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A Compilation of Soviet Ryad Mainframe and SM Minicomputer Equipment

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A COMPILATION OF SOVIET RYAD MAINFRAME AND SM MINICOMPUTER EQUIPMENT



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Information available as of September 1982 has been used in this report.

The authors of this paper are  Office of Scientific and Weapons Research. Comments and queries are welcome and may be addressed to the Chief, Military Technology Branch, OSWR, 



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PREFACE

The purpose of this guide is to provide a quick and easy reference to the many peripheral units that comprise the Soviet Ryad mainframe and SM minicomputer systems, as well as to provide a concise presentation of important technical information. The appendix contains examples of typical system configurations and performance information. A glossary of abbreviations is provided on the last page of the appendix. [REDACTED]

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This equipment list is compiled primarily from technical brochures and other open literature. The narrative titles and numerical groupings used by the authors in this report do not necessarily reflect an official Soviet taxonomy for this equipment. Five-digit references represent Joint Publications Research Service (JPRS) issues from the Foreign Broadcast Information Service. [REDACTED]

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[REDACTED] Parentheses around designators mean that the information available on this equipment is sparse. [REDACTED]

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The presence of specific equipment in this nomenclature listing does not necessarily imply a technology or a production capability. Frequently, conflicting data are available on the operational parameters of indigenous Soviet computer systems. The authors have used engineering judgments to select the most likely operational values. [REDACTED]

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Memory storage in this publication is specified in powers of 2, for example, 2 raised to the tenth power is 1,024, which is equivalent to 1K of memory. Memory storage units may be expressed in bits, bytes, or words; the basic units are always specified and are defined in the glossary. In general, communications or data transfer rates are specified in powers of 10. Telecommunication rates usually are expressed in the number of bits per second, whereas computer transfer rates typically are given in the number of bytes per second. [REDACTED]

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INTRODUCTION

Around 1967 the Soviets made a major decision to develop a system of mainframe computers by copying the architecture of the commercially successful IBM System/360 family. The Soviet versions of IBM computers are functional equivalents, not exact physical copies. Copying the IBM architecture enabled the Soviets to use the large Western repository of IBM-compatible software. By the end of 1969, the Soviets had convinced most of their East European allies to join in a coordinated and cooperative effort to produce a family of computers, called Ryad-1. The USSR was to concentrate on high-performance systems, while its partners in the Council for Mutual Economic Assistance (CEMA) were to put their resources into low-end mainframes and peripheral equipment.

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Initially, the Ryad-1 family consisted of models: 1010, 1020, 1021, 1030, 1040, 1050, and 1060. The Hungarian 1010 is unlike other systems in the series in that it is modeled after the French Mitra-15. The 1021 is a Czech computer combining some attributes of the System/360 line with those of the Czech ZPA-6000/20 computer. Neither the 1010 nor the 1021 are software-compatible with the rest of the Ryad-1 line. The first Soviet 1020 model was displayed in 1971, but it was mid-1973 before most of the other models were displayed. The 1030 and 1050 were also Soviet projects, while the 1040 was developed and produced in the German Democratic Republic (GDR). The high-performance 1050 and 1060 Soviet computers, which used new high-speed, emitter-coupled logic (ECL), encountered many problems in development. The problems of the 1060 were serious enough to cause the system to be deferred until the Ryad-2 generation.

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Ryad-1 was soon followed by interim system upgrades. Hungary produced the 1011 and 1012 models. The USSR made three improved versions: the 1022 from the 1020, the 1033 from the 1030, and the 1052 from the 1050. Poland developed the 1032, based on the 1030 model.

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As production of these intermediate models began, the second generation of Ryad computers was being developed. In mid-1978 the USSR introduced the Ryad-2, based upon the IBM System 370. The Soviet models eventually included the 1035, 1045, 1060, and the 1065. The USSR licensed Bulgaria to produce the 1035. Czechoslovakia modified its 1025 into the 1025M, and the GDR evolved its 1055 into the 1055M. However, as of late 1981, Hungary still did not have its 1015 in production.

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In November 1981 the Soviets announced the 1036, and in January 1982 a model 1061 was mentioned in the Soviet press. These models may be interim models prior to the production of the third Ryad generation.

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In 1974 the CEMA countries held another conference to discuss a project similar to Ryad, involving minicomputers called the "international system of small computers" (SM-EVM). Four small systems have been developed in the USSR -- the SM-1, SM-2, SM-3 and SM-4. The SM-1 and SM-2 are variations on the Hewlett-Packard HP-2100 series of minicomputers. Modifications by the Soviets of the basic HP-2100 design in developing the SM-1 and SM-2 have made the software of these SM systems incompatible with HP software. The SM-3, the Soviet adaptation of the DEC PDP-11/05, and the SM-4, the Soviet version of the PDP-11/40, were copied scrupulously to insure compatibility with DEC software. In 1981 Soviet literature contained at least one reference to an SM-5 minicomputer. We believe this system will follow along the PDP-11 line, with

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probably an SM-1/SM-2 emulator that would make this new machine software-compatible with the four previous SM machines. 

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Component Listing for Ryad or Edinaya Systems (ES) Mainframe Computers

All equipment designators preceded by ES unless otherwise specified.

() = only scarce information is on file for this equipment.

Frequently, conflicting data are available on the operational parameters of indigenous Soviet computer systems. The authors have used engineering judgments to select the most likely operational values.

STATIONARY POWER SUPPLIES: 08XX

(0823) Power supply for 1022
 (0824) Power supply for 1060
 (0825) Power supply for 1060
 (0835) Power supply for 1035
 (0853) Power switching device

MOBILE POWER SUPPLIES: 09XX

(0904) Power pack for magnetic tape controller; +5 volts; 18 amps; also referred to as BP-1; 10516p48
 (0905) Power pack for magnetic tape controller; +5 volts (BP-2), -5 volts (BP-3); 3.6 amps; 10516p48

COMPUTER SYSTEMS: 10XX

1010 Ryad-1 Hungary; 16-bit mini; 3 kOPS; 8 to 64 kilobytes; upgm ctl; TTL; modeled after US SDS Sigma-5 & French CII Mitra-15; Videoton produced "several hundred configurations;" 80230p17
 (1010V) Ryad-1M Hungary; control computer system; 10508p2
 1010M Ryad-1M Hungary; 1010 with 64 KB main memory; poss exported to France
 (1011) Ryad-1M Hungary; 16- or 32-bit modes; 512 KB; poss used by military and poss exported to France
 (1012) Ryad-1M Hungary; 6 kOPS; 128 KB; xpan inst set; few produced 80230p17
 (1015) Ryad-2 Hungary; 12 to 16 kOPS; 160 KB; 16 MB VS
 (1016) Ryad-? Hungary; expected around mid-1980s; 80230p17
 (1017) Ryad-? Hungary; expected around mid-1980s; 80230p17
 1020 Ryad-1 USSR,Bulgaria; 10-20 kOPS; 64-256 KB; TTL; upgm ctl; 2 us cycle time; 10502p30-37
 1020A Ryad-1 CSSR; same as 1021
 1021 Ryad-1 CSSR; 20 kOPS; 64 KB; 1 us access time; 2 us cycle time; "not compatible with Ryad-1 series"; 72253p12
 (1021M) Ryad-1 CSSR 1020; 16-64 KB; "not compatible" with Ryad-1; 10387
 1022 Ryad-1M USSR; 80-90 kOPS; 128-512 KB; TTL; 600 ns cycle time; upgm ctl; 10502p29-42 10516p10
 1022B Ryad-1M Bulgaria; 80 kOPS; 512 KB; under Soviet "license"
 1025 Ryad-2 CSSR; 60 kOPS; 256 KB; 8 MHz clock; 102 instruction set; 1.25 us cycle time; multiprogram operation
 1030 Ryad-1 USSR,Poland; 60 kOPS; 128-512 KB; TTL; upgm ctl; 10502p27-36 10516p19
 (1032) Ryad-1M Poland; 200 kOPS; 256-512 KB; 72020p10
 1033 Ryad-1M USSR; 200 kOPS; 256-512 KB; 1.2 us cycle time; 200 kB/s xfer rate; real-time & time sharing operation; upgm ctl; 10502p29-34
 1035 Ryad-2 USSR,Bulgaria; 140 kOPS; 512 KB; 2 us cycle time; time sharing & real time operation; compatible with Minsk-32; 10502p29-32 72020p10
 (1036) Ryad-2.5? USSR; first mentioned in daily SNAP, Dec. 24, 1981

(1037) Ryad-3? USSR; mentioned in 8371 brochure
 1040 Ryad-1 GDR; 380 kOPS; 128-1024 KB; TTL; 1.35 us cycle time; upgm ctl; 10502p29-34 10516p19 9540
 1045 Ryad-2 USSR, Poland; 500 kOPS; 3 MB; 1.2 us cycle time; 1500 kB/s xfer rate; 10502p32
 (1047) Ryad-3? USSR; mentioned in 8371 brochure
 1050 Ryad-1 USSR; 500 kOPS; 128-1024 KB; hard-wired ctl; time sharing & real time operation; 1.25 us cycle time; uses ECL logic series 137 & 187; 10502p30-34 10516p4
 (1052) Ryad-1M USSR; 700 kOPS; 2048 KB
 1055 Ryad-2 GDR; 450 kOPS to 750 kOPS with cache; 2 MB; time sharing & real time operation; 1.2 us cycle time; 10502p29
 (1055M) Ryad-2 GDR; 450 kOPS; 4 MB; 10466p1 81621p15-20
 1060 Ryad-2 USSR; 1.3 MOPS; 2 MB; 8 MB VS; hard-wired ctl; 1.0 us cycle time; time sharing & real time operation; 1500 kB/s xfer rate; uses series 137 & 187 ECL circuits; 10502p29-32 10516p4
 (1065) Ryad-2 USSR; 4-5 MOPS; 2-16 MB; time sharing & real time operation; 1500 kB/s xfer rate; 10502p29-32

OPERATOR CONSOLES: 15XX

(1501) Control panel for 1060
 (1535) Control panel for 1035 & 1045

PROCESSORS: 2XXXPROCESSORS WITHOUT MAIN MEMORY AND WITHOUT CHANNELS: 20XX

2010 Hungary; processor for 1010; 18-bit word with 16 info bits; upgm ctl
 2020 USSR; processor for 1020; 20-30 us per short operation; upgm ctl; 1-byte ALU
 2021 CSSR; processor for 1021
 2030 USSR; processor for 1030; 5-11 us per short operation; upgm ctl; 4-byte ALU
 2032 Poland; processor for 1032; 300 ns machine cycle time; 2.4 us per short operation
 2040 GDR; processor for 1040; 1.4-2 us per short operation; upgm ctl
 2050 USSR; processor for 1050; 0.65 us per short operation
 2060 USSR; Processor for 1060; 50-90 ns cycle time

PROCESSORS WITH MAIN MEMORY BUT WITHOUT CHANNELS: 23XX

2335 Array processor for 1035; 200 ns cycle time
 (2345) Array processor for 1045; 75250p1-4

PROCESSORS WITH CHANNELS BUT WITHOUT MAIN MEMORY: 24XX

(2422) CPU with 1 mux & 2 selector channels; mentioned in 1022 brochure
 2433 CPU for 1033 with 1 mux & 3 selector channels; works with 3203 main store; 1.5 us cycle time; 256-512 KB; upgm ctl
 (2435) CPU with 1 mux & 2 selector channels; mentioned in 1035 brochure

PROCESSORS WITH MAIN MEMORY AND WITH CHANNELS: 26XX

2622 USSR; central unit for 1022 consisting of 2422, 3222, & 0823; upgm ctl; 2-byte ALU
 2635 USSR; central unit for 1035; consists of 2435, 3235 or 3237, 1535, 5009 & 0835; upgm ctl; 2-byte ALU

2640 GDR; central unit for 1040; upgm ctl & sequential ctl; 380 kOPS
(2655) GDR; central unit for 1055; 450 kOPS
(2655M) GDR; central unit for 1055M; 10466p2 81621p21-34,75-104

INTERNAL MEMORY UNITS: 3XXX

MAIN MEMORY: 32XX

3203 USSR; core main store for 1030 & 1033; 256 KB rack consisting of two 128 KB modules; 0.85 us access time; 1.5 us cycle time
(3204) GDR; core main store for 1040; 1.35 us cycle time; 256-1024 KB; 10502p34
3205 USSR; core main store for 1050; 256 KB rack consisting of two 128 KB modules; 0.8 us access time; 1.25 us cycle time
3206 Core main store for 1045, 1052, & 1060; 1 MB rack consisting of sixteen 64 KB modules; 0.6 us access time
3207 Core main store for 1033; 512 KB rack consisting of eight 64 KB modules (3941); 0.7 us access time; 1.2 us cycle time
(3220) Core main store for 1020; 256-512 KB; 2 us cycle time; 10502p34
3222 Core main store for 1022; 256-512 KB; 1 us access time
3235 Core main store for 1035; 256-1024 KB; 0.5 us access time; 0.8 us cycle time; some refs to the 3235 being "semiconductor based"
3236 32 Kb memory board consisting of 1 Kb nMOS RAMs
(3237) Core main store; 256 KB; mentioned in 1035 brochure
3238 192 Kb memory board consisting of 48 4 Kb nMOS RAMs
3263 Semiconductor memory for 1033; 256 KB; 1.5 us cycle time; 77882
(3266) 8 MB semiconductor memory consisting of four 2 MB blocks; 520 ns access time; 680 ns cycle time; 77882
(3267) Core main store for 1045; 1 MB rack; four racks/system; 1560 us cycle time

MICROPROGRAM STORE CONTROLLERS: 35XX

3535 Control for upgm storage devices using 2435 CPU adapter

READ-ONLY MEMORIES: 36XX

(3604) Read-only memory for 1040

STORAGE MODULES: 39XX

3941 64 KB storage module; mentioned in 3207 brochure

CHANNELS: 4XXX

MULTIPLEXOR CHANNELS: 400X-402X

4001 General-purpose channel with 100 kB/s byte mux, 500 kB/s selector channel & up to 3000 kB/s blk mux
4011 GDR; multiplexor channel for 1040 computer; 25 kB/s serial; 720 kB/s blk
4012 USSR; multiplexor channel for large Ryad-1 computers; 670 kB/s xfer rate

SELECTOR CHANNELS: 403X-405X

4034 GDR; selector chn for GDR's 1040; 300-1300 kB/s xfer rate
4035 USSR; selector channel for large Ryad computers; 1300 kB/s

CHANNEL-CHANNEL ADAPTERS: 406X

(4060) Channel-to-channel adapter; mentioned in 4035 brochure

(4061) Channel-to-channel adapter; 10318p176

REPEATERS: 407X-409X

(4080) Logic repeater used in 1065; 10318p176

(4081) Main line signal repeater of I/O interface

MULTIPLEXOR AND SELECTOR CHANNELS: 44XX

4430 USSR; selector & mux chns for 1030; 40-800 kB/s xfer rate

EXTERNAL MAGNETIC MEMORY STORAGE: 5XXX

MAGNETIC TAPE DRIVES: 500X-502X

NOTE: All drives take 9 track, 25 MB capacity, ISO reels (267 mm diameter, 12.7 mm wide, 730 m long) unless otherwise noted

(5001) Poland; magnetic tape storage; NRZI; 10516p35

(5002) 200 kB/s xfer rate; 3 m/s; 64 b/mm NRZI; (*)

5003 USSR,Bulgaria(?); 5 m/s; 63 b/mm PE at 315 kB/s or 32 b/mm NRZI at 160 kB/s; not confirmed operational; do not confuse with ISOT 5003; 10516p35

5003.3 Bulgaria; 3 m/s; 63 b/mm PE at 189 kB/s or 32 b/mm NRZI at 96 kB/s;

5004 CSSR; 2 m/s; 63 b/mm PE at 126 kB/s or 32 b/mm NRZI at 64 kB/s; tape has 50 MB storage capacity; 10516p35

(5009) "Console magnetic tape unit"

(5010) USSR; magnetic tape store for 1020; 2 m/s; 8 or 32 b/mm NRZI up to 64 kB/s xfer rate; 10502p31 10516p35-46

(5012) Bulgaria; 2 m/s; 8 or 32 b/mm NRZI at 16 or 64 kB/s; 10516p35-46

5012.3 USSR; 3 m/s; 32 b/mm NRZI at 96 kB/s

(5012.4) Bulgaria; 74657p4

(5014) USSR; 2 m/s; 32 b/mm or 63 b/mm PE at 126 kB/s; 10502p155

(5015) CSSR; 4 m/s; 32 b/mm or 63 b/mm PE at 240 kB/s; 10516p33-37

(5016) GDR; 296 mm reel; 1.524 m/s; 8 or 32 b/mm NRZI at 48 kB/s; 10502p35 10516p35

5017 USSR,GDR; magnetic tape store for 1022 & 1033; 296 mm reel; 2 m/s; 8 & 32 b/mm NRZI up to 64 kB/s; 10502p31 10516p35

(5017.2) GDR; magnetic tape store; 8 or 32 b/mm; 64 kB/s; 10466p1

(5017.3) Magnetic tape store for 1060; 8 or 32 b/mm; 2 m/s tape speed; NRZI; 10318p176

(5019) Poland; magnetic tape storage for 1030 & 1050; 296 mm reel; 3 m/s; 8, 22, 32 b/mm NRZI up to 120 kB/s; 10502p31 10516p35

(5021) USSR,GDR; 8 or 32 b/mm NRZI; 10516p35

(5022) CSSR; 2 m/s (3 & 4 also reported); 32 b/mm NRZI at 64 kB/s or 64 b/mm PE at 128 kB/s; 10502p35 10516p35 76587p28

5025 USSR; 2 m/s; 32 b/mm NRZI or 64 b/mm PE; 50 MB capacity; 64 or 126 kB/s xfer rate; 10516p35

(5027) External memory unit; 10570p1

(5029) CSSR; 2 m/s; 8 or 32 b/mm NRZI; 16 to 64 kB/s xfer rate; (*)

MAGNETIC DRUMS: 503X-504X

5033 USSR; 6 MB; 20 ms average access time; 42 b/mm; 1500 rpm; 1250 kB/s xfer rate; 450 mm drum diameter; 800 info tracks; 10516p54-57

(5034) Poland; 2 MB; 20 ms average access time; 100 kB/s xfer rate; 10516p54

(5035) GDR,Poland; 2 MB; 20 ms avg access time; 32 b/mm; 1500 rpm; 100 kB/s xfer rate; 320 mm drum diameter; 10516p54-55

MAGNETIC RIGID-DISK DRIVES: 505X-506X

5050 USSR; 7.25 MB; 6 disks/pack; 10 operating surfaces; 29-44 b/mm; 90 ms avg access time; 156 kB/s xfer rate; 2400 rpm; (200 + 3) tracks/surface; 10502p31-35 10516p62-64

5051 USSR; 100 MB non-removable disk packs; 36 disks: 64 working surfaces; 250 ms avg access time; 384 tracks/surface; 83.25 kB/s xfer rate

5052 USSR,Bulgaria; 7.25 MB; 6 disks/pack; 45 b/mm; 156 kB/s xfer rate; 2400 rpm; 95 ms avg access time; similar to 5050; 10516p62

5053 Bulgaria; 7.25 MB; 6 disks/pack; 44 b/mm; 2500 rpm; IBM-1311 or -2311

(5055) GDR; similar to 5050; 10516p62

5056 USSR; 7.25 MB; 6 disks/pack; 2400 rpm; 75 ms avg access time; similar to 5050; 10516p62

(5058) CSSR; changeable disk drive for 1010; similar to 5050; 90 ms avg access time

(5060) Hungary; 800 KB; 40 b/mm; 3600 rpm; 150 kB/s xfer rate; similar to 5050; used in 2010 processor of 1010 computer; 10502p157-159

5061 Bulgaria; 29 MB; 11 disks/pack; 50 ms access time; 312 kB/s xfer rate; IBM-2314 compatible

(5064) USSR; 11 MB; 1500 kB/s xfer rate; (*)

5066 USSR,Bulgaria; 100 MB; 159 b/mm; 806 kB/s xfer rate; 3600 rpm; uses 5266 disk pack; 55 ms avg access time; 10502p35

5067 Bulgaria; 200 MB; 5267 disk pack; 159 b/mm; 3600 rpm; 55 ms avg access time; 806 kB/s xfer rate

5067.2 Bulgaria; 806 kB/s xfer rate; 159 b/mm; dual 100 MB drives; IBM-3033; 76664p24

5067.4 Bulgaria; dual (?) 200 MB drives; IBM-3033-II; 76668p24

5069 24 or 48 MB; "irremovable ... cassette disk;" 2 disks/pack; 2400 rpm; 12.5 ms avg access time; 1250-2500 kb/s xfer rate

OTHER MAGNETIC DEVICES: 507X-509X

(5071) Magnetic card storage device; 125 Mb capacity; 2 KB/magnetic card; 32 b/mm; 52 kB/s read-write speed; 5 us avg access time; 10502p162

(5072) CSSR; floppy disk unit; 650 KB capacity; (*)

5074 Bulgaria; 3.2 Mb floppy; 128 b/mm; 1.89 trks/mm; 360 rpm; 280 kb/s xfer rate

5075 Bulgaria,CSSR; two 5074 floppies w/cntrl; 250 kb/s xfer rate; 9584p72

(5080) USSR; 200 MB rigid disk drive; 806 kB/s xfer rate; 30 ms avg access time; 10318p81

(5088) Bulgaria; 109.4 KB floppy disk store; 125 kB/s xfer rate; 35 trks; 300 rpm

(5090) USSR,Poland; cassette tape unit; 8 kB/s xfer rate; 0.254 m/s; (*)

(5094) Hungary; cassette tape unit; 200 kB/s xfer rate

MAGNETIC DISK PACKS: 52XX

5261 Bulgaria; 29 MB; 11 disks/pack; 90 b/mm; (200 + 3) trks/surface; IBM-2314, -2314A, & -2319 compatible

5266.1 Bulgaria; 100 MB; 10 disks/pack; 159 b/mm; 192 tpi; IBM-3330

5267 Bulgaria; 200 MB; 10 disks/pack; 159 b/mm; 370 tpi; IBM-3330-II

5269 Bulgaria; 3.1 MB; single disk; 44 b/mm; 203 trks/surface; compatible w/CDC-9427

5269A Bulgaria; 1.22 or 2.45 MB; single disk; 44 or 88 b/mm; IBM-5444

5274 Bulgaria; 8" floppy w/1.9, 2.1, 2.3, 4.5, 7.8, 9.0, or 9.6 MB

5274.E3 Bulgaria; 5.25" floppy; soft, 10 hard, or 16 hard sectors

MAGNETIC TAPE CONTROLLERS: 550X-552X

Note: Transfer rate is a function of tape drive, controller and recording density.

5503 USSR,CSSR; ctls 8 or 16 5002, -03 & -04 magnetic tape drives; 64-315 kB/s xfer rate; 10502p155
 5511 USSR; ctls eight NML-67, 5010, or 5012 tape drives; 64 kB/s xfer rate
 5512 Bulgaria; ctls eight 5012, -12.3 & -17(possible) tape drives; 64 or 96 kB/s xfer rate; 8 or 32 b/mm
 5514 USSR; ctls eight 5014 tape drives; 126 kB/s xfer rate
 (5515) CSSR; ctls up to eight 5022 or -29 tape drives; 128 kB/s xfer rate; 10516p46
 5516 USSR; ctls eight 5016, -17, or -21 drives; 96 kB/s xfer rate; 76587p29
 5517 USSR; ctls up to eight 5010, -12.1, -17, -17.2, -19, -22, -29 tape drives; 64, 96, or 128 kB/s xfer rate
 (5519) Ctlr for 5019 tape drive; 96 kB/s xfer rate; 10516p46
 5521 GDR; ctls eight 5016 tape drives; 64 kB/s xfer rate
 5525 USSR; ctls eight 5012, -17, -19, or -25 tape drives; 64, 126, 189 kB/s

MAGNETIC DRUM CONTROLLERS: 553X

5533 USSR; ctls eight 5033 drums; max xfer rate 1250 kB/s

MAGNETIC DISK CONTROLLERS: 555X-556X

5551 USSR; ctls eight 5050,5051,5052 or 5056 disk drives; 156 kB/s xfer rate
 (5551-M) USSR; disk storage controller; 10516p105-106
 5552 Bulgaria; ctls eight 5051, -52, -53, -56, or -58 drives; 156 kB/s NRZI
 (5555) GDR; similar to 5552 but consumes more power; mentioned in 1040 brochure
 5558 CSSR; ctls up to eight 5052 or 5058 units; 156 kB/s xfer rate
 5561 Bulgaria; ctls eight interchangeable disk drives; 312.5 kB/s xfer rate
 5566 USSR; ctls eight 5066 disk drives; 806 kB/s xfer rate
 5567 Bulgaria; ctls up to 32 spindles thru four 5667 ctl units; referred to as a ctl "module" vice the 5567 ctl "device"; 806 kB/s
 5568 USSR; ctls eight 5061 disk drives; 312.5 kB/s xfer rate
 5569 Ctls four 5069 cassette disks; 1500 kB/s xfer rate; 9584p69

MISCELLANEOUS: 56XX

5612 Bulgaria; magnetic tape drive similar to 5012.3 w/63 b/mm PE at 189 kB/s xfer rate; NRZI; uses 5525.3 ctlr
 5667 Bulgaria; ctls up to eight spindles from 5067 series disk drives

NONMAGNETIC INPUT DEVICES: 6XXX

(Note: some 61XX designators are not in sequence)

CARD READERS: 601X and 611X

6012 USSR; mechanical feed up to 500 cards/minute in start/stop mode; photoelectric reader; Ryad-1
 6013 USSR; vacuum feed up to 1200 cards/minute in a start/stop mode; photoelectric reader
 (6014) I/O device; 10570p2
 6015 USSR; two frictional feeds for up to 2 x 600 cards/minute; photoelectric reader
 6016 CSSR; mechanical feed up to 1000 cards/minute; photoelectric reader; Ryad-1; 75925p12
 6019 USSR; vacuum feed up to 1200 cards/minute; photoelectric reader
 6111 USSR; punch card reader; 50 cols/second; photoelectric reader
 (6112) CSSR; 250 cards/minute; (*)

PAPER TAPE READERS: 602X and 612X

6022 USSR,CSSR,Hungary; 1500 lpm; photoelectric reader;
5, 6, 7, or 8 trk paper tape; Ryad-1
(6025) I/O device; 10570p2
6121 Hungary,Poland; used with the 1010; 300 char/s; photoelectric reader
6122 Poland; 1000 char/sec; photoelectric reader; 5,6,7, or 8 trk paper tape;
75925p13
(6124) Hungary; 300 char/s; 5 or 8 track tape; photoelectric reader; (*)
(6125) CSSR; 1500 char/s; 5 or 8 track tape; photoelectric reader; (*)
6191 CSSR,Hungary; paper tape I/O device; 40 char/s; 5 or 8 trk tape; 10570p2
(6192) CSSR; 50 char/s; 5 or 8 trk tape; (*)

OPTICAL CHARACTER READERS: 603X-604X

(6031) Up to "400 documents per minute;" 10466p92
(6032) 10717p119
(6035) 10717p119
(6041) 10717p119

MICROFICHE INPUT UNITS: 660X

(6602) 1000 char/s; 96 char set; 10717p119

NONMAGNETIC OUTPUT & I/O DEVICES: 7XXXCARD PUNCHES: 701X

7010 USSR; mechanical feed up to 100 cards/min; 256 byte buffer storage;
sequential column punch; 10502p136
7012 USSR; mechanical feed up to 250 cards/min; parallel line punch; 256 byte
buffer storage; 10502p137
(7013) CSSR; buffer memory; 10502p137
(7014) CSSR; mechanical feed up to 160 cards/min; sequential column punch; 75925p12
(7018) USSR; punches up to 100 cards per minute; 80411p19

PAPER TAPE PUNCHES: 702X

7022 USSR; 150 char/sec; 5 & 8 track paper tape
(7024) 100 lines/sec; 5 or 8 track paper tape; 10502p138

LINE PRINTERS: 703X-704X

7030 USSR; "barrel" (drum); 650-900 lpm; 128 char/line; 96 char set
7031 GDR; drum; 900-1200 lpm; 120 char/line; 63 char set; 75590p44
7032 USSR; drum; 900 lpm; 128 char/line; 84 or 96 char set; 75590p44
7033 Poland; drum; 600-1100 lpm; 120,126,128 or 160 char/line; 83+1 char set
75590p44
(7033M) Poland; parallel printer; 10466p1
(7034) CSSR; printer used at least with the 1010 & the 1025; 900 lpm; 132
char/line; 64 char set; 10318p176 10502p142
(7035) GDR; 600-1100 lpm; 120 char/line; 64 char set; 10502p142
7036 USSR; 800 lpm; 132 char/line; paper is 80 x 420 mm; 80411p20
7037 USSR; chain; 1200 lpm; 132 char/line; 48, 64, 96, 128, 192 char set
7038 CSSR; 750-1000 lpm; 132 or 160 char/line; 35, 64, or 96 char set;
10502p142 77882p20
7039 GDR; chain; 900-1500 lpm; 132 or 160 char/line; 48 or 96 char set; 9584p70
7040 400 lpm; 132 char/line; 84 char set; paper is 80 x 420 mm;

80411p21

7049 Hungary; drum; 750 or 1200 lpm; 132 char/line; 64 or 96 char set; contains buffer storage; 78296p32

PLOTTING EQUIPMENT: 705X

7050 USSR; 8 b/mm; magnetic tape recorder for use with 7051, -52, & -53 plotters

7051 USSR; flat-bed plotter; 1 square meter area; 255 symbols; .025 or .05 mm writing element spacing; speed up to 50 mm/s; 3 colors avail; 10502p144

7052 USSR; drum plotter; plot speed 200 mm/s; 380 x 600 mm working area; 64 symbols; 0.1-0.05 mm writing element spacing; 3-colors avail; 10502p144

7053 USSR; drum plotter; auto 3-colors "capability;" plot speed 150 mm/s; 841 x 1600 mm (or 730 x 1600 mm) working field; 253 symbols; 0.1 mm writing element spacing; 10502p144

(7054) CSSR; "plane surface plotter"; 1600 x 1200 mm working field; max driving speed 100 mm/s; 96 symbols; 4 colors available; 10502p144 73816p4

VIDEO DISPLAYS: 706X

(7061) Hungary; 16(64) or 12(80) lines on screen(char per line); 64 char set; 1024 byte buffer; 10502p149

(7063) CSSR,Hungary; 16(64) or 12(80) lines on screen(chars/line); 96 char set; 1024 byte buffer; produces printed copies; CSSR model also has 15(64) screen display; 10502p149

7064 USSR; raster (1024 x 1024 dots) & vector (5-7 mm/us) scan; 49 or 74 char/line; 430 mm (diagonal) screen

7066 USSR; vector scan; 6 or 12 lines; 128 char set; 40 or 80 char/line

(7069) GDR; "control unit;" 92 char set; 75894p5

(7069M) GDR; operator & service console for 1055 processor; 81262p30 81621p35-45

SERIAL PRINTERS: 707X

7070 USSR; letter arm; 10 char/s; 92 char set ; 106 char/line; mechanical keyboard; 75894p5

(7071) CSSR; typewriter used at least with the 1010; 10 char/s

(7072) 117 char/line; 10 char/s printing speed

7073 GDR; letter arm; 9.5 char/s; 92 char set; mechanical keyboard; 75894p5

7074.1 Bulgaria; lettter arm; 10 char/s; 92 char set; mechanical keyboard; 75894p5

7074.2 Bulgaria; turning disc (daisey wheel?); 30 char/s; 92 char set; reed relay keyboard; 75894p5

7076 Poland; matrix printer; 180 char/s; 92 char set; reed relay keyboard; 75894p5

7077 USSR; letter arm; 10 char/s; 92 char set; 106 char/line; mechanical keyboard; 75894p5

TERMINALS: 71XX

(7111) I/O device; 10570p2

(7112) I/O device; 10570p2

(7121) USSR; 100 char/s; 5 or 8 track tape; (*)

(7122) Poland; paper tape I/O device; 100 char/s; 5 or 8 track tape; 10570p2 (*)

(7168) Hungary; same as VT-340 & SM-7206; intelligent video terminal

(7172) CSSR; "Consul" 260.1 typewriter; mentioned in 7906 manual & 10502p166

7173 GDR; unit for direct communication of operator with computer; 10570p2

7174 Bulgaria,Poland(?); unit for direct communication of operator with computer; 10570p2

(7181) CSSR; mosaic printer; 80 char/s in start/stop mode; 160 char/s in continuous

mode; 132 char/line; 96 char set; 10717p119 (*)
(7184) Hungary; printer; 80 char/line; 253-283 lpm; 205 mm printfield width; 10508p79 75540p44
(7186) Poland; mosaic printer; 180 char/s; 132 char/line; 10717p119 (*)
(7187) Printing mechanism; uses floppy disk; mentioned in 1535.01 brochure
(7191) CSSR,Hungary; paper tape & punch card I/O device; 33 char/s; 5 & 8 track tape; 10570p2 (*)
(7192) CSSR; paper tape I/O device; 10570p2
(7195) Hungary; 50 char/s; 5 or 8 track tape; (*)

CONTROL UNITS: 75XX

(7565) Ctls up to four 7065 video display units; 80411p22
(7566) Ctls up to sixteen 7066 display screens or 7174 typewriters; two buffer memories; 9-bit wordlength; 10502p148 10516p81

MICROFICHE OUTPUT UNITS: 76XX

7602 GDR; microfilm output unit; 5 microfiches/min; 73816p4 Robotron brochure
(7612) Microfiche storage & access unit; 10k to 100k microfiche capacity; 10 second retrieval time; 10717p119

INPUT/OUTPUT SYSTEMS: 79XX

(7902) GDR; consists of 6122 paper tape reader & 7024 paper tape punch; 75295p13
(7902M) GDR; model-1 uses paper tape & magnetic tape; model-2 uses paper tape only; 10466p1-3 81621p68-74
(7903) Paper tape I/O: 1500 char/s input, photoelectric reader; 150 char/s output; 5 or 8 track paper tape; 77882p14
(7904) Punched card I/O; 1500 to 2000 char/s input; photoelectric reader; 150 to 200 char/s output; 10717p119
(7905) USSR; I/O of alphanumeric & graphic data; uses four 7065 CRTs & 7565 ctls; 96 char set; 49 or 74 char/line; 80411p22
7906 USSR; display group control; 7172 printer, up to 16 7066s + 7566 ctrl; 40 or 80 char/line; 6 or 12 lines/s; 96 symbols; 4096 byte buffer
7908 USSR; I/O of alphanumeric & graphic data; 80411p24
7920 USSR,GDR; alphanumeric display system: 7922 ctrl, up to 32 7927s & 7934s; 600, 1200, 2400, & 4800 b/s
(7920M) GDR; display system; 10466p1 81621p46-67
7921 Group control unit; 600, 1200, 2400, 4800 b/s data trans rate via telephone lines; controls up to 32 units; part of 7920 complex of alphanumeric display stations
7922 Group ctrl unit for 7920; I/O interface between computer & 7927 & 7934 units; 200 kB/s
(7925) Video terminal; 73816p5
(7925M) Programmable display user station; 10466p4
7927 Dot matrix I/O display station; screen capacity 480 or 1920 char; 96 char set; 20 char/s
7934 CSSR; matrix printer; 96 char set; 132 char/line; 40 char/s

DATA COMMUNICATION EQUIPMENT: 8XXXMODEMS: 800X-801X

8001 USSR,Bulgaria; FM; 200 b/s; full duplex; sync or async
(8002) GDR,CSSR,Hungary; FM; 200 b/s; half or full duplex; async; 10502p18
8005 USSR,Bulgaria; FM; 600 or 1200 b/s; half or full duplex; sync or async
(8006) CSSR,Hungary,Poland; 5 models, some with automatic call device; 600 or 1200 b/s; half duplex; (*)
8007 Hungary; c1980; 4-phase; 600 or 1200 b/s; full duplex; sync or async; 78269p11
8010 USSR; PM; 600, 1200, or 2400 b/s; full duplex; sync; 74076p30
(8011) Hungary; PM; 1200 or 2400 b/s; half or full duplex; sync; 10502p18
(8013) Hungary; c1981; microprocessor based; 8-phase; half or full duplex; 74076p30
8015 USSR; PM; 2400 & 4800 b/s; full duplex; sync
(8018) Hungary; 1981; microprocessor based; 8-phase; 2400 to 4800 b/s; half & full duplex; 74076p30
(8019) USSR; bipolar amplitude modulation; 24,000 & 48,000 b/s; full duplex; sync; 10502p18

SIGNAL CONVERTERS: 802X-803X

(8025) Unit of remote data processing; 10570p2
8027 Bulgaria; half or full duplex; sync: 600, 1200, 2400 & 4800 b/s; async: to 4800 b/s
(8028) Hungary; unit of remote data processing; 10570p2
(8029) USSR; bipolar amplitude modulation; 9600 b/s; half or full duplex; sync or async; 10502p18
8030 USSR,Bulgaria; half or full duplex; sync: 20, 50, & 100 b/s; async: up to 200 b/s; 10502p19
(8032) CSSR; half or full duplex; sync or async; 50, 100, & 200 b/s; 10502p19
8033 Bulgaria; 50, 75, & 100 b/s; also model with automatic call device; half duplex; async
(8040) Unit for remote data processing; 10570p2

AUTOMATIC TELEPHONE CALLERS: 806X

(8060) Unit for remote data processing; 10570p2
8061 USSR; automatic connection over switched voice-grade telephone lines; 50 b/s
(8062) Telephone caller; 10502p17
8063 USSR; automatic connection over switched four-wire telegraph links; 50 b/s
(8080) Unit for remote data processing; 10570p2

ERROR PROTECTION DEVICES: 81XX

(8121) USSR; 600 & 1200 b/s; half duplex; 10502p21
(8122) Hungary; 200, 600, 1200, 2400, & 4800 b/s; full duplex; 10502p21
(8131) Unit for remote data processing; 10570p2
(8135) USSR; 50, 100, 200, 2400, & 4800 b/s; full duplex; 10502p21
(8136) Unit for remote data processing; 10570p2
(8140) USSR; 24,000 or 48,000 b/s; full duplex; 10502p21

DATA COMMUNICATION PROCESSORS: 83XX

8371 Bulgaria,Poland (?); ctls host-terminal comms; 32-512 KB memory; 56 kb/s max xfer rate; top of four models can support up to 352 comms lines

DATA TRANSMISSION MULTIPLEXORS: 840X-844X

8400 USSR; max 16 lines; up to 100 b/s over telegraph; up to 2400 b/s over telephone lines
 8401 Bulgaria; up to 31 2-wire telephone lines at 50, 100, 200, 600, 1200, & 2400 b/s; 50, 100, & 200 b/s over telegraph lines;
 8402 USSR; 8 to 176 half duplex or up to 88 full duplex lines; up to 4800 b/s
 8403 USSR; computer-computer comms over four half duplex or two full duplex lines; 50, 100, 600, 1200, 2400, & 4800 b/s
 8404 GDR; ctrlr; max 12 lines; sync or async; half duplex; up to 9600 b/s
 (8410) Hungary,Bulgaria; data transmission multiplexor; 10570p2
 (8421) Hungary; c1976; 600 & 1200 b/s; half or full duplex; sync or async; 67543p15

USER CONSOLES: 85XX

8501 Bulgaria; AP-1; 50, 100, 200, 300, 600, & 1200 b/s; async; half duplex; typewriter & paper tape I/O
 8502 USSR; AP-2; 200 b/s over telephone lines; 50, 100, & 200 b/s over telegraph lines; sync; half or full duplex; typewriter I/O; uses 6191, 7191, & 7172
 (8503) USSR,Hungary,Bulgaria; AP-3; unit for remote data processing; 10502p167
 8504 USSR; AP-4; 1200 or 2400 b/s; sync; half duplex; card, paper tape, magnetic tape, & CRT I/O
 (8505) GDR; AP-5; 200, 600, & 1200 b/s over telegraph lines; 10502p167
 (8506) GDR; AP-6; 600 & 1200 b/s over telegraph lines; 10502p167-172
 (8511) USSR; AP-11; half duplex; 600, 1200, & 2400 b/s; 10502p168
 (8514) Poland; AP-14; 600, 1200, & 2400 b/s; paper tape I/O; card input; magnetic tape storage; typewriter; CRT display; alphanumeric printer; 10502p168-172
 (8531) Bulgaria; AP-31; punched card & paper tape I/O; magnetic tape storage; 200, 600, & 1200 b/s; 10502p168-172
 (8532) GDR; AP-32; punched card & paper tape I/O; 200, 600, & 1200 b/s; 10502p168-172
 (8540) CSSR; data acquisition station; 9400p23
 (8550) Hungary; AP-50; 600, 1200, 2400, 4800, & 9600 b/s; 10502p168-172
 (8551) Universal programmable user station; 10466p4
 (8556) Programmable display user station; 10466p4
 8561 USSR; AP-61; 200, 1200, & 2400 b/s; half duplex; sync or async; CRT & typewriter I/O
 (8562) Hungary; AP-62; 200, 600, 1200 & 2400 b/s; half duplex; CRT I/O; 10502p168-172
 8563 USSR; AP-63; 1200 or 2400 bps; sync or async; half duplex; CRT I/O
 (8564) Hungary; AP-64 user station; 600, 1200, 2400, & 4800 b/s; 10502p168-172
 8570 USSR,Hungary; AP-70; 100 b/s; async; half duplex; mechanical typewriter I/O
 (8577) GDR; programmable multifunctional user station; 10466p1
 (8591) CSSR; 50, 75, & 100 b/s; 10502p169
 (8592) GDR; terminal; 10502p169 (*)
 (8593) CSSR; 100 & 200 b/s; 10502p169

DATA PREPARATION STATIONS: 9XXXMAGNETIC TAPE PREPARATION STATIONS: 900X

9001 USSR; for ES and Minsk-32 computer input; 96 char set; 8 b/mm; 15 char/s from keyboard
 9002 Bulgaria; 39.6 cm/s; 32 b/mm NRZI; 80 or 160 char/blk; direct recording from keyboard; 220 volt power supply

(9002.1) Bulgaria; 110 volt version of 9002
9002.2 Bulgaria; compatible with ISOT 230 printer
9003 Bulgaria; 9 tracks; 32 b/mm NRZI; processes & pools inputs from up to 16 keystations
9004 Bulgaria; 39.6 cm/s; 32 b/mm NRZI; 80 or 160 char/blk
(9004.1) Modification of 9004; 80943p6
(9004.2) Modification of 9004; 80943p6
(9004.3) Modification of 9004; 80943p6
(9004.4) Modification of 9004; 80943p6
(9005) Bulgaria; multi-console system; up to 32 inputting consoles; 80943p7
(9006) Hungary; uses 5094; 2 x 80 KB storage capacity; 140 bytes/s; for searching & updating data; 10502p87 (*)

PUNCHED-CARD PREPARATION STATIONS: 901X

(9010) Ryad-1 equipment; 10502p31
9011 USSR; card reader-punch; 15 cols/s manual input; 25 cols/s duplicating speed; 100 cols/s without punching; input limited by output
9011.1 USSR; modification of 9011; same basic parameters; integrated circuit electronics now standard feature
9012 USSR; card punch; 15 cols/s manual; 25 cols/s duplicating; 100 cols/s without punching
9013 USSR; card punch check unit; 15 cols/s manual check; 25 cols/s automatic check; 100 cols/s output speed without punching
9013.1 USSR; modification of 9013; same basic parameters
9014 CSSR; punch card column decoder & labeler; 60 cols/s; 80 cols/card
9015 CSSR; card punch & labeler; 60 cols/s without punching; 80 cols/card
9017 USSR; punch card decoder; 25 cols/s normal; 100 cols/s without punching
9018 CSSR; punched card verifier; 290 cols/s reading speed

PAPER TAPE PREPARATION STATIONS: 902X

9020 USSR; 8 track paper tape; 10 or 50 char/s; typewriter input; photoelectric reader
9021 CSSR,Hungary; 10 or 50 char/s; typewriter input; photoelectric reader
9022 CSSR,Hungary; 10 or 50 char/s; electronic keyboard; photoelectric reader
9024 USSR; 5 or 8 track paper tape; 10 or 50 char/s; typewriter; photoelectric reader

MISCELLANEOUS DATA PREPARATION STATIONS: 904X-91XX

9041 CSSR; punched card sorter; 80 cols/card
9080 Punched card verifier; 60 cols/s punch rate; 9584p70-71
9112 Bulgaria; floppy disk unit; CRT, keyboard, & typewriter; microprocessor based; 2 disk memory units
(9112S) Hungary; floppy disk; 20,000 char/s; 243 KB disk pack capacity; 74 tracks
(9113) Bulgaria; magnetic tape & floppy disk unit; c1981; 80943p7
(9114) Bulgaria; floppy disk; succeeds 9002 & 9004; 80943p7
(9150) Poland; magnetic tape system contains: processor, 5001 magnetic tape storage, two disk storage units; alphanumeric printer, up to 32 operator's consoles, & CRT; 10508p82

Component Listing for Sistema Melykh (SM) Minicomputers
 Numerical designators in this section refer to SM equipment
 unless otherwise specified.
 () = information is scarce on this equipment.

SYSTEM INTERFACES: 010X

- (0101) CSSR; system interface unit for SM-3 & SM-4; consists of 2001 & 3501 SM units; 10767p49
 (0102) CSSR; interface boards for SM-3 & SM-4; async; 10767p50

SPECIAL-PURPOSE DEVICES: 05XX

- 0502 Cuba; SM 54/10-4; special-purpose decimal processor for use with SM-3 & SM-4; upgm ctl; 16 bits/word; 10767p47-48

COMPUTER SYSTEMS: 1XXX

- SM-1 USSR; 133 kOPS; 8 to 64 KB; modeled after Hewlett-Packard 2100 series; 9540p18-19
 SM-2 USSR; 154 kOPS; 64 to 256 KB; modeled after Hewlett-Packard 2100 series; 9540p18-19
 SM-3 USSR, CSSR, Poland, Cuba(?); 135 kOPS; 56 KB; modeled after PDP-11/05; 9504p18-19 79819p6; referred to as SM-1301 in 9551p11
 SM-4 USSR, CSSR, Romania(Independent I-100); 213 kOPS; 248 KB max; modeled after PDP-11/40; 9540p18-19 10767p7,111; referred to as SM-1401 in 9551p4
 (SM-5) USSR; 1,000 kOPS; 32 to 512 KB; 10717p115
 (1410) USSR; a two processor complex consisting of 2104 and 2410; system can work with SM-4 or MIR computer equipment; 10767p7-10
 (1420) Mentioned in article by D.G.Zhimerin in Izvestia on August 11, 1982
 (1604) "Video terminal;" 80943p5
 (1605) "Miniterminal;" 80943p5
 (1608) GDR; Robotron K8912; (*)
 (1616) GDR; Robotron K8937; (*)
 (1617) GDR; office processor; designed chiefly for bookkeeping; 10553p110 (*)
 (1618) GDR; (*)
 1624 GDR; SM 50/10-1; 8-bit microcomputer; 6 general-purpose registers; 16 KB memory using 4 Kb chips; 50 to 9600 b/s async comms xfer rate; 10767p51
 1626 GDR; SM 50/40-2; 8-bit microcomputer; 128 KB memory; 10767p55-58
 1800 Microcomputer; based on 8-bit nMOS microprocessor; 16 KB memory; 2 to 8.5 us/instruction; 9551p23-26

TIMERS: 20XX

- 2001 Programmable timer for SM-3 & SM-4; common bus; 100 kHz, 10 kHz, or 50 Hz; time interval precision +/- .01%; 9826p96 10767p46

CENTRAL PROCESSING UNITS: 21XX-24XX

- 2101 USSR; central processor for SM-1; up to 270k words/s xfer rate; 16 data bits/word; 5 general-purpose registers; 9206p157
 2102 USSR; central processor for SM-2; upgm ctl; 16 data bits/word; 2.2 us/fixed point add; 10767p38-39
 2103 USSR; central processor for SM-3; upgm ctl; up to 1300k words/s xfer rate; 16 data bits/word; 8 general-purpose registers; 9206p157 9551p1-3 10767p40
 2104 USSR; central processor for SM-4; upgm ctl; 16 data bits/word; 8 general-purpose registers; handles SM-4 operating system; 9551p1-3

10767p43-47

- 2301 CSSR; central processor for SM-3 model 20; similar to 2103; (*) 10767p40
- 2302 Poland; central processor for SM-3; similar to 2103; 10767p40
- 2303 Cuba; central processor for SID-300; similar to 2103; 10767p40
- 2401 CSSR; central processor for SM-4 model 20; similar to 2104; 10767p43-45
- 2402 Romania; central processor possibly for Independent-100; similar to 2104; 10767p43-45
- 2410 USSR; second processor on the 1410 two processor complex; serves as an ANALITIK language interpreter; 10767p7

INTERNAL MEMORY UNITS: 3XXX

- (3100) USSR; ferrite main memory; 32K word capacity; 1.2 us cycle time; (16 data + 2 parity bits)/word; 9206p158
- (3101) Poland; ferrite main memory; 32K word capacity; 1.2 us cycle time; (16 data + 2 parity bits)/word; 9206p158
- 3102 Ferrite main memory; 16K word capacity; (16 data + 2 parity bits)/word; 1.2 us cycle time; 9551p112-113
- 3103 CSSR; ferrite main memory for SM-3 & SM-4; 8K to 32K words/module in 8K increments; (16 data + 2 parity bits)/word; 1 us cycle time; (*) 10767p59
- 3105 USSR; ferrite main memory for SM-2; 32K word capacity; 18 bits/word (probably contains 2 parity bits); 1.0 us access time; 10767p60
- 3501 Bulgaria; ISOT-3501C; semiconductor memory for SM-3 & SM-4 8, 16, 24, 28, or 32K words storage modules; 400 ns access time; 16 bits/word for SM-3; (16 data + 2 parity bits)/word for SM-4; common bus interface
- (3510) Semiconductor memory module for SM-3 & SM-4; (16 data + 2 parity bits)/word 16K word capacity per module; 0.7 us cycle time; 9826p97
- 3511 CSSR; semiconductor memory module for SM-4 model 20; up to 128K words/module; (16 data + 6 parity bits)/word; 0.6 us access time; 0.8 us cycle time; (*) 10767p61

INTERFACE EXPANDERS: 41XX

- 4101 For use in SM-3 & SM-4; 1000 char/s xfer rate; 1280 8-digit symbol buffer memory; expands I/O functions with a reduction in system speed; 9551p72
- 4104 For use in SM-3 & SM-4; 1000 char/s xfer rate; 1280 8-digit symbol buffer capacity

EXTERNAL MAGNETIC STORAGE: 5XXXMAGNETIC TAPE CONTROLLERS: 50XX

- 5001 Bulgaria; ISOT-5000C; transport controller for ISOT 5003, 5005, & 5006; 9 trk tape; 32 b/mm; 32, 64, 96, 114, & 190 cm/s; NRZI

MAGNETIC DISK CONTROLLERS: 51XX

- 5102 Poland; ctls up to four 5401 disk drives; 2500 kb/s xfer rate; 10767p62-63
- 5105.1 USSR, Bulgaria; ctls up to four SM-5400, 5401, or 5403 disk drives; 11.1 us/word xfer speed; 1500 rpm; 10767p64-65

MAGNETIC CASSETTE TAPE (3.81 mm) STORAGE: 52XX

- (5202) Poland; 5.76 MB capacity; 32 b/mm; 0.5 kB/s xfer rate; 10553p5
- (5203) CSSR; 3.2 MB capacity; 32 b/mm; 0.125 kB/s xfer rate; 10553p5

(5204) 450 KB capacity
5205 Poland; 2-trk cassette tape storage unit; 5 Mb capacity; 32 b/mm;
0.127 m/s tape speed; PE; 10767p66
(5206) GDR; (*)
(5208) Magnetic cassette tape unit for use with SM-3 & SM-4
(5210) GDR; (*)
5211 Mag tape cassette unit; 2 cassette capacity (5204.01); 32 b/mm;
1.25 KB/s; common line interface; 10508p13
5269.1 Bulgaria; removable disk cartridge; 3 MB; 9206p133

MAGNETIC TAPE (12.7 mm) STORAGE: 53XX

5300 Bulgaria; ISOT-5004; magnetic tape unit; 10 kB/s xfer rate; 32 b/mm;
NRZI; 9 trk tape; .3175 m/s; 100 MB capacity; 10553p5
(5301) Magnetic tape unit for SM-3 & SM-4; 10 kB/s xfer rate; NRZI; 10508p14
5302 Bulgaria; ISOT-5005; mini-magnetic tape unit; 32 b/mm; NRZI; 0.63 m/s
tape speed; 20 kB/s xfer rate; 9 trks; 200 MB capacity
(5303) Bulgaria; ISOT-5006; 32 b/mm; 36 kB/s xfer rate; 10553p5
(5304) Poland; 32 or 64 b/mm; 40 kB/s xfer rate; 10553p5

REMOVABLE CASSETTE DISK STORAGE: 54XX

5400 Bulgaria; ISOT-1370; removable cartridge disk drives; 50 Mb capacity;
50 ms avg access time; 1500-2400 rpm; 180 & 312 kB/s xfer rate;
uses ES-5269.1 disk pack; 9584p18 9408p23
(5401) Poland; cassette-type plug in disk storage; 50 Mb capacity; 312 kB/s
xfer rate; 2400 rpm; 40 ms avg access time; 9584p18
(5402) External memory system; 9551p14
(5403) CSSR; disk storage with removable disk; 50 Mb capacity; 2500 kb/s xfer rate;
30 ms avg access time; 10553p4
(5407) Poland; (*)

FIXED-HEAD DISK STORAGE: 55XX

(5500) Hungary; fixed-head disk storage; 0.5 MB capacity; 1350 kb/s xfer rate;
10 ms avg access time; 10553p4
(5501) USSR; fixed-head disk storage; 0.864 MB capacity; 670 kb/s xfer rate;
10 ms avg access time; 10553p4

FLOPPY DISK STORAGE: 56XX

(5601) Hungary; floppy disk storage unit; 3 Mb capacity; 250 kb/s xfer rate;
9826p99
(5602) Poland; floppy disk storage unit; 3.2 Mb/disk; 2 disks; 6.4 Mb total
capacity of which 4.1 Mb is useable; 205 ms avg access time; 360 rpm;
250 kb/s xfer rate; 9826p66 10553p5
(5603) Floppy disk memory unit for SM-3 & SM-4; 0.5 MB capacity; 40 KB/s xfer
rate; 300 ms avg access time; 128 b/mm; 10508p13
(5604) CSSR; Consul 7112; 3.2 Mb capacity; 250 kb/s xfer rate; 10553p5
(5605) CSSR; 6.4 Mb capacity; 400 kb/s xfer rate; 500 ms avg access time;
uses two disks; 10553p5
(5606) Hungary; 6.4 Mb capacity; 250 kb/s xfer rate; 370 ms avg access time;
10553p5
(5607) Hungary; similar to ES-5074; (*)
5608 Poland; consists of one 5602 disk drive, ctrlr & power supply; 4.1 Mb
capacity; 205 us avg access time; 250 kb/s xfer rate; 10767p67
(5610) GDR; (*)
(5615) Floppy disk storage for SM-3 & SM-4; 3.2 Mb capacity; 250 kb/s xfer rate;

10508p11

- (5616) Floppy disk storage for SM-3; 19 bytes/us xfer speed; 0.5 MB capacity; 508 ms avg access time; 128 b/mm; 10508p12

GENERAL-PURPOSE CONTROLLERS: 60XX

- (6001) General-purpose controller for SM-3 & SM-4; 1 input & 1 output chn; 9826p97
(6002) General-purpose controller for SM-3 & SM-4; 1 input & 1 output chn; 9826p97

CARD READERS: 61XX

- (6101) Hungary; VT-42111; 80 cols/card; 600 cards/minute; 9826p99
(6102) GDR; Daro-1220; 160 cards/minute; 10553p6
6103 Romania; 300, 400, 600 or 800 cards/minute; photoelectric reader; 10767p68
(6105) Romania; RSD-9226; 300 to 800 cards/minute; 10553p6

PAPER TAPE INPUT, OUTPUT, & I/O DEVICES: 62XX

- (6200) Hungary; MPR-51/301; I/O unit; 50 or 500 lines/s; 5 or 8 trk tape; 10553p6
(6201) I/O unit for use with SM-3 & SM-4
(6202) I/O unit; 300 lines/s input; 50 lines/s output; photoelectric reader; 5 or 8 trk tape; 9551p107
(6203) Hungary; MR-301; input unit; 5 or 8 trks; 10553p5
(6204) Poland; SPTP-3; I/O unit; 50 or 100 lines/s; 5 or 8 trks; 10553p6
(6205) Poland; ST-2030; input unit; 300 lines/s; 5 or 8 trks; 10553p5
(6206) GDR; Daro-1215; output unit; 50 lines/s; 5 or 8 trk tape; 10553p6
(6208) CSSR; Consul 337.2; input unit; 100 rows/s in start/stop mode; 300 rows/s in continuous mode; 8 trk tape; 9826p98 10553p6
(6209) CSSR; FS-1503; input unit; 1500 lines/s; 8 trk tape; 10553p6
(6211) GDR; (*)
(6216) Poland; ST-2100/2200; input unit; 1000/2000 lines/s; 5 or 8 trks; 10553p6
(6222) Poland; DT-105C; output unit; 50 lines/s; 5 or 8 trk paper; 10553p6
(6227) Hungary; MP-51; output unit; 50 lines/s; 5 or 8 trk paper; 10553p6

ALPHANUMERIC PRINTERS: 63XX

- (6300) DZM-180 plus ctrlr; 180 char/s; 132 char/line; 256 symbol buffer memory; 9551p66-67
(6301) GDR; Daro 1156; sequential mosaic printer; 100 char/s; 132 char/line; 96 char set; 10553p7 (*)
(6302) Poland; DZM-180; sequential mosaic printer; 180 char/s; 132 or 138 char/line; 128 char set; 10553p7
(6303) CSSR; Consul 211.1; sequential mosaic printer; 150 char/s; 132 char/line; 96 char set; 10553p7
(6304) GDR; Daro 1156; sequential mosaic printer; 100 char/s; 132 char/line; 9551p67-68
(6305) Used with SM-3 & SM-4; 132 char/line; four models: 96 char at 500 lines/s & 64 char at 700 lines/s; both come with or without a programmable carrier 9551p108-109
(6306) Hungary; VT-25112; parallel printer; 900 lines/min; 96 char set; 132 char/line; 10553p6
6307 GDR; dot-matrix printer; 45 char/s continuous mode; 25 char/s start/stop mode; 96 char set; 132 char/line; 10767p69
6308 USSR; "graphic character synthesizing printer" using dot-matrix based mechanism; 100 char/s; 7x5 dots/char; 96 char set; 128 char/line; 10767p70
(6309) GDR; Robotron 1157; high speed column mosaic printer; 132 or 210 char/line; 150 to 180 or 320 to 360 char/s; 96 to 192 char set; backward & forward

- printing; 10553p109-110 (*)
- (6312) Bulgaria; ISOT-0232D; sequential printer with keyboard; 20 char/s; 132 char/line; 96 char set; 10553p7
- 6312.1 Bulgaria; sequential printer with keyboard; 25 char/s; communication terminal; uses ES-7187 printer
- 6312.2 Bulgaria; similar to 6312.1; uses SM EVM IRPS interface; 10767p76-77
- 6313 GDR,Hungary; parallel printer; 660 lines/min; 96 char set; 136 char/line; Videoton 270; Robotron 1152; (*) 10767p71
- (6315) USSR; 132 char/line; 25 char/s; uses ES-7187 printer; four models: 500 lines/minute with 96 char set, and 700 lines/minute with 64 char set; both come with or without a programmable carrier; 10508p15-16
- (6316) Hungary; VT-24112; 253 or 365 lines/min; 80 char/line; 64 or 96 char set; 9206p163 10553p6
- (6321) Hungary; VT-25150; 650 lines/min; 132 char/line; 64 or 96 char set; 10553p6
- (6322) Romania; RSD-9233; 200 lines/min; 132 char/line; 64 or 96 char set; 10553p6

PLOTTING EQUIPMENT: 64XX

- (6402) Semi-automatic plotting board; 850 x 600 mm working field; 10508p14-15
- (6402.1) Same as 6402 but with a different interface; 10508p15

DATA PREPARATION STATIONS: 69XX

- 6900 GDR; programmable data entry device; microprocessor based; four models consisting of various I/O devices; 10767p79-81
- 6901 Bulgaria; floppy disk data entry station; keyboard input; CRT display; 10767p82
- 6902 GDR; magnetic tape data acquisition & conversion station; cassette tape drive at 500 B/s xfer rate; standard 9 trk drive at 10 kB/s xfer rate; 10767p83
- 6903 GDR; mark sensor; reads marks on forms; 4000 forms/hr; 10767p85
- (6905) Hungary; data preparation terminal; consists of VT 5300 ctrlr, MOMFLEX 3200 dual floppy disks, 1 or 2 VSD 47703 displays, VT 600/1200 modem, and one VT 23000 or DZM 180 printer; 78269p30
- (6907) GDR; office processor; 10553p110
- (6908) GDR; office processor; 10553p110
- (6921) CSSR; floppy disk data entry station; keyboard input; CRT display; 10767p86

TERMINALS: 7XXXHARDCOPY TERMINALS: 71XX

- (7102) GDR; Robotron 1154; sequential alphanumeric printer with keyboard; 45 char/s; 132 char/line; 94 char set; 10553p7 (*)
- 7103 Poland; alphanumeric dot-matrix printer; 7 x 7 dots/char; 180 char/s; 132 to 158 char/line; 96 char set; (*) 10767p72-73
- 7108 CSSR; Consul 2113 sequential printer with Consul 256 keyboard; 5 x 7 dots/char; 150 char/s; 132 char/line; 96 char set; 10553p7 9826p98 10767p74
- 7108.7 CSSR; 80 char/s; 132 char/line; 64 or 96 char set; 100, 200, or 300 b/s xfer rate; duplex; async; 10767p74-75

ALPHANUMERIC VIDEO TERMINALS: 72XX

- (7202) CSSR; 24 lines; 80 char/line; 5 x 7 dots/char; 96 char set; 9826p98
- (7203) Cuba; SID-702; 1440 char/screen; 5 x 7 dots/char; 10553p7
- 7204 USSR; alphanumeric video terminal; 24 lines; 80 char/line; 5 x 7 dots/char; 9551p69

- (7205) Hungary; Videoton 340; alphanumeric video terminal; 9551p70
7206 CSSR,Hungary; VT-47100; (same as ES-7168); 24 lines; 80 char/line; 128 char set; 5 x 7 dots/char; 10553p7
(7207) Poland; 512 char/screen; 5 x 7 dots/char; 10553p7
(7208) Poland; 1280 char/screen; 5 x 7 dots/char; 10553p7
(7209) Poland; MERA-7952; 1920 char/screen; 5 x 7 dots/char; 10553p7
(7219) Hungary; VDT-52105; 1920 char/screen; 7 x 8 dots/char; 10553p7

GRAPHIC DISPLAY TERMINALS: 73XX

- (7300) USSR; EPG-SM; 1024 x 1024 points/screen; vector scan; 10553p8
(7301) Hungary; VT-47607; 24 lines; 80 char/line; 125 char set; 512 x 236 points/screen; 9826p100

INTELLIGENT ALPHANUMERIC VIDEO TERMINALS: 74XX

- 7401 Hungary; VT-47605; programmable video terminal; 25 lines; 80 char/line; 9 x 7 dots/char; 2.4 kB/s xfer rate; 9551p101 10553p8
(7402) GDR; Robotron 4000; 256 char/screen; 5 x 7 dots/char; 10553p8
(7403) Poland; (*)

KEYBOARDS: 76XX

- 7601 CSSR; contactless (Hall effect) alphanumeric keyboard; 78 keys; up to 20 char/s typing speed; 10767p78

DATA COMMUNICATION EQUIPMENT: 8XXX

- 8002 CSSR; Modem 200; up to 300 b/s; sync or async; half or full duplex; FM; 10767p87
8006 CSSR; Modem 1200; 75 b/s incoming; 600 or 1200 b/s outgoing; sync or async; half or full duplex; FM; 10767p88
(8101) Modem 200; full duplex; async; up to 300 b/s xfer rate; for use over telephone network; 9826p102
(8102) Modem 1200; half or full duplex; sync or async; 600 or 1200 b/s xfer rate; for use over telephone network; 9826p102
(8103) Modem 2400; half or full duplex; sync; 1200 or 2400 b/s xfer rate; for use over telephone network; 9826p102
8105 CSSR; "null modem;" used to connect local data comm devices to a ctl computer complex; up to 48k b/s xfer rate; async; half or full duplex; 10767p89
8501 CSSR; remote comm adapter; 1-8 chns; 50, 100, 200, 300, 600, 1200, 2400, 4800, and 9600 b/s selectable xfer rate; simplex, half or full duplex; async; 9826p99 10767p90
8502 USSR; connects comm device with processor; half or full duplex; async; 3 models with different speeds up to 9600 b/s xfer rate; (*) 10767p91-92
8505 USSR; data transmission device; 4 channels; up to 20k b/s; sync; half duplex; 10767p93
8506 CSSR; synchronous adapter for SM-3 & SM-4; up to 9600 b/s xfer rate; simplex, half or full duplex; 10767p94
(8511) CSSR; asynchronous multiplexor; (*)
(8606) CSSR; synchronous adapter; (*)

DEVICE INTERFACES: 9XXX

- 9004 CSSR; passive ctlr connecting DASIO-600 device to SM-3 or SM-4; 250k words/s; xfer rate; 10767p95

9101 CSSR; device coupler for SM-1; 10767p96-97
9104 USSR; device coupler for SM-3 & SM-4; 19 models; 10767p98-99
9105 Hungary; process terminal; 1K RAM & 3K ROM capacity; Intel 8080 based;
10767p100-102
9201 USSR; analog, digital, & continuous frequency signal I/O interface
to SM-1 & SM-2; A/D converter; 10767p103-104
9205 CSSR; laboratory device coupler for SM-3 and SM-4; A/D & D/A converters;
10767p105-106
9402 CSSR; input & display module; half duplex; async; 200, 600, & 1200 b/s
xfer rate; 10767p107



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APPENDIX



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Typical Ryad-1 and Ryad-1M System Configurations

Ryad Model	1020	1021	1022	1030	1032	1033	1040	1050
Processor	2020 ^a ^b	2021.....1	2622.....1	2030.....1	2032.....1	2433.....1	2040.....1	2050.....1
Internal Storage	3220.....1	3221.....1	3222.....1	3203.....1		3203.....1 (3207) ^c	3204.....1	3205.....2
Channels	in processor	in processor	4430.....1	4430.....1		4011.....1 4035.....1	(4011) 4012.....1 4034.....1	4012.....1 4035.....2 4060.....1
Magnetic Tape Drive	5010.....4	5022..... (5012,5025)	5017.03..4	5010.....4 (5012,5017)	5019.....4 (5017)	5017.03..4	5016.....	5010.....8 (5017)
Magnetic Disk Drive	5056.....2	5058.....2 (5061)	5056.....2	5056.....2	5052.....4 (5061)	5061.....2	5052.....	5050.....5
Mag. Tape Controller	5511.....1	5515.....1 (5525)	5517.....1	5511.....1 (5517,5525)	5519.....1 (5517)	5517.....1	5521.....1	5511.....1 (5517)
Mag. Disk Controller	5551.....1	5558.....1 (5561)	5568.....1	5551.....1 (5561)	5552.....1 (5561)	5568.....1 (5555)	5552.....1	5551.....1
Input channels:								
Card reader	6012.....1	6016.....1	6019.....1 (6015)	6012.....1	6016.....2	6019.....1 (6015)	6012.....1 (6016)	6012.....2 (6013)
Paper tape	6022.....1		6022.....1	6022.....1	6022.....1	6022.....1	6122.....1	6022.....2
Output channels:								
Card punch	7010.....1	7014.....1	7010.....1	7010.....1	7014.....1	7010.....1	7010.....1	7010.....2
Tape punch	7022.....1		7022.....1	7022.....1	7024.....1	7022.....1	7024.....1	7022.....2
Line printer	7030.....1	7034.....1	7032.....1	7030.....1	7033.....2	7032.....1 (7033 7037)	7031.....1	7032.....2
Serial prntr	7070.....1	7071.....1	7077.....1	7070.....1	7076.....1	7077.....1	7070.....1	7070.....2
Data preparation devices:								
Card punch	9010.....2		9011.01..2	9010.....2 (9011)		9011.01..1 (9012)		9010.....1
Tape punch	9020.....2		9024.....2	9020.....2		9024.....1		9020.....1

a. Ryad or ES equipment designator
b. Number of units in a typical Ryad system
c. () = Common alternate equipment

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<u>Peripheral Equipment Associated with Ryad-2 Computer Systems</u>							
Ryad Model	1015	1025	1035	1045	1055	1060	1065
Magnetic Tape Drive	5017 ^a .3 ^b	5004..6	5017..6	5017..6	5017..8	5017..8 (5025) ^c	5025..8
Magnetic Disk Drive	5061..3	5061..2 (5066)	5061..3 (5052)	5061..4 (5066)	5061..8 (5066)	5066..6 (5061)	5066..8
Tape storage controller	5517..1	5503..1	5517..1	5517..1 (5519)	5517..1	5517..2 (5525,5568)	5517..2
Disk storage Controller	--	5569..1	5561..1	5561..1	5561..1	5566..2	5566..2
Card reader	6016..1	6016..2	6012..1	6012..2	6016..1	6019..2 (6016)	6019..2
Paper tape reader			6022..1	6022..1	6022..1	6022..2	6022..2
Card puncher	7014..1	7014..2	7010..1	7010..1 (7012 7014)	7014..1	7010..2 (7012)	7010..2
Paper tape punch			7022..1	7022..1 (7024)	7022..1	7022..2	7022..2
Printers	7184..1	7034..2 (7039)	7032..1	7032..2	7033..1	7033..2	7033..2
Video displays							7064..2
I/O Systems		7902..2				7906..1	7906..1

a. Ryad or ES equipment designator
b. Number of units in a typical Ryad system
c. {} = Common alternate equipment

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Ryad-2 Computer Specifications

Ryad Model Country	1025 CSSR	1035 USSR	1045 PNR-USSR	1055 GDR	1060 USSR	1065 USSR
				No cache Cache		
Processor						
Floating pt. add time	50.0	95.0	1.9	1.6	0.80	0.24
Speed (KOPS) ^b	30-40	140-160	540-880	450	1300-1600	4000-5000
Fixed add time (us) ^c	5-13	4.5	0.7-0.85	0.6-2.7	0.25-0.30	0.12
Fixed multiply time (us)	95-220	23	2.8-3.4	3.4-5.2	1.5-1.8	0.6
Floating pt. multiply time (us)	9.7	19.8	2.8	2.7	2.3	0.30
Primary Memory (Core)						
Capacity (Kbytes)	128-256	256-1024	256-4096	256-2048	512-8192	2048-16384
Cycle time (us)	1.25	0.8	1.0-1.2	1.2	0.6-1.0	*
Access time (us)	0.5	0.5	0.3-0.4	*	*	0.8
Bytes fetched per cycle	8	8	8	8	8	*
Microprogram Control Memory						
Capacity (Kbytes)	*	64 read only	8 & 64 read only	56	48	*
Cycle time (us)	0.38	0.20	0.12	0.40	0.13-0.14	*
Access time	*	*	*	0.14	0.06-0.07	*
Length of word accessed (byte)	*	*	8	8	16	*
Cache Memory						
Capacity (Kbytes) ^d	X ^e	X	8	8	8-16	*
Cycle time (us)	X	X	0.12	0.13	0.13-0.14	*
Access time (us)	X	X	*	0.13	0.06-0.07	*
Length of word accessed (byte)	X	X	8	8	8	*
Channels						
Maximum number	2	5	6	5	7	*
Total transfer rate (Kbytes/s)	*	1200	5000	6000	9000	15000
Selector channels						
Maximum number	1	4	(5) ^f	(4)	(6)	*
Transfer rate (Kbytes/s)	*	720	*	(1500)	(1300)	1500
Byte-multiplex channels						
Maximum number	1	1	2	2	2	*
Transfer rate (Kbytes/s)	*	30	*	10-60** ^g	100-450**	110
Block-multiplex channels						
Maximum number	X	X	5	4	6	*
Transfer rate (Kbytes/s)	X	X	*	500-3000**	*	3000
Class, per state stdn GOST 16325-76	II	III	III	IV	V	V

a. * = data not known at this time

b. KOPS = thousands of operations per second

c. us = microsecond

d. Kbyte = 1024 bytes = 8192 binary digits or bits

e. X = equipment not available on this ES model

f. () = block-multiplex channel can be operated as a selector channel

g. ** = speed varies depending upon number and type of operational channels in system.

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Typical SM-3 and SM-4 System Configurations

	Equipment Designators	
	SM-3	SM-4
Timer	2001	2001
Processor	2103	2104
Core main memory	3100 (3101,3102)	3100 (3101,3102)
Semiconductor main mem.	3510	3510
Interface expander	4101 (4104)	4101 (4104)
Magnetic cassette tape unit	5208	5208
9-track magnetic tape drive	5301	5301
Removable cassette disk drv	5400	5400
Magnetic disk drive	5402	5402
Floppy disk systems	5603 (5615,5616)	5603 (5615,5616)
General purpose controller	6001 (6002)	6001 (6002)
Paper tape I/O	6201 (6202)	6201 (6202)
Alphanumeric printer	6300 (6304,6305)	6300 (6302,6304,6305)
Alphanumeric video terminal	7204 (7205)	7204 (7205)

- a. SM-1 and SM-2 system configurations have not been noted using SM equipment designators.
- b. () = Designates alternate equipment

SM Minicomputer Parameters

Minicomputer	<u>SM-1</u>	<u>SM-2</u>	<u>SM-3</u>	<u>SM-4</u>	<u>SM-5</u>
Speed (kOPS)	250	460	250	800	1000
Main memory (Kwords)	4-32	32-128	16-28	16-124	16-256
Instruction time (us)					
Fixed point:					
Addition	2.5	2.2	5	1.2	-
Multiplication	36.6	10	16*	10.8	-
Division		17	19.5*	12.7	-
Floating point:					
Addition	33	18-40	320*	28.7	-
Multiplication	110	23	410*	34	-
Division	-	40	-	52	-

* Implemented in software

- Not known

GLOSSARY OF ABBREVIATIONS

A/D = Analog to Digital
 ALU = Arithmetic and Logic Unit
 async = asynchronous
 avg = average
 b = binary digit = bit
 b/mm = bits per millimeter
 b/s = bits per second
 blk = block
 B = Byte = 8 bits
 char = character
 chn = channel
 CMOS = Complimentary Metal Oxide Semiconductor
 cols = columns
 comms = communications
 CSSR = Czechoslovakian Soviet Socialist Republic
 ctl = control
 ctrlr = controller
 D/A = Digital to Analog
 ECL = Emitter-Coupled Logic
 ES = Edinaya Sistema = Unified System; often transliterated as YeS
 FM = Frequency Modulation
 GDR = German Democratic Republic
 Hz = Hertz = cycles per second
 inst = instruction
 k = 1,000
 K = 1,024
 kOPS = 1,000 operations per second
 lpm = lines per minute
 M = Mega = (1,024)(1,024) = 1,048,576; Mb = magabits; MB = megabytes
 ms = millisecond
 m/s = meters per second
 mm = millimeters
 mux = multiplexor
 nMOS = negative-channel Metal Oxide Semiconductor
 NRZI = Non-Return to Zero Inverted
 ns = nanosecond
 PE = Phase Encoded
 PM = Phase Modulation
 RAM = Random Access Memory
 ROM = Read Only Memory
 Ryad = Series; equivalent to ES
 s = second
 SM = Sistema Malykh = system of small computers
 sync = synchronous
 tpi = tracks per inch
 trks = tracks
 TTL = Transistor-Transistor Logic
 upgm = microprogrammable
 us = microsecond
 VS = Virtual Storage
 word = 16 data bits per SM word; 32 data bits per Ryad word except
 for Hungarian models which also have 16 data bits per word
 xfer = transfer
 xpan = expanded
 " = inches

Confidential

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