**Directorate of
Intelligence**

Confidential

25X1

PERMANENT File Copy

DO NOT REMOVE

A Compilation of Soviet
Ryad Mainframe and
SM Small-Computer Equipment

25X1

A Reference Aid

Confidential

Copy 189

Page Denied

25X1

25X1

A COMPILATION OF SOVIET RYAD MAINFRAME AND SM SMALL-COMPUTER EQUIPMENT

A Reference Aid

25X1   25X1

Information available as of May 1985 was used in this report.

This paper was prepared by [   ] Office of Scientific and Weapons Research. Comments and queries are welcome and may be directed to the Chief, Information Technologies Branch, OSWR [   ]
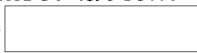
25X1

25X1

25X1

PREFACE

The purpose of this guide is to provide a quick and easy reference to the equipment that comprises the Soviet/East European Ryad mainframe and SM small-computer systems, as well as a concise presentation of important technical information. This reference aid is divided into two main sections: the first covers Ryad or Edinaya Sistema (unified system; ES or YeS) mainframe equipment and the second covers the small-computer (SM) systems. The appendix contains examples of typical system configurations and performance information. A glossary of abbreviations is provided at the end of the paper.

25X1

The presence of specific equipment in this nomenclature listing does not necessarily imply a technology or a production capability. This reference aid compiles information from a variety of publications. In those cases where we obtained conflicting data on the operational parameters of indigenous Soviet computer systems, we used our best engineering judgment to select the most likely operational values.

25X1

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; they 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. Sometimes telecommunication data rates are expressed in bauds, where a baud is the shortest signal element of a communication system. At low speeds, such as 300 bauds (per second), a baud is equal to a bit or binary digit of information. At higher speeds a baud may contain multiple bits of information. For example, many 9600 bits per second data communication systems actually transmit at 2400 bauds; here, each baud contains four bits of information in its signal structure.

25X1

25X1

25X1

SW 85-10080
July 1985

25X1

A COMPILATION OF SOVIET RYAD MAINFRAME AND SM SMALL-COMPUTER EQUIPMENT

TABLE OF CONTENTS

25X1

25X1

25X1

INTRODUCTION

In 1967 the Soviets made a major decision to develop a family of mainframe computers by copying the architecture of the commercially successful IBM System/360. By the end of 1969, the Soviets had convinced most of their East European allies in the Council for Mutual Economic Assistance (CEMA) to join this effort--called Ryad-1 (series), or Edinaya Sistema (unified system; ES or YeS). The USSR concentrated on high-performance systems, while its CEMA partners were to put their resources into low-end mainframes and peripheral equipment. For the most part, the CEMA countries adapted the IBM designs to their indigenous electronic base; thus, their hardware was not exact duplicates of their IBM counterparts. By copying IBM's logical architecture, the CEMA countries are able to use directly the large Western repository of IBM-compatible software--as is true with Western and Japanese companies that produce IBM "plug-compatible" equipment.

25X1

Initially, the Ryad-1 family consisted of models 1010, 1020, 1021, 1030, 1040, 1050, and 1060. The Hungarian 1010 is a 16-bit minicomputer that is modeled after the French Mitra-15. The 1021 is a low-performance Czech mainframe 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 IBM nor with the rest of the Ryad-1 line. The first Soviet Ryad-1 model, the 1020, was displayed in 1971; however, it was mid-1973 before most of the other models were displayed (see figure 1). 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, encountered many problems in development. The problems of the 1060 were serious enough to cause the system to be deferred until the subsequent Ryad-2 generation.

25X1

25X1

25X1

Figure 1
Timetable: IBM and Soviet Ryad Mainframes, 1964-84
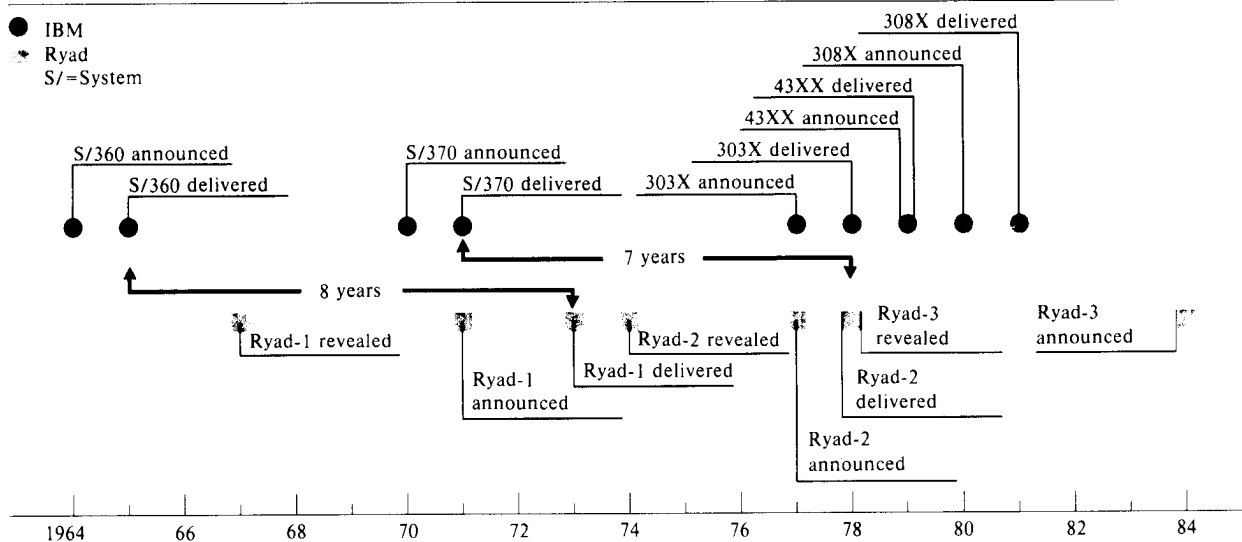
25X1

25X1

Ryad-1 was soon followed by interim Ryad-1 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. The Bulgarians were licensed by the Soviets to build the 1020 and the 1022. Poland developed the 1032, based on the 1030 model.

25X1

As production of these intermediate Ryad-1 models began, the second generation of Ryad computers was being developed--based upon the IBM System 370. The Soviets' first Ryad-2 computer, the 1035, was introduced in 1978. The Soviets eventually licensed this machine to the Bulgarians. Other Soviet Ryad-2 models include: the 1045, the 1060, and the 1065. Czechoslovakia modified its original Ryad-2 contribution, the 1025, into the 1025M, and subsequently the 1026. East Germany similarly evolved its Ryad-2 models through the 1055, 1055M, and finally the 1056. The Hungarian Ryad-2, the 1015, probably entered very low production around 1983. An improved Soviet 1060, the 1061, was first mentioned in 1982, and probably entered production about two years later.

25X1

In November 1981 the Soviets announced the 1036, and in 1984 the 1036 was described by the Soviets as their first member of the long-awaited Ryad-3 family. The 1036 may be modeled after an early IBM-43XX machine. Other Ryad-3 computers mentioned in the literature include: the Czech ES-1027, the Polish ES-1034, the Soviet ES-1037, and the East German ES-1057.

25X1

25X1

In 1974 the CEMA countries held a special conference to discuss a project similar to Ryad, involving minicomputers called the international system of small computers. Four small systems (Sistema Malykh, SM) were developed initially in the USSR: the SM-1, SM-2, SM-3, and SM-4. The SM-1 and SM-2 are variations of the Hewlett-Packard HP-2100 series (see figure 2) 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-11/34, appear to have been copied scrupulously and are believed to be directly compatible with DEC software.

25X1

About 1979, CEMA countries began coordinating the second generation of SM small computers, SM-2--both minicomputers and microcomputers. CEMA has adopted a new nomenclature for this next generation:
- o SM-50: General-purpose microcomputers for applications such as control and communications.
- o SM-51: Small computers maintaining software compatibility with the SM-1 series.
- o SM-52: High-performance, real-time small computers; this class will eventually include high-performance, 32-bit superminicomputers.
- o SM-53: Multiprocessors and multimachine systems.
- o SM-54: Special processors for character recognition, fast Fourier transforms, and other specialized applications.

At least 20 CEMA systems using this nomenclature have been identified. Many of these are still under development; others are simply a new designator for an existing system. New Soviet minicomputers, the SM-5 and the SM-1420 (probably the same machine), were introduced in about 1983 and are expected to follow the DEC PDP-11 architecture.

25X1

25X1

Figure 2
Mainframe Performance: United States and Soviet Bloc

Thousands of operations per second

—— IBM
—— Ryad

100,000	
	3084-QX ————
	3081-KX ————
10,000	3083-QX ————
	195 ———— 1065
	168 ————
	165 ————
	1060
1,000	155 ———— 1045
	———— 1055 (East German)
	145 ————
	135 ———— 1035
	125
100	115 ———— 1026 (Czechoslovak)
	——— 1025 (Czechoslovak)
10	
1	

1   10   100   1,000   10,000   100,000

Main memory in kilobytes
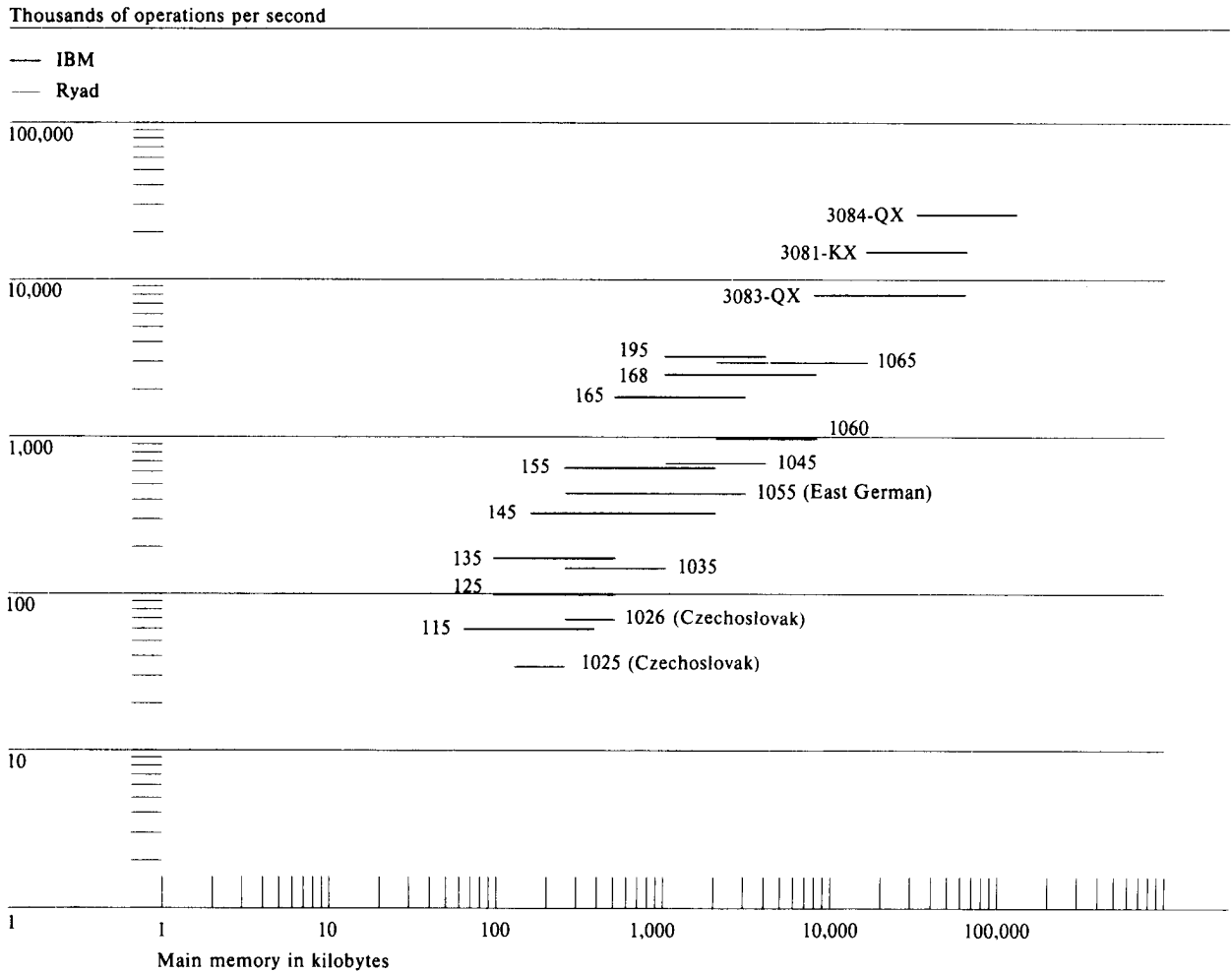
COMPONENT LISTING FOR RYAD OR EDINAYA SISTEMA (ES) MAINFRAME COMPUTERS
(All equipment designators preceded by ES unless otherwise specified.)

In those cases where we obtained conflicting data on the operational
parameters of indigenous Soviet computer systems, we used our best engineering
judgment to select the most likely operational values.

KEYBOARDS(?): 01XX
0101   CSSR c.1972, Hungary c.1973; contactless A/N keyboard; min 96 chars:
0101-1-01 Operator's desk, contactless keyboard;
0101-1-02 Cyrillic alphabet data acquisition, contactless keyboard;
0101-1-03 Cyrillic alphabet typewriter, contactless keyboard;
0101-1-04 General purpose, Latin alphabet, contactless keyboard
0102   Hungary c.1972, CSSR c.1974; numeric keyboard up to 25 char/s

STATIONARY POWER SUPPLIES: 08XX
0823   Power supply for 1022
0824   Power supply for 1060
0825   Power supply for 1060
0835   Power supply for 1035
0836   Power supply for 1036
0853   Power switching device

MOBILE POWER SUPPLIES: 09XX
0904   Power pack for mag tape ctlr; +5 volts; 18 amps; also refered to
           as BP-1
0905   Power pack for mag tape ctlr; +5 volts (BP-2), -5 volts BP-3); 3.6 amps

COMPUTER SYSTEMS: 10XX
1010   Ryad-1   Hungary c.1972; 16-bit mini; 3 kOPS; 8 - 64 KB; upgm ctl;
                  TTL; modeled after US SDS Sigma-5 & French CII Mitra-15;
                  Videoton produced "several hundred configurations"
1010V   Ryad-1M   Hungary; ctl computer system
1010M   Ryad-1M   Hungary; 1010 with 64 KB main memory; possibly exported to
                  France
1011   Ryad-1M   Hungary c.1978; 16- or 32-bit modes; 512 KB; possibly used
                  by military and possibly exported to France
1012   Ryad-1M   Hungary c.1975; 6 kOPS; 128 KB; xpan inst set; few produced
1015   Ryad-2   Hungary c.1979; 12 - 16 kOPS; 160 KB; 16 MB VS
1016   Ryad-2?   Hungary c.1983; 15-20 kOPS; 512 kB main memory; 16 MB
                  virtual memory; ES/DOS-3; 29 MB disks; dev completed 1983
1017   Ryad-?   Hungary; expected around mid-1980s
1020   Ryad-1   USSR c.1972, Bulgaria; 10-20 kOPS; 64-256 KB; TTL; upgm ctl;
                  2 us cycle time
1020A   Ryad-1   CSSR; same as 1021
1021   Ryad-1   CSSR c.1972; 20 kOPS; 16-24 KB; 1 us access 2 us cycle time
1021M   Ryad-1   CSSR 1020; 16-64 KB; "not compatible" with Ryad-1
1022   Ryad-1M   USSR c.1975; 80-90 kOPS; 128-512 KB; TTL; 600 ns cycle time;
                  upgm ctl
1022B   Ryad-1M   Bulgaria; 80 kOPS; 512 KB; under Soviet "license"
1025   Ryad-2   CSSR c.1979; 30-40 kOPS; 256 KB; 8 MHz clock; 102
                  instruction set; 1.25 us cycle time; multiprogram operation

25X1

ES LISTING

1025M	Ryad-2	CSSR c.1981
1026	Ryad-2	CSSR c.1983; 36-52 kOPS; 128-512 kB main memory
1027	Ryad-3	CSSR c.1985; 400 kOPS; max 2 MB (4 MB in 1987); 8 KB cache; to use Czech 16 Kbit DRAMs
1030	Ryad-1	USSR c.1972, Poland; 60 kOPS; 128-512 KB; TTL; upgm ctl
1032	Ryad-1M	Poland c.1976; 200 kOPS; 256-512 KB
1033	Ryad-1M	USSR c.1977; 200 kOPS; 256-512 KB; 1.2 us cycle time; 200 kB/s xfer rate; real-time & time-sharing operation; upgm ctl
1034	Ryad-3	Poland c.1987?; up to 4 MB main memory; up to 8 I/O channels
1035	Ryad-2	USSR c.1977; 140 kOPS; 512 KB; 2 us cycle time; time-sharing & real-time operation; compatible with Minsk-32
1035.01	Ryad-2	ES-1035 with semiconductor main memory
1035.03	Ryad-2	Bulgaria
1035.21	Ryad-2	Bulgaria
1036	Ryad-3	USSR c.1984, Bulgaria?; 400 kOPS; 2-4 MB main memory w/cache; introduces virtual machine operating system
1037	Ryad-3	USSR c.1985, Bulgaria?; 500 kOPS; max 4 MB main memory
1040	Ryad-1	GDR c.1973; 380 kOPS; 128-1024 KB; TTL; 1.35 us cycle time; upgm ctl
1045	Ryad-2	USSR c.1980, Poland?; 500 kOPS; up to 3 MB magnetic core main memory; 1.2 us cycle time; 1500 kB/s xfer rate
1045.01	Ryad-2	ES-1045 with semiconductor main memory
1046	Ryad-3?	USSR c.1985; 1 MOPS; 4-6 MB main memory
1047	Ryad-3?	USSR
1050	Ryad-1	USSR c.1973; 500 kOPS; 128-1024 KB; hard-wired ctl; time-sharing & real-time operation; 1.25 us cycle time; uses ECL logic series 137 & 187
1052	Ryad-1M	USSR c.1978; 700 kOPS; 2048 KB
1055	Ryad-2	GDR c.1978; 450-750 kOPS with cache; 2 MB; time-sharing & real-time operation; 1.2 us cycle time
1055M	Ryad-2	GDR c.1981; 450 kOPS; 4 MB
1056	Ryad-2	GDR c.1983
1057	Ryad-3?	GDR c.1985-1986?
1060	Ryad-2	USSR c.1978; 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
1061	Ryad-2	USSR c.1984; 0.5-2.0 MOPS; 1-8 MB main memory; 16MB virtual storage; 128-bit floating point capability
1065	Ryad-2	USSR c.1983; 3 - 3.5 MOPS per processor; max 2 processors; time-sharing & real-time operation; 1500 kB/s xfer rate

OPERATOR CONSOLES: 15XX

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

PROCESSORS: 2XXX

PROCESSORS WITHOUT MAIN MEMORY AND WITHOUT CHANNELS: 20XX

2010	Hungary; processor for 1010; 18-bit word with 16 info bits; upgm ctl
2020	USSR, Bulgaria; processor for 1020; 20-30 us per short operation; upgm ctl; 1-byte ALU
2021	CSSR; processor for 1021

25X1

ES LISTING

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
2127	CSSR; CPU for 1027; 8 KB cache; 400 kOPS

PROCESSORS WITH MAIN MEMORY BUT WITHOUT CHANNELS: 23XX

2335	Bulgaria; array processor for 1035; 200 ns cycle time
2345	USSR; array processor for 1045
2361	CPU for 1061; contains up to 8 MB memory

PROCESSORS WITH CHANNELS BUT WITHOUT MAIN MEMORY: 24XX

2422	CPU with 1 mux & 2 selector channels
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
2436	CPU for ES-1036

PROCESSORS WITH MAIN MEMORY AND WITH CHANNELS: 26XX

2600	USSR c.1985; interpretive processor; 200 kOPS; 64-256 KB main memory
2622	USSR; central unit for 1022 consisting of 2422, 3222, & 0823; upgm ctl; 2-byte ALU
2635	USSR; Bulgaria; 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
2703	USSR c.1984; "special" array processor
2705	USSR c.1984; "special" array processor
2706	USSR c.1984; matrix processor; 40 MOPS

INTERNAL MEMORY UNITS: 3XXX

MAIN MEMORY: 32XX

3203	USSR, Poland; 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
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	USSR; core main store for 1020; 256-512 KB; 2 us cycle time
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; 3235 has been referenced as "semiconductor based"
3236	32 Kb memory board consisting of 1 Kb nMOS RAMs
3237	Core main store; 256 KB
3238	192 Kb memory board consisting of 48 4 Kb nMOS RAMs

25X1

ES LISTING

3263	Semiconductor memory for 1033; 256 KB; 1.5 us cycle time
3266	8 MB semiconductor memory consisting of four 2 MB blocks; 520 ns access time; 680 ns cycle time
3267	Core main store for 1045; 1 MB rack; four racks/system; 1560 us cycle time
3415	Memory device

MICROPROGRAM STORE CONTROLLERS: 35XX
3535	Control for upgm storage devices using 2435 CPU adapter

READ-ONLY MEMORIES: 36XX
3604	GDR; read-only memory for 1040

STORAGE MODULES: 39XX
3941	64 KB storage module

CHANNELS: 4XXX

MULTIPLEXER 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; used with 1060 & 1061
4011	GDR; mux chn for 1040 computer; 25 kB/s serial; 720 kB/s blk
4012	USSR; mux chn 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 chn for large Ryad computers; 1300 kB/s

CHANNEL-CHANNEL ADAPTERS: 406X
4060	USSR; channel-to-channel adapter
4061	USSR; channel-to-channel adapter
4065	USSR; channel-to-channel adapter

REPEATERS: 407X-409X
4080	Logic repeater used in 1065
4081	Main line signal repeater of I/O interface

MULTIPLEXER AND SELECTOR CHANNELS: 44XX
4430	USSR, Poland; 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
5002.03	GDR c.1981; 96/189 kB/s; 32 or 63 b/mm linear density
5003	USSR, Bulgaria c.1983; 200 ips; 1600 bpi PE at 315 kB/s or 800 bpi NRZI at 160 kB/s; not confirmed operational; do not confuse with ISOT 5003;
5003.03	Bulgaria c.1981; 120 ips; 1600 bpi PE at 189 kB/s or 800 bpi NRZI at 96 kB/s

25X1

ES LISTING

5003.05   c.1984; 200/ips; 1600 bpi; 315 kB/s xfer rate
5003.06   Bulgaria c.1984; 160/315 kB/s; 32/64 b/mm linear density
5004   CSSR c.1976, Bulgaria?; 75 ips; 1600 bpi PE at 126 kB/s or 800 bpi
          NRZI at 64 kB/s; tape has 50 MB storage capacity
5009   "Console magnetic tape unit"
5010   USSR c.1971; magnetic tape store for 1020; 75 ips; 200 or 800 bpi NRZI
          up to 64 kB/s xfer rate
5010.01   USSR c.1975; modernized 5010
5012   USSR c.1971; 75 ips; 200 or 800 bpi NRZI at 16 or 64 kB/s
5012.01   Bulgaria c.1971; 200 bpi at 16 kB/s or 800 bpi at 64 kB/s
5012.03   Bulgaria; 120 ips; 800 bpi NRZI at 96 kB/s; modernized 5012.01
5012.4   Bulgaria
5014   USSR; 75 ips; 800 bpi or 1600 bpi PE at 126 kB/s
5015   CSSR; 4 m/s; 800 bpi or 1600 bpi PE at 240 kB/s
5016   GDR c.1973; 296 mm reel; 1.524 m/s; 200 or 800 bpi NRZI at 48 kB/s
5017   USSR, GDR; magnetic tape store for 1022 & 1033; 296 mm reel; 75 ips;
          8 & 800 bpi NRZI up to 64 kB/s
5017.01   USSR c.1972
5017.2   GDR c.1972; magnetic tape store; 200 or 800 bpi; 64 kB/s
5017.3   Magnetic tape store for 1060; 200 or 800 bpi; 75 ips tape speed; NRZI
5019   Poland c.1971; magnetic tape storage for 1030 & 1050; 296 mm reel;
          120 ips; 200 or 800 bpi NRZI up to 96 kB/s
5021   USSR, GDR; 200 or 800 bpi NRZI
5022   CSSR c.1972; 75 ips (120 ips & 160 ips also reported); 800 bpi NRZI at
          64 kB/s or 1600 bpi PE at 128 kB/s
5025   USSR; 75 ips; 800 bpi NRZI or 1600 bpi PE; 50 MB capacity; 64 or
          126 kB/s xfer rate
5025.03   USSR c.1981; 800 or 1600 b/mm; up to 126 kB/s
5026   Bulgaria c.1983; 40/150 MBytes; 75 ips; 63-FM/246-PSK b/mm;
          126/712 kB/s
5027   Bulgaria c.1983; 40/150 MBytes; 120 ips; 1600 bpi FM/6250 bpi GCR;
          189/738 kB/s
5028   Bulgaria c.1983; 40/150 MBytes; 200 ips; 63-FM/246-PSK b/mm;
          315/1230 kB/s

                    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
5034   Poland; 2 MB; 20 ms average access time; 100 kB/s xfer rate
5035   GDR, Poland; 2 MB; 20 ms avg access time; 800 bpi; 1500 rpm; 100 kB/s
          xfer rate; 320 mm drum diameter

              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
5051   USSR; 100 MB nonremovable 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
5053   Bulgaria; 7.25 MB; 6 disks/pack; 44 b/mm; 2500 rpm; IBM-1311 or -2311
5055   GDR; similar to 5050
5056   USSR; 7.25 MB; 6 disks/pack; 2400 rpm; 75 ms avg access time;
          similar to 5050

ES LISTING

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

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

5063 317 MB disk drive

5065 635 MB disk drive

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

5067 Bulgaria c.1979; 200 MB; 5267 disk pack; 159 b/mm; 3600 rpm; 55 ms avg
   access time; 806 kB/s xfer rate

5067.2 Bulgaria c.1978; 806 kB/s xfer rate; 159 b/mm; dual 100 MB drives;
   IBM-3330 compatible

5067.4 Bulgaria; dual (?) 200 MB drives; IBM-3330-11 compatible

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;
   800 bpi; 52 kB/s read-write speed; 5 us avg access time

5074 Bulgaria; 3.2 Mb floppy; 3200 bpi; 1.89 trks/mm; 360 rpm; 280 kb/s

5074.01 Existence known; no technical information

5075 Bulgaria, CSSR; two 5074 floppies w/ctlr; 250 kb/s xfer rate;
   produced at the Aritma plant in Prague

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

5088 Bulgaria; 109.4 KB floppy disk; 125 kB/s xfer rate; 35 tracks; 300 rpm

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 with 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
(Actual transfer rate is a function of the tape drive, the controller,
and the tape recording density.)

5503 USSR, CSSR; ctls 8 or 16 5002, -03, & -04 magnetic tape drives; 64-315
   kB/s xfer rate

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; 200 or 800 bpi

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

5516 USSR; ctls eight 5016, -17, or -21 drives; 96 kB/s xfer rate

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

ES LISTING

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
5525.03 Listed for ES-1036
5525.05 Bulgaria
5527   Bulgaria c.1983; ctls 5026/26/27; compatible to IBM-3803-2/3420-4, &
          Memorex 3222/26/28

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
5552   Bulgaria; ctls eight 5051, -52, -53, -56, or -58 drives; 156 kB/s NRZI
5555   GDR; similar to 5552 but consumes more power
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
5563   Controller for 5063
5565f   Controller for 5065
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

MISCELLANEOUS: 56XX
5612   Bulgaria; magnetic tape drive similar to 5012.3 w/1600 bpi 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
(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 1,200 cards/minute in a start/stop mode;
          photoelectric reader
6014   I/O device
6015   USSR; two frictional feeds for up to 2 x 600 cards/min;
          photoelectric reader
6016   CSSR; mechanical feed up to 1,000 cards/minute; photoelectric reader;
          Ryad-1
6019M   USSR; vacuum feed up to 1,200 cards/minute; photoelectric reader
6111   USSR; punch card reader; 50 cols/second; photoelectric reader
6112   CSSR?; table card reader; 300 cards/min

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
6121   Hungary, Poland; used with the 1010; 300 char/s; photoelectric reader

25X1

ES LISTING

6122   Poland; 1000 char/s; photoelectric reader; 5, 6, 7, or 8 trk paper
        tape
6191   CSSR, Hungary; paper tape I/O device; 40 char/s; 5 or 8 trk tape

OPTICAL CHARACTER READERS: 603X-604X
6031   Up to "400 documents per minute"
6032   Existence known; no technical information
6035   Existence known; no technical information
6041   Existence known; no technical information

MICROFICHE INPUT UNITS: 660X
6602   1,000 char/s; 96 char set

NONMAGNETIC OUTPUT & I/O DEVICES: 7XXX

CARD PUNCHES: 701X
7010   USSR; mechanical feed up to 100 cards/min; 256 byte buffer storage;
        sequential column punch
7012   USSR; mechanical feed up to 250 cards/min; parallel line punch; 256-
        byte buffer storage
7013   CSSR; buffer memory
7014   CSSR; mechanical feed up to 160 cards/min; sequential column punch
7018   USSR; punches up to 100 cards per minute

PAPER TAPE PUNCHES: 702X
7022   USSR; 150 char/s; 5 & 8 track paper tape
7024   100 lines/sec; 5 or 8 track paper tape

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
7032   USSR; drum; 900 lpm; 128 char/line; 84 or 96 char set
7033   Poland; drum; 600-1100 lpm; 120,126,128 or 160 char/line; 83+1 char se
7033M   Poland; parallel printer
7034   CSSR; printer used at least with the 1010 & the 1025; 900 lpm; 132
        char/line; 64 char set
7035   GDR; 600-1100 lpm; 120 char/line; 64 char set
7036   USSR; 800 lpm; 132 char/line; paper is 80 x 420 mm
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
7039   GDR; chain; 900-1500 lpm; 132 or 160 char/line; 48 or 96 char set
        Hungary c.1979; 64/96 char set for 80/132 char/line; 245-1100 lpm
7040   400 lpm; 132 char/line; 84 char set; paper is 80 x 420 mm
7045   150 dots/s
7049   Hungary; drum; 750 or 1200 lpm; 132 char/line; 64 or 96 char set;
        contains buffer storage

PLOTTING EQUIPMENT: 705X
7050   USSR; 8 b/mm; magnetic tape recorder for use with 7051, -52, & -53
        plotters
7051   USSR; flatbed plotter; 1 square meter area; 255 symbols; 0.025 or
        0.05 mm writing element spacing; speed up to 50 mm/s; 3 colors avail
7052   USSR; drum plotter; plot speed 200 mm/s; 380 x 600 mm working area;

25X1

ES LISTING

                64 symbols; 0.1-0.05 mm writing element spacing; 3 colors avail
7053   USSR; drum plotter; auto 3-color "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
7054   CSSR; "plane surface plotter;" 1600 x 1200 mm working field; max
        driving speed 100 mm/s; 96 symbols; 4 colors available

VIDEO DISPLAYS: 706X

7061   Hungary; 16 (64) or 12 (80) lines on screen (char per line); 64 char
        set; 1024-byte buffer
7063   Hungary, CSSR; 16 (64) or 12 (80) lines on screen (char/line); 96 char
        set; 1024-byte buffer; produces printed copies; CSSR model also has
        15 (64) screen display
7064   USSR; raster (1024 x 1024 dots) & vector (5-7 mm/us) scan; 49 or 74
        char/line; 430 mm (diagonal) screen
7065   Hungary c.1979; AN/graphic display
7066   USSR; vector scan; 6 or 12 lines; 128 char set; 40 or 80 char/line
7067   Graphic display
7068   Hungary c.1979; 16 lines; 80 char/line
7069   GDR; "control unit;" 92 char set
7069M   GDR; operator & service console for 1055 processor

SERIAL PRINTERS: 707X

7070   USSR; letter arm; 10 char/s; 92 char set ; 106 char/line; mechanical
        keyboard
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
7074.1 Bulgaria; letter arm; 10 char/s; 92 char set; mechanical keyboard
7074.2 Bulgaria; turning disc (daisy wheel?); 30 char/s; 92 char set; reed
        relay keyboard
7076   Poland; matrix printer; 180 char/s; 92 char set; reed relay keyboard
7077   USSR; letter arm; 10 char/s; 92 char set; 106 char/line; mechanical
        keyboard

TERMINALS: 71XX

7111   I/O device
7112   I/O device
7122   Poland; paper tape I/O device; 100 char/s; 5 or 8 track tape
7168   Hungary; same as VT-340 & SM-7206; intelligent video terminal
7172   CSSR; "Consul" 260.1 typewriter
7173   GDR; unit for direct comms of operator with computer
7174   Bulgaria, Poland?; unit for direct comms of operator with computer
7181   CSSR; mosaic printer; 80 char/s in start/stop mode; 160 char/s in
        continuous mode; 132 char/line; 96 char set; Consul-2111
7183   GDR; A/N printer
7184   Hungary; printer; 80 char/line; 253-283 lpm; 205 mm print field width
7186   Poland, Hungary; mosaic printer; 180 char/s; 132 char/line
7187   Bulgaria; ISOT-132D; printer; uses floppy disk
7191   CSSR, Hungary; paper tape & punch card I/O device; 33 char/s; 5 & 8
        track tape
7192   CSSR; paper tape I/O device

SPECIAL PRINTERS (?): 72XX

ES LISTING

7230	Laser; 6,000 lines/min
7231	Laser; 6,000 lines/min
7240	Electrostatic; 1,000 lines/min

CONTROL UNITS: 75XX

| 7565 | Ctls up to four 7065 video display units |
| 7566 | Ctls up to sixteen 7066 display screens or 7174 typewriters; two buffer memories; 9-bit wordlength |

MICROFICHE OUTPUT UNITS: 76XX

| 7602 | GDR; microfilm output unit; 5 microfiches/min |
| 7612 | Microfiche storage & access unit; 10k to 100k microfiche capacity; 10-second retrieval time |

INPUT/OUTPUT SYSTEMS: 79XX

7901	Graphic display
7902	GDR; consists of 6122 paper tape reader & 7024 paper tape punch
7902M	GDR; model-1 uses paper tape & magnetic tape; model-2 uses paper tape only
7903	USSR; paper tape I/O: 1500 char/s input, photoelectric reader; 150 char/s output; 5 or 8 track paper tape
7903.M	USSR; new ICs and improved power supply
7904	Punched card I/O; 1,500 to 2,000 char/s input; photoelectric reader; 150 to 200 char/s output
7905	USSR; I/O of alphanumeric & graphic data; uses four 7065 CRTs & 7565 ctlrs; 96 char set; 49 or 74 char/line
7906	USSR; display group control; 7172 printer, up to 16 7066s + 7566 ctlr; 40 or 80 char/line; 6 or 12 lines/s; 96 symbols; 4096-Byte buffer
7907	CSSR; Digigraf 1208/1712 plotter
7908	USSR; I/O of alphanumeric & graphic data
7910	USSR, Poland; A/N display
7920	USSR, GDR; alphanumeric display system: 7922 ctlr; up to 7927s & 7934s; 600, 1200, 2400, & 4800 b/s
7920M	GDR; display system
7920.01	c.1984; 1.9 kB buffer memory
7920.11	A/N display complex; 7921 + 7927 + 7934
7920.21	A/N display complex; 7925 + 7934
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; 480-Byte buffer memory
7921.01	c.1984; 1.9 kB buffer memory; may interface with 7927, 7927.01, or 7034.01
7921.02	c.1984; 1.9 kB buffer memory; may interface with 7927, 7927.01, or 7934.01
7922	Group ctl unit for 7920; I/O interface between computer & 7927 & 7934 units; 200 kB/s
7922.01	c.1984; control unit; 1.9 kB buffer memory; may interface with 7927, 7927.01, 7934, or 7934.01
7925	CSSR; video terminal
7925M	Programmable display user station
7927	Dot matrix I/O display station; screen capacity 480 or 1,920 char; 96 char set; 20 char/s
7929.01	USSR; display
7934	CSSR; matrix printer; 96 char set; 132 char/line; 40 char/s

-15-

ES LISTING

7934.01   CSSR? c.1984
7934.02   CSSR; dot matrix printer
7941   CSSR; graphics complex
7942   CSSR; graphics complex
7943   CSSR; graphics complex
7971   USSR; display
7980   Graphics display

DATA COMMUNICATION EQUIPMENT: 8XXX

MODEMS: 800X-801X

8001   USSR, Bulgaria, Hungary, CSSR, Romania; FM; 200 b/s; full duplex; sync or async
8002   GDR, CSSR, Hungary, Poland; FM; 200 b/s; half or full duplex; async
8004   Hungary; 200 baud
8005   USSR, Bulgaria, Romania; 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 c.1980; 4 phase; 600 or 1200 b/s; full duplex; sync or async
8009   Bulgaria; 600 and 1200 baud
8010   USSR; PM; 600, 1200, or 2400 b/s; full duplex; sync
8011   Hungary; PM; 1200 or 2400 b/s; half or full duplex; sync
8013   Hungary, Poland c.1981; microP based; 8 phase; half or full duplex
8015   USSR; PM; 2400 & 4800 b/s; full duplex; sync
8017   Romania; 4800 baud
8018   Hungary c.1981; microP based; 8 phase; 2400 to 4800 b/s; half & full duplex
8019   USSR; bipolar amplitude modulation; 24,000 & 48,000 b/s; full duplex; sync

SIGNAL CONVERTERS: 802X-803X

8025   Unit of remote data processing
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
8029   Poland, USSR; bipolar amplitude modulation; 9600 b/s; half or full duplex; sync or async
8030   USSR, Bulgaria; half or full duplex; sync: 20, 50, & 100 b/s; async: up to 200 b/s
8032   CSSR, Hungary; half or full duplex; sync or async; 50, 100, & 200 b/s
8033   Bulgaria; 50, 75, & 100 b/s; also model with automatic call device; half duplex; async
8036   Hungary; 300, 1200, & 4800 baud
8040   Unit for remote data processing

AUTOMATIC TELEPHONE CALLERS: 806X

8060   Unit for remote data processing
8061   USSR, Hungary; auto connection over switched voice-grade lines; 50 b/s
8062   Poland; telephone caller
8063   USSR; auto connection over switched 4-wire telegraph links; 50 b/s
8070   Hungary
8080   Unit for remote data processing

-16-

ERROR PROTECTION DEVICES: 81XX

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

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
8371.01 Poland? c.1984; telecommunication processor

DATA TRANSMISSION MULTIPLEXERS: 840X-844X

8400   CSSR; max 16 lines; up to 100 b/s over telegraph; up to 4800 b/s over
        telephone lines; MPD-1A
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; MPD-1
8402   USSR; 8 to 176 half duplex or up to 88 full duplex lines; up to
        4800 b/s; MPD-2
8403   USSR; computer-computer comms over four half duplex or two full duplex
        lines; 50, 100, 600, 1200, 2400, & 4800 b/s; MPD-3
8404   GDR; ctlr; max 12 lines; sync or async; half duplex; up to 9600 b/s;
        MPD-4
8410   Hungary, Bulgaria; data transmission mux; MPD-10
8421   Hungary c. 1976; 600 & 1200 b/s; half or full duplex; sync or async

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
8504   USSR; AP-4; 1200 or 2400 b/s; sync; half duplex; card, paper tape,
        mag tape & CRT I/O
8505   GDR; AP-5; 200, 600, & 1200 b/s over telegraph lines
8506   GDR; AP-6; 600 & 1200 b/s over telegraph lines
8511   USSR; AP-11; half duplex; 600, 1200, & 2400 b/s; smart terminal
8514   Poland; AP-14; 600, 1200, & 2400 b/s; paper tape I/O; card input;
        mag tape storage; typewriter; CRT display; alphanumeric printer
8531   Bulgaria; AP-31; punched card & paper tape I/O; mag tape storage;
        200, 600, & 1200 b/s; smart terminal
8532   GDR; AP-32; punched card & paper tape I/O; 200, 600, & 1200 b/s;
        smart terminal
8534   Hungary; AP-34; programmable user station (smart terminal); TAP-34;
        2400 bauds
8540   CSSR; data acquisition station
8542   Terminal
8550   Hungary; AP-50; 600, 1200, 2400, 4800, & 9600 b/s
8551   Universal programmable user station
8556   Programmable display user station

ES LISTING

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
8563	USSR; AP-63; 1200 or 2400 b/s; sync or async; half duplex; CRT I/O
8564	Hungary; AP-64 user station; 600, 1200, 2400, & 4800 b/s
8570	USSR, Hungary; AP-70; 100 b/s; async; half duplex; mechanical typewriter I/O
8571	Bulgaria; AP-71
8574	Hungary; AP-74
8575	Poland; AP-75
8575M	Poland c.1984; terminal with floppy disk
8576	Terminal
8577	GDR; programmable multifunctional user station
8579	Terminal
8591	CSSR; 50, 75, & 100 b/s
8592	GDR; terminal
8593	CSSR; 100 & 200 b/s

DATA PREPARATION STATIONS: 9XXX

MAGNETIC 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; 800 bpi 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; 800 bpi NRZI; processes & pools inputs from up to 16 keystations
9004	Bulgaria, USSR?; 39.6 cm/s; 800 bpi NRZI; 80 or 160 char/blk consists of mag tape, monitor, and keyboard
9004.01	Can use two of these units to do a direct tape-to-tape data transfer without the use of a computer
9004.02	Allows recorded data to be printed on ISOT-0230 printer without the use of a computer
9004.03	Provides means for direct data entry and recording of information from ISOT-6001 punched-card reading unit
9004.04	Uses input via ES-9114 floppy and output to mag tape
9005	Bulgaria c.1982; mag tape data preparation station with up to 32 work stations
9006	Hungary; uses 5094; 2 x 80 KB storage capacity; 140 Bytes/s; for searching & updating data
9009	USSR; uses two 5091 drives

PUNCHED-CARD PREPARATION STATIONS: 901X

9010	Ryad-1 equipment
9011	USSR; card reader-punch; 15 cols/s manual input; 25 cols/s duplicating speed; 100 cols/s without punching
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

ES LISTING

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
9050   Existence known; no technical information
9053   CSSR; Consul 9114
9070   Bulgaria c.1984; mag tape data preparation; 800 bpi; 25 ips
9080   CSSR; punched-card verifier; 60 cols/s
9110   CSSR; Consul 271
9111   CSSR; Consul 2711; data recorder on floppy disk
9112   Bulgaria; floppy disk unit; CRT, keyboard, & typewriter; microP-based;
         2 disk memory units
9112S   Hungary; floppy disk; 20,000 char/s; 243 KB disk pack capacity; 74 trks
9113   Bulgaria c.1981; mag tape & floppy disk unit
9114   Bulgaria; floppy disk; succeeds 9002 & 9004
9150   Poland; mag tape system contains: processor, 5001 mag tape storage,
         two disk storage units, alphanumeric printer, up to 32 operators'
         consoles, & CRT

25X1

SM LISTING

25X1

COMPONENT LISTING FOR SM SMALL-COMPUTERS
(All equipment designators preceded by SM unless otherwise specified.)

In those cases where we obtained conflicting data on the operational parameters of indigenous Soviet computer systems, we used our best engineering judgment to select the most likely operational values.

SM-II COMPUTER SYSTEMS

SM LIST

25X1

50/20	CSSR c.1984; sequential controller
50/40-1	USSR, CSSR; 8-bit microC based on K580 (= Intel-8080A) microP
50/40-3	MicroC based on 8-bit uP; 1 MHz clk; RAM: 4KB static & 8 KB dynamic; 16 KB ROM
50/50	CSSR c.1985; 16-bit microC based on Sov. K1804 microP (= US AMD-2901)
50/50.M1	CSSR c.1986; 16-bit miniC 4K upgm ctl; optional floating-point processor; up to 2 MB main memory
50/50 PLUS	CSSR c.1984; same as 50/50.M1
50/60	USSR c.1984; software compat w/SM-2M; 16KW upgm storage
51/10	Hungary; same as ES-1011 or R-11
51/13	CSSR c.1984; "emulative" computer
52/10-1	Hungary; see 1502
52/11	CSSR c.1983; miniC; copy of PDP-11/60;
52/11.M1	CSSR c1984; 16-bit miniC; up to 1.25 MB main memory (used Czech 16-Kbit DRAMs); has CIS (commercial instruction set)
52/11 PLUS	CSSR c.1984; same as 52/11.M1
52/12	CSSR c.198?; 32-bit supermini; 16 address and general-purpose registers; 8 Kb cache memory; 32-bit virtual address space; eventually up to 32 MB main memory
53/10	CSSR c.1984; multicomputer system based on 50/50 or 50/40
54/30	CSSR c.1984; "video graphic" computer

SYSTEM INTERFACES: 010X

0101	CSSR; system interface unit for SM-3 & SM-4; consists of 2001 & 3501 SM units
0102	CSSR; interface boards for SM-3 & SM-4; async
0203C	"Input module" for SM-52/11
0205	A "simple" timer used on SM-52/11
0211.2	Diagnostic control memory on Czech SM-52/11

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

COMPUTER SYSTEMS: 1XXX

SM-1	USSR; 133 kOPS; 8-64 KB; modeled after Hewlett-Packard 2100 series
SM-2	USSR; 154 kOPS; 64 - 256 KB; modeled after Hewlett-Packard 2100 series
SM-3	USSR, CSSR, Poland, Cuba?; 135 kOPS; 56 KB; modeled after PDP-11/05; also referred to as SM-1301

SM LISTING

3/20	CSSR SM-3
SM-4	USSR, CSSR, Romania (Independent I-100); 213 kOPS; 248 KB max; modeled after PDP-11/40; also referred to as SM-1401
SM-4	Bulgaria; ISOT-1016S
SM-4A	Poland; 128 KB; compat w/DEC PDP-11/40; Warsaw Era prod 98 units in 1983
4-20	CSSR SM-4; copy of PDP-11/34A; 256 KB DEDSEC memory; floating-point board
SM-5	USSR; 1,000 kOPS; 32 to 512 KB
1210	USSR c.1982; up replacement for M-6000, M-7000, SM-1, & SM-2
1300	USSR; 64 KB memory; 500 kOPS; microP-based SM-3
1301	USSR; same as SM-3
1403	USSR; may use Italian peripherals
1407	USSR; variation of SM-4
1410	USSR c.1981; a two-processor complex consisting of 2104 and 2410; system can work with SM-4 or MIR computer equipment
1420	USSR; first mentioned c.1982; follow-on to SM-4; up to 1920 KW memory; similar to SM-5
1502	Hungary SM-52/10-1; State tests Nov 1983; compatible w/ SM-4 or ES-1011; uses ECL microP
1600	USSR c.1983; two-processor 16-bit miniC; single-bus interface; compatible w/ SM-3/SM-4 software; SM-1420 & M5100
1601	64x16 or 40x12 char/lines dumb display
1604	Bulgaria; video terminal used w/ SM-3 & -4 and w/ Estel 4.1 comms on ES
1605	"Miniterminal"
1613	Existence known; no technical information
1617	GDR; office processor; designed chiefly for bookkeeping
1621	MicroP-based workstation
1624	GDR; SM 50/10-1; 8-bit microC; 6 general-purpose registers; 16 KB memory using 4 Kb chips; 50 to 9600 b/s async comms xfer rate
1626	GDR; SM 50/40-2; 8-bit microC; 128 KB memory
1627	Bulgaria; microcomputer
1630	GDR c.1983; same as Robotron K-1630 ?
1633	Poland; part of MERA-60 (Elektronika-60 in USSR) family; 16-bit microC; inst set similar to SM-3; 8 KB memory
1634	USSR; based on 16-bit SM-50/60 microC; 256 KB main memory
1800	USSR c.1982; microC based on K580 microP; 32-64 KB memory; 200 watts; 500 kOPS; 2 to 8.5 us/inst
1803.05	MicroC; 64 KB main memory

TIMERS: 20XX

2001	Programmable timer for SM-3, SM-4, & SM-52/11; common bus; 100 kHz, 10 kHz, or 50 Hz; time interval precision +-.01%

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
2102	USSR; central processor for SM-2; upgm ctl; 16 data bits/word; 2.2 us/fixed point add
2103	USSR; central processor for SM-3; upgm ctl; up to 1,300k words/s xfer rate; 16 data bits/word; 8 general-purpose registers
2104	USSR; central processor for SM-4; upgm ctl; 16 data bits/word; 8 general-purpose registers; handles SM-4 operating system
2301	CSSR; central processor for SM-3 model 20; similar to 2103
2302	Poland; central processor for SM-3; similar to 2103

SM LISTING

2303	Cuba; central processor for SID-300; similar to 2103
2401	CSSR; central processor for SM-4 model 20; similar to 2104
2402	Romania; central processor possibly for Independent-100; similar to 2104
2410	USSR; second processor on the 1410 two-processor complex; serves as an ANALITIK language interpreter
2420	USSR; CPU for 1420 computer; uses K1804 microP and K565RU3 16Kbit DRAMs

INTERNAL MEMORY UNITS: 3XXX

3100	USSR; ferrite main memory; 32K word capacity; 1.2 us cycle time; (16 data + 2 parity bits)/word
3101	Poland; ferrite main memory; 32K word capacity; 1.2 us cycle time; (16 data + 2 parity bits)/word
3102	Ferrite main memory; 16K word capacity; (16 data + 2 parity bits)/word; 1.2 us cycle time; with SM-3
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
3105	USSR; ferrite main memory for SM-2; 32K word capacity; 18 bits/word (probably contains 2 parity bits); 1.0 us access time
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
3509	Semiconductor memory
3510	Semiconductor memory module for SM-3 & SM-4; (16 data + 2 parity bits) per word; 16K word capacity per module; 0.7 us cycle time
3511	CSSR; semiconductor memory module for SM-4 model; up to 128K words/module; (16 data + 6 parity bits)/word; 0.6 us access time; 0.8 us cycle time

INTERFACE EXPANDERS: 41XX

4101	For use in SM-3 & SM-4; 1,000 char/s xfer rate; 1,280 8-digit symbol buffer memory; expands I/O functions with a reduction in system speed
4104	For use in SM-3 & SM-4; 1,000 char/s xfer rate; 1,280 8-digit symbol buffer capacity
4501	USSR; common bus switch for SM-1300
4503	USSR; establish comms channel between common-bus small computers

EXTERNAL MAGNETIC STORAGE: 5XXX

MAGNETIC TAPE CONTROLLERS: 50XX

5001	Bulgaria; ISOT-5000C; transport controller for ISOT 5003, 5005, & 5006; 9 trk tape; 800 bpi; 32, 64, 96, 114, & 190 cm/s; NRZI
5074.01	Dual floppy disks with capacity of 256 KB

MAGNETIC DISK CONTROLLERS: 51XX

5102	Poland; ctls up to four 5401 disk drives; 2500 kb/s xfer rate
5105.1	USSR, Bulgaria; ctls up to four SM-5400, 5401, or 5403 disk drives; 11.1 us/word xfer speed; 1500 rpm
5105.7	Disk controller

25X1

SM LISTING

MAGNETIC CASSETTE TAPE (3.81 mm) STORAGE: 52XX

5202   Poland; 5.76 MB capacity; 800 bpi; 0.5 kB/s xfer rate
5203   CSSR; 3.2 MB capacity; 800 bpi; 0.125 kB/s xfer rate
5204   450 KB capacity
5205   Poland; 2 trk cassette tape storage unit; 5 Mb capacity; 800 bpi;
         5 ips tape speed; PE
5208   Magnetic cassette tape unit for use with SM-3 & SM-4
5211   Mag tape cassette unit; 2 cassette capacity (5204.01); 800 bpi;
         1.25 KB/s; common line interface
5269.1   Bulgaria; removable disk cartridge; 3 MB

MAGNETIC TAPE (12.7 mm) STORAGE: 53XX

5300   Bulgaria; ISOT-5004E; mag tape unit; 10 kB/s xfer rate; 800 bpi; NRZI;
         9 trk tape; .3175 m/s; 100 MB capacity
5300.01 Bulgaria; 800 bpi; NRZI; 12.5 ips; 10 kB/s
5301   Magnetic tape unit for SM-3 & SM-4; 10 kB/s xfer rate; NRZI
5301.10 Magnetic tape drive
5302   Bulgaria; ISOT-5005; mini-mag tape unit; 800 bpi; NRZI; 12.5 ips tape
         speed; 20 kB/s xfer rate; 9 trks; 200 MB capacity
5303   Bulgaria; ISOT-5006; 800 bpi; 36 kB/s xfer rate
5304   Poland; 800 or 1600 bpi; 40 kB/s xfer rate
5305   USSR; 800 or 1600 bpi; 75 ips; 64 or 126 kB/s xfer rate
5306   Bulgaria; 1600 bpi (PE); 800 bpi (NRZI); 75 ips; 126 & 64 kB/s
5308   c.1984; mag tape drive
5309   Bulgaria; 1600 bpi (PE); 800 bpi (NRZI); 45 ips; 72 & 36 kB/s

REMOVABLE CASSETTE DISK STORAGE: 54XX

5400   Bulgaria; ISOT-1370; 5 MB (2.5 fixed + 2.5 removable);
         50 ms avg access time; 1500-2400 rpm; 180 & 312 kB/s xfer rate;
         uses ES-5269.1 disk pack
5401   Poland; MERA-9425; cassette-type plug in disk storage; 50 Mb capacity;
         312 kB/s xfer rate; 2400 rpm; 40 ms avg access time
5402   External memory system
5402.09 Magnetic disk
5403   CSSR; disk storage with removable disk; 50 Mb capacity; 2500 kb/s
         xfer rate; 30 ms avg access time
5404   29 MB disk drive
5405   Bulgaria; for SM-4 computers
5407.09 Interchangeable magnetic disk
5408   Cartridge disk system; 16 MB total; 38 ms access time; 4064 bpi
5410   Bulgaria; 11.5 MB; 406 trks/surface; 79 b/mm; 200 tpi
5412   Bulgaria c.1983; 80 MB; 806 KB/sec at 2400 rpm or 1209 KB/sec at 3600;
         45 msec avg access time

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
5501   USSR; fixed-head disk storage; 0.864 MB capacity; 670 kb/s xfer rate;
         10 ms avg access time

FLOPPY DISK STORAGE: 56XX

5601   Hungary; floppy disk storage unit; 3 Mb capacity; 250 kb/s xfer rate
5602   Poland; floppy disk storage unit; 3.2 Mb/disk; 2 disks; 6.4 Mb total

25X1

SM LISTING

capacity of which 4.1 Mb is useable; 205 ms avg access time; 360 rpm; 250 kb/s xfer rate

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

5604 CSSR; Consul 7112; 3.2 Mb capacity; 250 kb/s xfer rate

5605 CSSR, Hungary; 6.4 Mb capacity; 400 kb/s xfer rate; 500 ms avg access time; uses two 512 KB floppy disks

5606 Hungary; 6.4 Mb capacity; 250 kb/s xfer rate; 370 ms avg access time

5608 Poland; consists of one 5602 disk drive, ctlr, & power supply; 4.1 Mb capacity; 205 us avg access time; 250 kb/s xfer rate

5612 Bulgaria; 32 or 1600 bpi; 96 or 189 kB/s

5615 Floppy disk storage for SM-3 & SM-4; 3.2 Mb capacity; 250 kb/s xfer rate

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

GENERAL-PURPOSE CONTROLLERS: 60XX

6001 P80-8 parallel adapter for SM-3 & SM-4; connects peripherals with 8-bit IRPR interface; 300 kb/s async

6002 Serial adapter for SM-3 & SM-4; 9.6 kb/s async; connects to IRPS or S2 interface

CARD READERS: 61XX

6101 Hungary; VT-42111; 80 cols/card; 600 cards/minute

6102 GDR; Daro-1220; 160 cards/minute

6103 Romania; 300, 400, 600, or 800 cards/minute; photoelectric reader

6105 Romania; RSD-9226; 300 to 800 cards/minute

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

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

6202.01 Existence known; no technical information

6203 Hungary; MR-301; input unit; 5 or 8 trks

6204 Poland; SPTP-3; I/O unit; 50 or 100 lines/s; 5 or 8 trks

6205 Poland; ST-2030; input unit; 300 lines/s; 5 or 8 trks

6206 GDR; Daro-1215; output unit; 50 lines/s; 5 or 8 trk tape

6208 CSSR; Consul 337.2; input unit; 100 rows/s in start/stop mode; 300 rows/s in continuous mode; 8 trk tape

6209 CSSR; FS-1503; input unit; 1,500 lines/s; 8 trk tape

6216 Poland; ST-2100/2200; input unit; 1,000/2,000 lines/s; 5 or 8 trks

6222 Poland; DT-105C; output unit; 50 lines/s; 5 or 8 trk paper

6227 Hungary; MP-51; output unit; 50 lines/s; 5 or 8 trk paper

ALPHANUMERIC PRINTERS: 63XX

6300 DZM-180 plus ctlr; 180 char/s; 132 char/line; 256 symbol buffer memory

6300.01 Existence known; no technical information

6301 GDR; Daro 1156; sequential mosaic printer; 100 char/s; 132 char/line; 96 char set

6302 Poland; DZM-180; sequential mosaic printer; 180 char/s; 132 or 138 char/line; 128 char set

6303 CSSR; Consul 211.1; sequential dot matrix printer; 150 char/s; 132 char/line; 96 char set

25X1

SM LISTING

6304   GDR; Daro 1156; sequential mosaic printer; 100 char/s; 132 char/line
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
6306   Hungary; VT-25112; parallel printer; 900 lines/min; 96 char set; 132
       char/line
6307   GDR; dot-matrix printer; 45 char/s continuous mode; 25 char/s start/stop
       mode; 96 char set; 132 char/line
6308   USSR; "graphic character synthesizing printer" using dot-matrix based
       mechanism; 100 char/s; 7x5 dots/char; 96 char set; 128 char/line
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
6312   Bulgaria; ISOT-0232D; sequential printer with keyboard; 20 char/s;
       132 char/line; 96 char set
6312.1 Bulgaria; sequential printer with keyboard; 25 char/s; comms terminal;
       uses ES-7187 printer
6312.2 Bulgaria; similar to 6312.1; uses SM EVM IRPS interface
6313   GDR, Hungary; parallel printer; 660 lpm; 96 char set;
       136 char/line; Videoton 270; Robotron 1152
6315   USSR; 132 char/line; 25 char/s; uses ES-7187 printer; four models:
       500 lpm with 96 char set, and 700 lpm with 64
       char set; both come with or without a programmable carrier
6316   Hungary; VT-24112; 253 or 365 lpm; 80 char/line; 64 or 96 char set
6321   Hungary; VT-25150; 650 lpm; 132 char/line; 64 or 96 char set
6322   Romania; RSD-9233; 200 lpm; 132 char/line; 64 or 96 char set

PLOTTING EQUIPMENT: 64XX

6402   Semiautomatic plotting board; 850 x 600 mm working field
6402.1 Same as 6402 but with a different interface
6403   USSR; electrostatic graphics printer; 4 points/mm

DATA PREPARATION STATIONS: 69XX

6900   GDR; programmable data entry device; microP based; four models
       consisting of various I/O devices
6901   Bulgaria; floppy disk data entry station; keyboard input; CRT display
6902   GDR; mag tape data acquisition & conversion station; cassette tape
       drive at 500 B/s xfer rate; standard 9 trk drive at 10 kB/s xfer rate
6903   GDR; mark sensor; reads marks on forms; 4,000 forms/hour
6905   Hungary; data preparation terminal; consists of VT 5300 ctlr, MOMFLEX
       3200 dual floppy disks, 1 or 2 VSD 47703 displays, VT 600/1200 modem, &
       one VT 23000 or DZM 180 printer
6907   GDR; office processor
6908   GDR; office processor
6921   CSSR; floppy disk data entry station; keyboard input; CRT display

TERMINALS: 7XXX

HARDCOPY TERMINALS: 71XX

7102   GDR; Robotron 1154; sequential alphanumeric printer with keyboard;
       45 char/s; 132 char/line; 94 char set
7103   Poland; alphanumeric dot-matrix printer; 7 x 7 dots/char; 180 char/s;
       132 to 158 char/line; 96 char set

25X1

SM LISTING

7108 CSSR; Consul 2113 sequential printer with Consul 256 keyboard; 5 x 7
   dots/char; 150 char/s; 132 char/line; 96 char set
7108.7 CSSR; 80 char/s; 132 char/line; 64 or 96 char set; 100, 200, or 300 b/s
   xfer rate; duplex; async

ALPHANUMERIC VIDEO TERMINALS: 72XX
7202 CSSR; 24 lines; 80 char/line; 5 x 7 dots/char; 96 char set
7203 Cuba; SID-702; 1440 char/screen; 5 x 7 dots/char
7204 USSR; alphanumeric video terminal; 24 lines; 80 char/line; 5 x 7
   dots/char
7205 Hungary; Videoton 340; alphanumeric video terminal
7206 CSSR, Hungary; VT-47100 (same as ES-7168); 24 lines; 80 char/line;
   128 char set; 5 x 7 dots/char
7207 Poland; 512 char/screen; 5 x 7 dots/char
7208 Poland; 1280 char/screen; 5 x 7 dots/char
7209 Poland; MERA-7952; 1,920 char/screen; 5 x 7 dots/char
7215 Poland c.1986; color monitor
7219 Hungary; VDT-52105; 1,920 char/screen; 7 x 8 dots/char

GRAPHIC DISPLAY TERMINALS: 73XX
7300 USSR; EPG-SM; 1024 x 1024 points/screen; vector scan
7301 Hungary; VT-47607; 24 lines; 80 char/line; 125 char set;
   512 x 236 points/screen
7316 Video terminal; 340 by 340 mm

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
7402 GDR; Robotron 4000; 256 char/screen; 5 x 7 dots/char
7404 1024x1024 vector graphic intelligent terminal w/SM-2301 processor

KEYBOARDS: 76XX
7601 CSSR; contactless (Hall effect) alphanumeric keyboard; 78 keys; up to
   20 char/s typing speed
7953 Poland; video terminal and printer

DATA COMMUNICATION EQUIPMENT: 8XXX
8002 CSSR; Modem 200; up to 300 b/s; sync or async; half or full
   duplex; FM
8006 CSSR; Modem 1200; 75 b/s incoming; 600 or 1200 b/s outgoing;
   sync or async; half or full duplex; FM
8101 Modem 200; full duplex; async; up to 300 b/s xfer rate; for use over
   telephone network
8102 Modem 1200; half or full duplex; sync or async; 600 or 1200 b/s xfer
   rate; for use over telephone network
8103 Modem 2400; half or full duplex; sync; 1200 or 2400 b/s xfer rate;
   for use over telephone network
8105 CSSR; "null modem;" used to connect local data comms devices to a ctl
   computer complex; up to 48kb/s xfer rate; async; half or full duplex
8501 CSSR; remote comms 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
8502 USSR; connects comms device with processor; half or full duplex; async;

SM LISTING

	3 models with different speeds up to 9600 b/s xfer rate
8505	USSR; data transmission device; 4 channels; up to 20k b/s; sync; half duplex
8506	CSSR; synchronous adapter for SM-3 & SM-4; up to 9600 b/s xfer rate; simplex, half, or full duplex
8511	CSSR; asynchronous multiplexer
8512	19.2 kb/s
8606	Synchronized adapter for inter-computer connections

DEVICE INTERFACES: 9XXX

9004	CSSR; passive ctlr connecting DASIO-600 device to SM-3 or SM-4; 250k words/s xfer rate
9101	CSSR; device coupler for SM-1
9104	USSR; device coupler for SM-3 & SM-4; 19 models
9105	Hungary; process terminal; 1K RAM & 3K ROM capacity; Intel 8080 based
9201	USSR; analog, digital, & continuous frequency signal I/O interface to SM-1 & SM-2; A/D converter
9205	CSSR; laboratory device coupler for SM-3 and SM-4; A/D & D/A converters
9402	CSSR; input & display module; half duplex; async; 200, 600, & 1200 b/s xfer rate
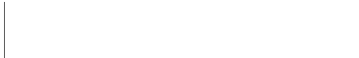
APPENDIX
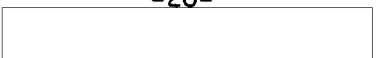
25X1

Typical Ryad-1 and Ryad-1M System Configurations

| Ryad Model	1020-a-	1021	1022	1030	1032	1033	1040	1050
Processor	2020.....1-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)	3204.....1 (4011)	3205.....2 4012.....1
Channels	in processor	in processor	4430.....1	4430.....1		4011.....1 4035.....1	4012.....1 4034.....1	4035.....2 4060.....1
Magnetic Tape Drive	5010.....4	5022..... (5012,5025)-c-	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
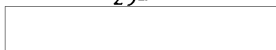
25X1

25X1

25X1

Peripheral Equipment Associated with Ryad-2 Computer Systems

Ryad Model	1015-a-	1025	1035	1045	1055	1060	1065
Magnetic Tape Drive	5017..3-b-	5004..6	5017..6	5017..6	5017..8	5017..8 (5025)	5025..8
Magnetic Disk Drive	5061..3	5061..2 (5066)-c-	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
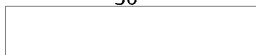-c-. () = Common alternate equipment

-30-

25X1

Technical Specifications for Soviet Ryad-2 Mainframe Computers

Model	ES-1025	ES-1035	ES-1045	ES-1055	ES-1060	ES-1061	ES-1065
Country	Czech SSR	USSR/Bulgaria	USSR	GDR	USSR	USSR	USSR
Processor							
Speed (1,000 operations/second)	35	160	650	450	1,000	2,000	3,000
Fixed add time (us)	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 point add time (us)	50.0	95.0	1.9	1.6	0.80	*	0.24
Floating point multiply time (us)	9.7	19.8	2.8	2.7	2.3	*	0.30
Main memory							
Capacity (Mbytes)	0.1-0.5	0.25-1	1-4	0.25-4	0.5-8	1-8	2-16
Cycle time (ns)	1,250	800	840	1,140	800	*	*
Access time (ns)	500	550	650	*	*	*	870
Bytes fetched per cycle	8	8	8	8	8	*	*
Microprogram control memory							
Capacity (Kbytes)	*	48 RW	7RO + 1RW	8	48	*	*
Cycle time (ns)	380	200	120-380	135	*	*	*
Access time (ns)	*	*	*	140	65	*	*
Length of word accessed (bytes)	*	*	8	8	16	*	*
Cache (scratch pad) memory							
Capacity (Kbytes)	X	X	8	X	8	*	32
Cycle time (ns)	X	X	120	X	135	*	*
Access time	X	X	72	X	65	*	*
Length of word accessed (bytes)	X	X	8	X	8	*	*
Channels							
Maximum number	2	5	6	5	7	8	*
Total transfer rate (kbytes/s)	*	1,200	5,000	6,000	9,000	*	15,000
Selector channels							
Maximum number	1	4	(5)	(4)	(6)	*	(16)
Transfer rate (kbytes/s)	33	740	(1,500)	(1,500)	(1,300)	*	(1,500)
Byte-multiplex channels							
Maximum number	1	1	2	2	2	*	*
Transfer rate (kbytes/s)	24	40-280**	40-160**	40-1,500**	110-670**	*	110-?
Block-multiplex channels							
Maximum number	X	X	5	4	6	*	*
Transfer rate (kbytes/s)	X	X	1,500	500-3,000**	*	*	3,000
Class, per State Standard GOST 16325-76	II	III	III	IV	V	V	V

X - Equipment not available on model; RW - read/write; RO - read only
( ) - On these models the block-multiplex channel can be operated as a selector channel.
* - Data not available.
** - Speed varies depending on numbers and types of operational channels in system.
us = microsecond = 10**(-6) second; ns = nanosecond = 10**(-9) second.
Byte = 8 bits (8 binary digits); Kbyte = 1,024 bytes; kbytes = 1,000 bytes; Mbytes = 1,048,576 bytes.

25X1

25X1

25X1

Typical SM-3 and SM-4 -a- System Configurations

	Equipment Designators -b-	
	SM-3	SM-4
Timer	2001	2001
Processor	2103	2104
Core main memory	3100 (3101,3102)	3100 (3101,3102)
Semiconductor main memory	3510	3510
Interface expander	4101 (4104)	4101 (4104)
Magnetic cassette tape unit	5208	5208
9-track magnetic tape drive	5301	5301
Removable cassette disk drive	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- Parenthetical numbers represent alternate equipment.

25X1

25X1

Technical Specifications for Soviet SM-1 Small Computers -a-

Characteristic	SM-1	SM-2	SM-3	SM-4	SM-5
Speed in kOPS	130	155	135	215	400
Main memory, KW	4-32	32-128	16-28	16-124	128-2,097

Instruction time in microseconds
    Fixed point:

	SM-1	SM-2	SM-3	SM-4	SM-5
Addition	2.5	2.2	5	1.2	- -c-
Multiplication	36.6-b-	10	16-d-	10.8	-
Division	-	17	19.5-d-	12.7	-

    Floating point:

	SM-1	SM-2	SM-3	SM-4	SM-5
Addition	33-b-	18-40	320-d-	28.7	-
Multiplication	110-b-	23	410-d-	34	-
Division	-	40	-	52	-

-a- Information in this table was obtained from Soviet open literature; the SM-5 also has been identified with the SM-2 family in a Soviet export brochure, circa 1983.

-b- Possibly implemented in software.

-c- Dash = not known.

-d- Implemented in software.

25X1

25X1

-33-

GLOSSARY OF ABBREVIATIONS

A/D	=	Analog to Digital
A/N	=	Alphanumeric
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
bpi	=	bits per inch
B	=	Byte = 8 bits
char	=	character
chn	=	channel
cm/s	=	centimeter per second
CMOS	=	Complimentary Metal Oxide Semiconductor
cols	=	Columns
comms	=	communications
CRT	=	Cathode Ray Tube
CSSR	=	Czechoslovakian Soviet Socialist Republic
ctl	=	control
ctlr	=	controller
D/A	=	Digital to Analog
DEDSEC	=	Double-error detection, single-error correction
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
I/O	=	input output
inst	=	instruction
ips	=	inches per second
IRPR	=	standard Soviet interface, expansion unknown
IRPS	=	standard Soviet interface, expansion unknown
k	=	1,000
K	=	1,024
KW	=	kiloword = 1024 words
kOPS	=	1,000 operations per second
lpm	=	lines per minute
M	=	Mega = (1,024)(1,024) = 1,048,576; Mb = magabits; MB = megabytes
mag	=	magnetic
ms	=	millisecond
m/s	=	meters per second
microC	=	microcomputer
microP	=	microprocessor
miniC	=	minicomputer
mm	=	millimeters
MOPS	=	millions of operations per second
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
rpm     = revolution per minute
s       = second
SM      = Sistema Malykh = system of small computers
sync    = synchronous
tpi     = tracks per inch
trk(s)  = track(s)
TTL     = Transistor-Transistor Logic
upgm    = microprogammable
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
w/      = with
xfer    = transfer
xpan    = expanded
"       = inches
?       = entry immediately preceeding is uncertain
```

Confidential

Confidential