × 123 × 300
- turret conveyor control unit		- 120 × 165 × 270



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Fire control systems: *antiaircraft mount control equipment*



Control unit



Amplifier power unit

The tank anti-aircraft mount control equipment is intended for control and stabilization of the anti-aircraft mount in horizontal and vertical planes.

It provides a wide speed range of the anti-aircraft mount, realization of the algorithms of the diagnostic and emergency condition identification systems.



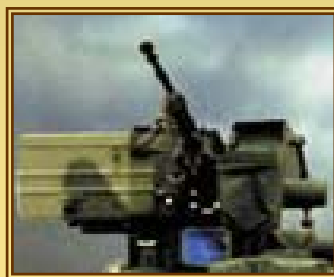
LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Fire control systems: *antiaircraft mount control equipment*

Application: tank electronic systems



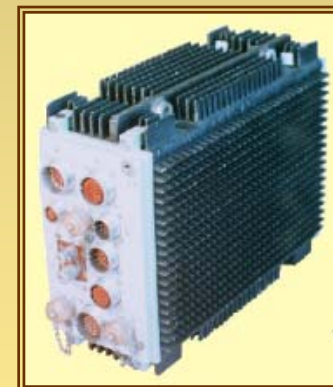
Tank with an
antiaircraft mount



Antiaircraft mount



Antiaircraft mount control equipment





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

○ Fire control systems: *antiaircraft mount control equipment*

Basic performance data:

Mean square pointing error, mrad, not more	- 0.152
Pointing nonsmoothness, mrad, not more	- 0.33
Pointing rate, degree/sec: minimum, not more	- 0.01
maximum, not less	- 3.54
Conveying speed, degree/sec, not less	- 45.05
Continuous operating time, hours	- 24
Supply voltage, V	- 27
27 V mains power, W	- 50
Overall dimensions: control unit, mm	- 366 × 256 × 175
amplifier power unit, mm	- 270 × 140 × 87
Article mass, kg, not more	- 15



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Fire control systems: armament control and stabilization equipment (warfare modules)



Control unit



Display panel



Horizontal and vertical stabilization units



Mode control panel

The armament control and stabilization equipment (warfare modules) is intended for stabilization and stabilized pointing of the warfare module weapons unit in horizontal and vertical planes in the automatic mode by sight signals and with taking into account the information about firing conditions.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Fire control systems: armament control and stabilization equipment (warfare modules)

Application: electronic systems for armored vehicles



Thunder warfare module



Thunder module installation objects



Armored
vehicle control
engines



Control and
stabilization equipment





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

- Fire control systems: *armament control and stabilization equipment (warfare modules)*

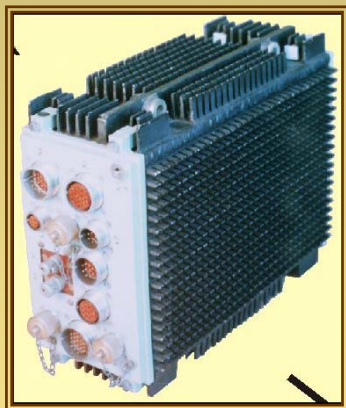
Basic performance data:

Pointing rate:	minimum, not more	- 0.02°/sec
	maximum, not less	- 6°/sec
Mean stabilization error, not more		- 0.3 thousandth of range
Nonsmoothness of pointing rate, not more		- 0.3 thousandth of range
Time of the article availability for service after energizing, sec		- 35
Continuous operating time, hours, not more		- 12
Supply voltage, V		- 27
27 V mains power at idling, W		- 60
Overall dimensions:		
	- control unit, mm	- 366 × 256 × 175
	- horizontal (vertical) stabilization unit, mm	- 270 × 140 × 87
	- display panel, mm	- 300 × 263 × 88
	- control panele, mm	- 205 × 142 × 88
Article mass, kg		- 31.2



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Protection systems: *smoke screening system control equipment*



Analysis and control unit



Control panel



Display panel

The system is intended for operation as a component of the optoelectronic suppression complex for the purpose of acquisition of the enemy laser emission, smoke or aerosol screening, emission of the modulated light for disorientation of the enemy guided missiles.

In irradiation of a tank by an enemy laser rangefinder the audible signaling system acts, one or several smoke grenades are fired automatically in the direction of irradiation and the tank turret turns in the irradiation direction which allows to timely escape from the aimed fire area and defeat the enemy.

At the same time the complex emits the modulated light which is the jamming to the ATGM (anti-tank guided missile) control system.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Protection systems: smoke screening system control equipment

Application: tank electronic systems



Sensors: screening



direction



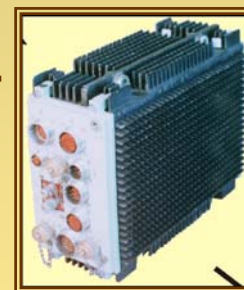
wind



Aerosol grenades



Aerosol grenades



Smoke screening system
control equipment





LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Information management systems for armored vehicles

○ Protection systems: smoke screening system control equipment

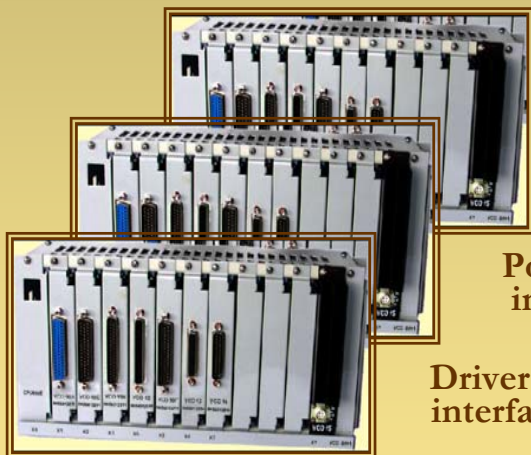
Basic performance data:

Spectral range of analyzers, μm	- 0.6...12
Total field of vision in horizon, $^{\circ}$	- 360
Time of the article availability for service after energizing, sec	- 15 ± 0.5
Operating temperature range (with a permissible measurement error of $\pm 2\%$), $^{\circ}\text{C}$	- minus 40...+55
27 V mains power, W	- 20 ± 0.5
Overall dimensions:	
- analysis and control unit, mm	- $224 \times 343 \times 123$
- display panels, mm	- $160 \times 92 \times 74$
Article mass (with a permissible measurement error of $\pm 10\%$):	
- unpacked, kg	- 7.5
- packed, kg	- 30



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

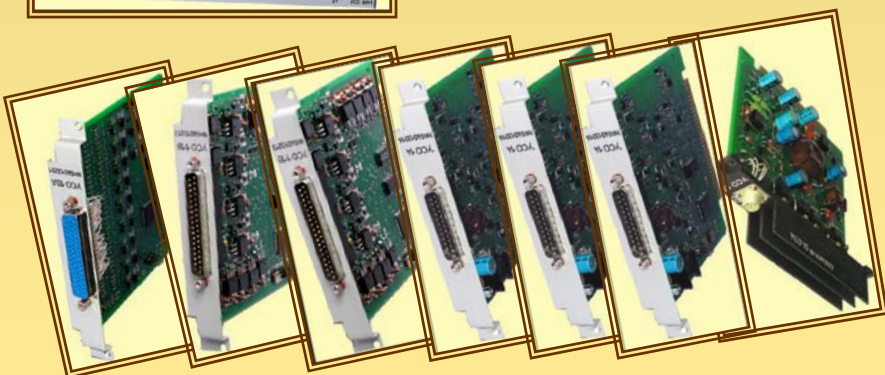
- Information management systems for armored vehicles
 - Training simulator equipment: interface equipment for armored vehicle trainers



Commander
trainer interface
unit

Pointer trainer
interface unit

Driver trainer
interface unit



Interface cell kit

The interface equipment for armored vehicle trainers is intended for operation as a component of the trainer complex with a view to prepare the tank crews on a high-quality level in different climatic conditions and on different terrains in situations close to combat.

It is used to train the personnel to operate the technical means supplied to the army in rearmament.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Training simulator equipment: *interface equipment for armored vehicle trainers*

Application: electronic systems for simulators



Pointer trainer



Commander trainer



Driver trainer



Interface equipment for
trainers



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- Information management systems for armored vehicles
 - Training simulator equipment: *interface equipment for armored vehicle trainers*

Main functions:

- recording, conversion and processing of signals from the sensors and controls of the trainer, driver, pointer and commander compartments
- formation of the control signals controlling the actuators and display units
- information exchange between the mathematical modelling computer and the instructor computer.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Computer-aided Rocket Forces and Artillery (RFA) control complexes

○ Computer-aided artillery division (battery) control equipment

Computer-aided artillery division (battery) control equipment is intended for:

- creation of new perspective control systems for a tactical control level of land forces
- modernization of the existing control systems for a tactical control level of land forces
- additional equipping of the existing control systems for a tactical control level of land forces
- modernization and additional equipping of fire weapons, possibility of their autonomous use.



Lviv Radio Engineering Research Institute *State Enterprise*

LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Computer-aided Rocket Forces and Artillery (RFA) control complexes

○ Computer-aided artillery division (battery) control equipment

Structure:



Processing and control equipment



Navigation and topographical control equipment



Data transceiver



Cryptographic data security equipment



Radio modems with noise-like signals



Portable commander kits



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

- ❑ Data processing and transmission equipment

- *Dedicated data processing computer*



The dedicated computer for data processing is intended for operation on wheeled and caterpillar-mounted vehicles as a computer for a commander workstation.

Data processing computer



Lviv Radio Engineering Research Institute
State Enterprise

LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Data processing and transmission equipment

○ Dedicated data processing computer

Basic performance data:

Central processor	- AMD GEODE LX800
Core storage volume	- 128-1024 megabytes
Disk memory volume	- 512 megabytes (1024 Mbytes – on a flash-disk)
Interfaces:	
- RS-232(422/485)	- 8 items
	with a speed up to 250 Kbit/sec (up to 1.5 Mbit/sec)
- USB V2.0	- 4 items
Ethernet local net :	- number of channels – 2 items
	- interface type 10BASE-T
	- rate of exchange – 10 Mbit/sec;
Video interface type	- VGA/LCD 24BIT TFT
Resolution	- 640 × 480
Diagonal axis	- 10.4 inches (26 centimeters)
Overall dimensions, mm	- 200 × 300 × 150
Power consumption, not more, W	- 50



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Data processing and transmission equipment

○ *Portable commander terminal*



Commander terminal

The commander terminal is intended for use in a control and communication system of the land forces tactical level as a radio terminal in a complete set with a portable radio station and a data communication equipment.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Data processing and transmission equipment

○ Portable commander terminal

Basic performance data:

Operating unit:	processor type	-I486
	CPU clock frequency, MHz	- 66
	permanent memory volume, Mbytes	- 2
	main memory volume, Mbytes	- 2
Input-output ports:	COM1, COM2 - RS-232/422/485 interface	
	data rate, Kbit/sec	- up to 115
Display:	decade number	- 4 × 20
	display zone size, mm	- 77 × 26
Keyboard:	type	- special-purpose, damp proof;
	number of keys	- 14
Supply voltage, V		- 12
Power consumption, W		- 2.4
Overall dimensions, mm		- 220 × 110 × 60
Mass, kg, not more		- 2



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Data processing and transmission equipment

○ Data transmission equipment



Data transmission unit

The data transmission equipment (DTE) is intended for the telecode information interchange by the radio communication channels derived by using short-wave, ultra-short wave radio stations, and also by nonswitched two-wire telephone communication lines based on the Π -274M (Π -275M) cable.

It is used for data transfer between command posts (CmP) and control posts (CnP) of the land forces tactical level, for additional equipping and modernization of the CmP and CnP control vehicles of land forces.

It provides data transfer in three radio networks simultaneously.



Lviv Radio Engineering Research
Institute
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LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Data processing and transmission equipment

○ Data transmission equipment

Basic performance data:

Number of packet radio networks	- from 1 up to 3
Number of the allocated telephone lines	- from 1 up to 10
Interface with the data processing equipment	- RS-232 or RS-422
Data transfer rate by the RS-232	- from 1.2 up to 19.2 Kbit/sec
Interface with radio stations	- И-PC or C1-ТЧ
Data transfer rate by a radio channel	- 1200, 2400, 4800 or 9600 bit/sec
Interface with telephone lines	- C1-ΦΛ-БИ
Data transfer rate by telephone lines:	- from 38.4 up to 150 Kbit/sec
Length of telephone communication lines	- up to 10 km
Power supplies:	+27 V onboard mains, storage battery (10-16)V
Power consumption, not more	- 25 W
Overall dimensions of the onboard unit, mm	- 300 × 220 × 120



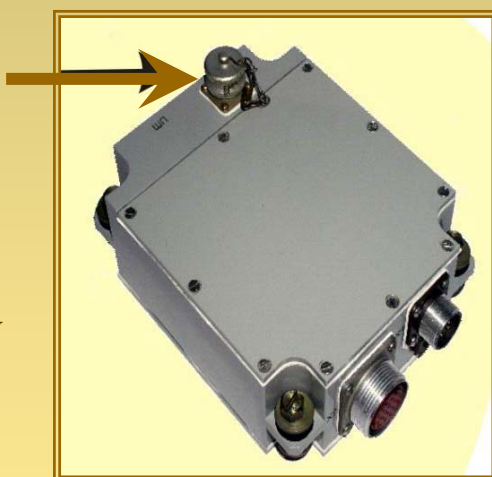
LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Data processing and transmission equipment

○ Data encryption device



Coder
processor key



Code processor with
a key

The data encryption device (code processor) is intended for encoding, generation of a simulation insertion and codes of the data electronic digital signature (EDS) and voice data transmitted by control and communication channels of the land forces tactical level.



LRERI RESEARCH and TECHNOLOGICAL PRODUCTION

□ Data processing and transmission equipment

○ Data encryption device

Basic performance data:

Algorithm of cryptographic conversion	- ГOCT 28147-89
Algorithm of EDS generation/check-up	- ГOCT 34.310-95, ΔCTY 4145-2002
Hardware implementation of random-sequence generator	
Probability of false data appearance	- 2^{-32}
Length of an encryption key	- 256 bit
Encryption rate	- up to 2 Mbit/sec
Length of key protection parole in key data storage	- 8 symbols
Type of consistent data communication with a computer	- USB
Mass, not more	- 2 kg
Overall dimensions, mm	- $220 \times 310 \times 100$
Supply	- $+(9+30) V$