Data General Commercial Systems Family

MANAGEMENT SUMMARY

In May 1982, Data General Corporation announced a new Commercial Systems product family consisting of the CS/5, CS Series 100 and CS Series 200. Models are based on microNova (CS/5), microEclipse (CS Series 100 and 200), and Eclipse (CS Series 200) processors and, according to DG, incorporate software compatibility throughout the company's full range of commercial and business computer systems. Concurrently the company introduced Business Basic software utilities for word processing, graphics, and report and program generation.

Users of earlier CS/10, CS/50, and CS/70 models may upgrade their systems to take advantage of the performance of the current CS Series products. Existing Business Basic and Interactive Cobol applications from the earlier CS systems will also transport to the new products.

All of the CS Systems are offered in either a base or packaged version. Base systems include the processor, memory, chassis, cabinet, an operating system subsequent license, and a commercial language run-time license. Packaged systems include all of the above plus disk storage, a backup device, and a master console.

The CS/5 is an integrated desktop business computer. Running under the MP/OS operating system, business-oriented programming languages for the CS/5 include MP/OS Interactive Cobol, and MP/OS Business Basic. The basic CS/5 system is a compact unit with a 16-bit microNova mN602 processor, 64K bytes of dynamic RAM memory, a CRT display, two floppy disk drives with 716K bytes of combined storage, and an 83-position ▷

Data General's Commercial Systems include the CS/5, CS Series 100, and two versions of the CS Series 200. Models are based on the microNova, microEclipse, or Eclipse processors. The microNova-based CS/5 is a single integrated desktop business computer, which may also be used as part of a distributed data processing system. The microEclipse-based CS Series 100 can support up to nine users and perform a variety of tasks simultaneously. The CS Series 200 offers a choice of a microEclipse or Eclipse processor, supports up to 25 users, and is suited to larger applications, involving either multi-programming or multi-tasking.

MAIN MEMORY: 64K bytes to one megabyte.
DISK CAPACITY: Five to 1400 megabytes.
WORKSTATIONS: Up to 25.
PRINTERS: 55 cps to 600 lpm.
OTHER I/O: Magnetic tape, a graphics terminal, and a graphics printer.

CHARACTERISTICS

MANUFACTURER: Data General Corporation, 4400 Computer Drive, Westboro, Massachusetts 01580. Telephone (617) 366-8911.

Data General is a leading manufacturer of minicomputers, peripherals, and associated equipment. The company ▶
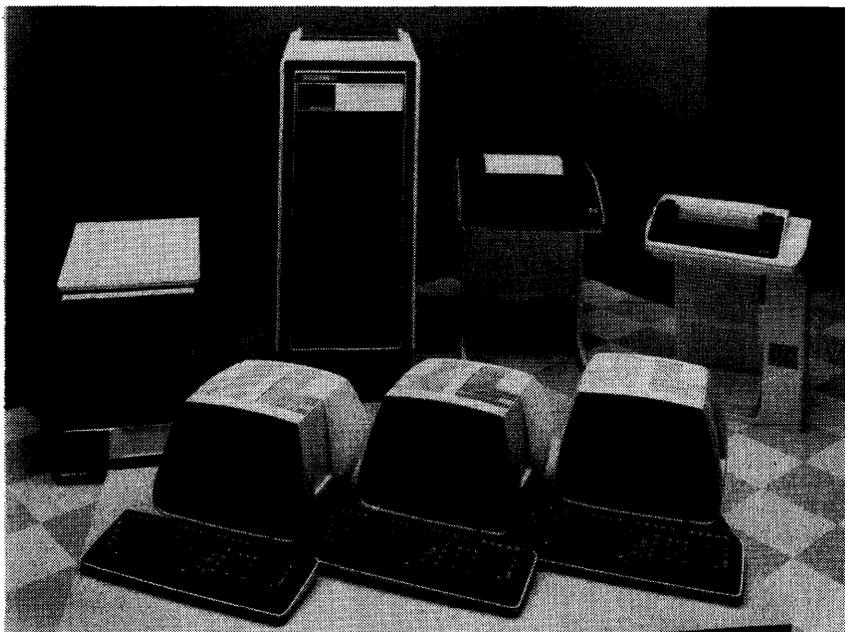
Data General's revamped Commercial Systems family includes the CS Series 100 (left), CS Series 200 (left center), and the CS/5 desktop computer (not pictured). The pictured systems support all existing Commercial Systems peripherals, and existing Business Basic and Interactive Cobol software applications are directly transportable to the new CS Series products.

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CS FAMILY CHARACTERISTICS

MODEL	CS/5	CS Series 100	CS Series 200-A	CS Series 200-B
Processor	microNova (Enterprise-based)	microEclipse (S/20-based)	microEclipse (S/120-based)	Eclipse (S/140-based)
Operating System(s)	MP/OS	RDOS	RDOS or AOS	RDOS or AOS
Maximum number of terminals	1	9*	13-under RDOS 6-under AOS	25-under RDOS 13-under AOS
Main memory capacity (bytes): Minimum Maximum	64K 64K	128K 512K	256K 512K	256K 1,024K
Hard disk storage capacity (bytes): Minimum Maximum	.7M 30M	5M 50M	15M 628M	15M 1,452M
Single media backup capacity (bytes): Minimum Maximum	.3M 27M	1.2M 27M	1.2M 27M	1.2M 27M
Printer speeds: Minimum Maximum	150 cps 150 cps	55 cps 300 lpm	55 cps 600 lpm	55 cps 600 lpm

*The maximum number of terminals is application-dependent.

▷ keyboard with a 14-key numeric pad. The CS/5's two input/output ports conform to RS-232-C standards, and may be used for a printer, for loading programs from other Data General processors via communications devices, or for other communications functions. Data rates are up to 19,200 baud.

Additional languages supported by MP/OS are MP/Fortran IV and MP/Pascal. Among the utility programs are the IBM-oriented MP/RJE80 and MP/3270 communications products. Applications developed under Business Basic and Interactive Cobol are transportable without rewriting, from the CS/5 through the CS Series 100 and 200, into the company's high-end 32-bit Eclipse MV family. Business Basic users may also run the Busitext word processing utility package.

The CS/5 system may be configured with an optional 150 cps dot matrix printer. Available disk storage subsystems include a 12.5-megabyte or 25-megabyte Winchester disk with an optional 1.26-megabyte diskette, or any combination of 5-megabyte or 15-megabyte disk drives. A maximum of two disk drives may be configured with the CS/5, offering up to 30 megabytes of storage. A 1600 bpi magnetic tape backup subsystem is also available.

The MP/OS operating system is available in either a run-time or developmental version. A run-time MP/OS system operates with run-time Business Basic or run-time Interactive Cobol, and provides file backup, diskette copy, and menu-editor utility programs.

A developmental system has a full MP/OS operating system with system generation capability, and runs both MP/OS Business Basic and MP/OS Interactive Cobol. ▷

▶ maintains sales offices in most major North American cities and in South America, Europe, and Australia. Manufacturing operations are located in Southboro, Massachusetts; Westbrook, Maine; Portsmouth, New Hampshire; Johnston Center, North Carolina; and Sunnyvale, California. Assembly operations are also performed in Hong Kong and in Thailand.

MODELS: CS/5, CS Series 100, and CS Series 200.

DATE ANNOUNCED: All models, May 1982.

DATE OF FIRST DELIVERY: CS/5 August 1982, CS Series 100 August 1982, CS Series 200 August 1982.

DATA FORMATS

BASIC UNIT: 16-bit word or 8-bit byte.

FIXED-POINT OPERANDS: 16-bit words can be interpreted as signed or unsigned binary numbers, logical words, memory addresses, or portions of decimal character strings.

Decimal numbers can be either character decimal or packed decimal. In character decimal format, each digit is an 8-bit ASCII character, and the sign is either carried separately as an extra character at the beginning or end of the decimal string or by modifying either the first or last digit in the string. The packed decimal format places each digit in 4-bit hexadecimal code with a separate sign character at one end of the string.

FLOATING-POINT OPERANDS: The microNova-based CS/5 features 32-bit single-precision operands with 7-bit exponent and signed 24-bit fraction, and 64-bit double-precision operands with a 7-bit exponent and signed 56-bit fraction. The CS/5 has single- and double-precision floating-point arithmetic implemented through software subroutines. No hardware floating-point arithmetic is available for the CS/5. The MicroEclipse-based CS Series 100 and 200 offer an optional high-speed hardware floating-point unit (FPU). ▶

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PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION
MAGNETIC TAPE EQUIPMENT	
6026	Transport and controller; industry-compatible, 9-track, NRZI, 10.5-inch reels, 800/1600 bpi, 8 drives per controller
6123/6125	Streaming tape drive; industry-compatible, 8.5-inch reels, 1600 bpi, streams at 30 ips off-line
PRINTERS	
4422	Dot matrix; 150 cps, 136 columns, 96-character set, upper and lower case, serial interface, multilingual type fonts are printer-resident and switch-selectable; for the CS/5, CS Series 100 and 200
6041	Dot matrix; 60 cps, 132 columns, 96-character set, upper and lower case, serial interface, optional multilingual fonts; for the CS Series 100 and 200 only
6156	Dot matrix; 80 cps, 80 columns, 96-character set, upper and lower case, G300 interface, graphics slave printer, no multilingual type fonts; for the CS Series 100 and 200 only
6193	Dot matrix; 180 cps, 132 columns, 96-character set, upper and lower case, serial interface, optional multilingual type fonts; for the CS Series 100 and 200 only
6190-P	Dot matrix; 180 cps, 132 columns, 96-character set, upper and lower case, programmed I/O interface (PIO), optional multilingual type fonts; for the CS Series 100 only
6191	Dot matrix; 180 cps, 132 columns, 96-character set, upper and lower case, programmed I/O interface (PIO), optional multilingual type fonts; for the CS Series 200 only
6192	Same as 6191 except with data channel interface (DCH); for the CS Series 200 only
4354	Dot matrix; 340 cps, 132 columns, 96-character set, upper and lower case, serial interface, multilingual type fonts; for the CS Series 100 and 200
4353-P	Same as 4354 except with programmed input/output interface (PIO); for the CS Series 100 only
4355	Same as 4354 except with programmed input/output interface (PIO); for the CS Series 200 only
4356	Same as 4354 except with data channel interface (DCH); for the CS Series 200 only
4324-P	Band; 230 lpm, 132 columns, 96-character set, upper and lower case, programmed input/output interface (PIO), optional multilingual type fonts; for the CS Series 100 only
4323-P	Band; 300 lpm, 132 columns, 96-character set, upper case only, programmed input/output interface (PIO), optional multilingual type fonts; for the CS Series 100 only
4326	Band; 230 lpm, 132 columns, 96-character set, upper and lower case, programmed input/output interface (PIO), optional multilingual type fonts; for the CS Series 200 only
4328	Same as 4326 except with data channel interface (DCH); for the CS Series 200 only
4325	Band; 300 lpm, 132 columns, 64-character set, upper case only, programmed input/output interface (PIO), optional multilingual type fonts; for the CS Series 200 only
4327	Same as 4325 except with data channel interface (DCH); for the CS Series 200 only
4363	Band; 436 lpm, 132 columns, 96-character set, upper and lower case, data channel interface (DCH), optional multilingual type fonts; for the CS Series 200 only
4364	Band; 600 lpm, 132 columns, 64-character set, upper and lower case, data channel interface (DCH), optional multilingual type fonts; for the CS Series 200 only
4320/4322	Letter quality; 55 cps, 132 columns, 96-character set, upper and lower case, serial interface, optional multilingual type fonts; for the CS Series 100 and 200
TERMINALS	
6106	Dasher D100 terminal; 7 x 11 dot matrix, 24 lines x 80 characters, 96-character set, upper and lower case, standard 20mA async and EIA interfaces, up to 9,600 bps for local connector, detached typewriter-style keyboard, 14 data entry keys, printer interface is not available; for the CS Series 100 and 200 only
6107	Same as the 6106 with the addition of a printer interface; for the CS Series 100 and 200 only
6108	Dasher D200 terminal, 7 x 11 dot matrix, 24 lines by 80 characters, 96-character set, upper and lower case, standard 20mA async and EIA interfaces, up to 9,600 bps for local connector, detached typewriter-style keyboard, 14 data entry keys, 15 dedicated function keys, and 12 edit keys, printer interface is not available; for the CS Series 100 and 200 only
6109	Same as 6108 with the addition of a printer interface; for the CS Series 100 and 200 only
6130	Dasher D400 text/graphics terminal; 7 x 11 dot matrix, 24 lines by 80 or 135 columns, 256-character set, upper and lower case, standard EIA RS-232-C or 20mA communications interface, printer port, multiple windows, math notation, word processing set, line drawing set, multilingual capability, does not include keyboard; for the CS Series 100 and 200 only
6134	Dasher D450; same as 6130, except 1,024 downline loadable user-defined characters; for the CS Series 100 and 200 only
6131	Keyboard for 6130/4
6150	Dasher G300 graphics display; 640 x 240 picture element (pixel) matrix, standard EIA RS-232 or 20mA communications interface, seven character sets included, does not include keyboard; for the CS Series 100 and 200 only
6151	Keyboard for 6150

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▷ Both the CS Series 100 and 200 are targeted to a variety of business management levels, with such applications as: order entry, inventory/warehouse control, distribution, financial management, and manufacturing/production control. Optional tabs for graphics, report generation, and word/text processing are available.

Designed for interactive processing, Data General's microEclipse-based CS Series 100 is offered with 128K bytes of MOS main memory, expandable to 512K bytes in 128K-byte increments. Up to 54.8M bytes of nonremovable Winchester disk storage is available in 5, 12.5, 15, and 25 megabyte disk sizes. The CS Series 100 uses the Real-Time Disk Operating System (RDOS) and supports up to nine Dasher display terminals, depending on the application. A choice of either Interactive Cobol or Business Basic languages is provided. Both languages are compatible with any other CS system of the same language type, or with any AOS- and AOS/VS-based system. Business Basic users may choose from the following software packages: Busipen graphics display, Busigen program and report generator, and Busitext for word processing. For communications, the RJE80 Remote Job Entry control program, the HASP II workstation emulator, and X.25 CCITT software are offered. Hardware options include a graphics display and printer which are offered for Business Basic Busipen users. A variety of printers are also available for the CS Series 100, including a 55 cps letter-quality printer and a 300 lpm model.

The CS Series 200 may be configured with either a microEclipse or an Eclipse processor. The microEclipse-based CS Series 200A has 256K bytes of MOS main memory expandable to 512K bytes, and runs under either the RDOS or AOS operating system. The Eclipse-based CS Series 200B is available with 256K bytes of main memory expandable to 1M bytes, and also offers either the RDOS or AOS operating system. The CS Series 200B will support as many as 25 Dasher display terminals, when running under RDOS. Up to 635 megabytes of nonremovable Winchester disk storage is supported, in increments of 12.5, 15, 25, 73, and 147 megabytes. In addition, large systems can add up to four 277-megabyte disk packs for a total disk storage of 1400 megabytes. Several printers are available, ranging in speed from 55 cps (letter-quality) to 600 lpm.

According to DG, the members of the CS family are aimed at the following competitive products:

CS/5	Datapoint 1550, DECmate, HP 125, IBM System/23;
CS Series 100	DEC Micro PDP-11, HP 250 Model 30, IBM Series /1 4954;
CS Series 200A (microEclipse-based)	DEC PDP-11/23 PLUS, IBM System/34, Wang VS 25;
CS Series 200B (Eclipse-based)	DEC PDP-11/24, PDP-11/44 IBM System/38, Wang VS 45. ▷

▶ The FPU is a single board which replaces the standard firmware floating-point, and consists of Schottky TTL bit slice microprocessors cascaded into a 28-bit ALU, with four 64-bit accumulators. Communication between the FPU and the CPU is handled directly over the high-speed memory bus, and is supported by dedicated hardware floating-point microinstructions in the CPU control store, as well as microcode resident in the floating-point unit itself. For the Eclipse-based CS Series 200, floating-point arithmetic is performed by either optional firmware or hardware. The floating-point capablity of the CS Series 200 includes 64-bit double-precision operations, four 64-bit accumulators, and a monitoring Status Register.

INSTRUCTIONS: One-word instructions. There are four basic instruction types; each with different formats: Jump and Modify Memory, Move Data, I/O and Arithmetic and Logic. In all instructions, bits 0-2 specify the instruction type.

In Jump and Modify instructions, bits 3 and 4 identify the specific function (op code), and the rest of the word contains information used to calculate the effective address, including an 8-bit displacement, 2-bit index register specification, and 1-bit indicator to specify direct or indirect addressing.

In Move Data instructions, bits 3 and 4 address an accumulator, and the rest of the word is identical in structure to the Jump and Modify type above.

In I/O instructions, bits 5 through 9 specify the function (indication of transfer direction, selection of an I/O device register, and/or specification of an operation). Bits 3 and 4 select an accumulator for transfer, and bits 10 through 15 indicate a specific device.

Arithmetic and Logic instructions are bits 1 and 2 to identify an accumulator containing a second operand (if present), bits 5 through 7 to specify primary function, and the rest of the word to specify secondary functions, if any.

For all memory reference instructions, bits 5 through 15 are used for addressing, using bits 8 through 15 as the displacement or direct address.

INTERNAL CODE: ASCII and binary.

MAIN STORAGE

TYPE: Dynamic MOS RAM, requiring 64 refresh cycles every 1.8 milliseconds. Refresh is overlapped with CPU execution.

CYCLE TIME: 960 nanoseconds for the CS/5, 500 nanoseconds for the CS Series 100 and 200.

CAPACITY: See the CS Family Characteristics chart on page M11-304-402.

CHECKING: None on the CS/5, but standard on the CS Series 100 and 200.

STORAGE PROTECTION: None on the CS/5, standard on the microEclipse-based CS Series 100 and CS Series 200, and optional on the Eclipse-based CS Series 200.

CENTRAL PROCESSOR

GENERAL: The CS/5 uses the microNova mN602 16-bit microprocessor which includes frame-oriented stack support and programmable 16-level interrupt capability on a single 40-pin circuit.

The CS Series 100 and one model of the CS Series 200 feature a microEclipse-based processor with 16-bit word length, four general purpose accumulators, and four ▶

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USER REACTION

Datapro received seven responses to the 1982 Computer Survey, from users of Data General's Commercial Systems. Respondents were reporting on nine systems installed for an average of two years and eight months. The CS/40, CS/50, and CS/60 described in this survey are no longer actively marketed, however, CS/50s may be upgraded to the current CS Series.

Of the nine systems, three users reported on the CS/40 with a Nova 3/D processor, three on the CS/50 with the Nova 4 processor, and three on the CS/60 with the Eclipse S/130 processor. CS/40 installations included from one to 15 local workstations, from one to five remote workstations, from 128K bytes to less than 1024K bytes of memory, and from 20M bytes to 200M bytes of disk storage. Configurations of the CS/50 contained from one to 15 local workstations, from zero to 15 remote workstations, from 256K to less than 512K bytes of memory, and from 20M bytes to less than 80M bytes of disk storage. CS/60 systems were configured with from one to 15 local workstations, from one to five remote workstations, from 256K bytes to less than 1024K bytes of memory, and from 20M bytes to 200M bytes of disk storage.

Types of businesses represented here were retail/wholesale, government, manufacturing, health care/medical, and facilities management. Most frequently used applications were accounting/billing, payroll/personnel, purchasing, and order processing/inventory control.

A table summarizing users' ratings follows:

	Excellent	Good	Fair	Poor	WA*
Ease of operation	5	2	0	0	3.7
Reliability of mainframe	6	1	0	0	3.9
Reliability of peripherals	3	2	1	0	3.3
Maintenance service:					
Responsiveness	4	2	0	1	3.3
Effectiveness	3	1	3	0	3.0
Technical support:					
Trouble-shooting	0	1	3	2	1.8
Education	0	1	3	2	1.8
Documentation	1	2	0	3	2.2
Manufacturer's software:					
Operating system	2	3	1	1	2.9
Compilers & Assemblers	2	5	0	0	3.3
Applications programs	1	1	0	1	2.7
Ease of programming	4	2	0	0	3.7
Ease of conversion	1	2	1	1	2.6
Overall satisfaction	1	5	0	1	2.9

*Weighted Average on a scale of 4.0 for Excellent.

As the table shows, evaluations were mixed, with weighted averages ranging from a low of 1.8 for trouble-shooting and education, to a high of 3.9 for reliability of mainframes.

On the positive side, these specific advantages of the CS Series were noted: the system is easy to expand/reconfigure (four respondents); users are happy with response ▷

▶ floating-point accumulators. The microEclipse hardware stack facility includes overflow protection, a stack pointer, a frame pointer, a stack fault address, and stack limit control. Microprograms control the processor's operation and implement its Eclipse instruction set. These microprograms are generated from both 35-bit horizontal and 18-bit vertical microinstructions. Vertical microinstructions have been coded to contain the address of a horizontal instruction and two microverbs indicating the source and the destination. These latter two fields can be selected and substituted for control fields in horizontal microinstructions (fields from certain instructions in the pipeline can also be selected and substituted). With this technique, a single horizontal microinstruction can be modified repeatedly to produce a number of different results, making it possible to create very sophisticated instructions from highly efficient microinstruction primitives.

The microEclipse CPU contains four 16-bit wide internal buses so that data can be written, read, and transferred to a variety of internal components concurrently. The A and B buses transfer operands to the ALU and shifter. The C bus writes data into the registers either from the ALU and shifter, or from outside the chip. The M bus is used to transfer addresses directly from the register file or the program counter to the external system bus.

The CS Series 200, with the Eclipse processor, consists of microprogrammed architecture with an asynchronous memory bus for combining storage types and communications/peripheral interfaces. Interfaces are contained on one or more individual boards which plug into the processor's chassis.

CONTROL STORAGE: None for the CS/5. The microEclipse-based CS Series 100 and CS Series 200 include the basic Eclipse microprograms and the kernel of the Eclipse instruction set, which are resident on the CPU chip (64 horizontal microinstructions and 288 vertical instructions). In addition, the control store is extended by three high speed external microcontroller (XMC) firmware chips, each of which contains 1,024 additional vertical microinstructions. These are transmitted to the CPU for modifications over a dedicated bus. The microprogrammed (Eclipse-based) CS Series 200 uses microinstructions automatically accessed from control storage. The read-only memory (ROM) consists of 2K 56-bit words with an access time of 200 nanoseconds.

REGISTERS: All CS processors have four 16-bit accumulators and a 15-bit program counter. Two accumulators can be used for address indexing. The CS computers also have a last-in/first-out (LIFO) push-down stack implemented in any 256 consecutive memory locations and two additional hardware registers, the stack pointer and the frame pointer. The stack pointer identifies the first memory location designated as the stack, and the frame pointer marks intra-stack boundaries to permit several "register saves" to be accumulated in the stack.

ADDRESSING MODES: All CS processors have six addressing modes: direct (256 words), indirect (multi-level), indexed, indexed-indirect (pre-indexing), program-relative, and program relative-indirect.

When memory mapping is implemented, the 15-bit logical address coming from the CPU or data channel is translated to a 20-bit physical address. Memory access cycle time is unchanged.

The mapping information needed to service a CPU or data channel request is given to the address translation hardware by the operating system through I/O instructions that reference the address translation hardware. This information is transmitted before the supervisor enables either the user map or the data channel map. ▶

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time (three respondents); programs/data carried over from other systems are compatible—as the vendor promised (two respondents); productivity aids keep programming costs down (two respondents); and terminals/peripherals carried over from other systems are compatible (one respondent).

On the opposite side, three users described these disadvantages: the equipment is noisy; the installation of the equipment was late; delivery of the required software was late; the computer proposed by the vendor was too small; hardware/software costs exceeded the expected total; the vendor did not provide all of the promised software or support; and the programs/data are not compatible. One user added the following comment in large block letters, "SLOW." However, when asked if they would recommend their CS systems to other users, six users replied, "yes" and only one user replied, "no."□

All addresses can be mapped, including those acquired from DMA controllers.

INSTRUCTION REPERTOIRE: The CS processors have the basic complement of 4 Jump and Modify Memory instructions, 2 Move Data instructions, 7-stack processing instructions, 16 I/O instructions, and 8 arithmetic and logic instructions. (There are 256 variations on each of the arithmetic and logic instructions.) Hardware multiply/divide instructions are standard. The processors' complement of instructions includes: Arithmetic (30); Logical (15); Byte Manipulation (4); Bit Manipulation (7); Data Movement (2); Stack Manipulation (10); Program Flow Alteration (12); I/O (8); CPU (8); ERCC (3); Real-Time Clock (1); and Power Fail/Auto Restart (2).

INTERRUPTS: A 16-level programmed priority interrupt facility is used to recognize interrupts for I/O operations. Each device on the systems is wired to one of 16 bus positions, and is either authorized or denied authorization to interrupt particular service routines by an Interrupt Disable Mask Bit that corresponds to the bus positions of the device. An interrupt-handling instruction, Vector, provides servicing through device identification and vectoring to a device handler or through device identification, saving the machine state, switching stacks, and priority updating. The interrupt facility is implemented in hardware.

PHYSICAL SPECIFICATIONS:

	Height (inches)	Width (inches)	Depth (inches)	Weight (pounds)
CS/5	11⅝	21⅛	20	32.5
CS Series 100 (microEclipse CPU)	5.25	19.0	17.23	N/A
CS Series 200 (microEclipse CPU)	5.25	19.0	26.14	40 to 50
CS Series 200 (Eclipse (CPU)	10.48	19.0	26.14	78 to 110

Power requirements are 120 volts (+10%, -15%), 60 Hz for the CS/5, and 240/120 volts, 60 Hz for the CS Series 100 and 200. Recommended temperature for the CS/5 ranges between 50 and 100 degrees F., and for the CS Series 100 and 200—from 40 to 90 degrees F. Suggested operating humidity for the CS/5 is from 20% to 80%, non-condensing and for the CS Series 100 and 200—from 40% to 80% non-condensing.

INPUT/OUTPUT CONTROL

INPUT/OUTPUT CHANNELS: An I/O bus and a Direct Memory Access (DMA) channel are standard on all CS

processors. The I/O bus is serial in nature, and it functions to provide communication between mainframe-based I/O boards and the CPU board. The DMA data channel provides a multiplexer-like capability, and can be seized by any device through a data channel request to handle 16-bit data transfers to and from main memory. DMA is used for disk and magnetic tape I/O, as well as for high-speed terminals. The channel transmission rates range from 148,000 to 1.25 million words per second for input, and from 173,000 to 714,285 words per second for output.

The CS/5 has separate memory and I/O buses; an I/O bus is available for external use.

The microEclipse-based CS Series 100 and 200 have separate memory and I/O buses. The CS Series 100 I/O bus, with microNova compatibility, has 300K bytes per second maximum input/output speeds and a maximum data channel latency of six microseconds. Maximum interrupt latency is 110 microseconds with 16-level priority interrupts. The CS Series 200 maximum input speed is 2.0M bytes per second, and 1.3M bytes per second output speed. Data channel latency is three microseconds, maximum interrupt latency is 110 microseconds, and 64 I/O device codes are recognized.

The Eclipse-based CS Series 200 uses programmed I/O for low-speed I/O devices, while the I/O bus and high-speed direct memory access (DMA) channel that is standard on all Eclipse systems is used for disk and magnetic tape I/O.

SIMULTANEOUS OPERATIONS: DMA input/output operations are overlapped with processing through cycle stealing so as to be concurrent on all systems.

CONFIGURATION RULES

See the CS Family Characteristics table on page M11-304-402 for configuring workstations, disk storage, and available printers.

MAGNETIC TAPE: The CS/5 and CS Series 100 support an optional 1600 bpi streaming tape drive for system/data file backup to Winchester disk storage; the CS Series 200 offers an 800/1600 magnetic tape drive or 1600 bpi streaming tape drive for system/data file backup.

PRINTERS: The CS/5 may be configured with a maximum of one printer; the CS/5 supports only the 4422 model, 150 cps dot matrix printer.

A maximum of one parallel interface printer, with programmed I/O (PIO), is configurable on a CS Series 100 system. A maximum of two parallel interface printers, with data channel (DCH) or programmed I/O (PIO), are configurable on a Series 200 system.

Serial interface printers (SER) are connected to CS Series 100 or 200 systems, either directly or indirectly, using one asynchronous communications line. Indirect connections include attachment to a modem (remote) and/or display (local or remote). The number of serial interface printers configurable on a system is limited to the number of asynchronous communication lines available.

MASS STORAGE

6220 FIXED-DISK SERIES SUBSYSTEM: The 6220/5 provide five million bytes, while the 6222/7 offer fifteen million bytes of storage. The 6220 series are desktop or rack-mountable subsystems which include the disk drive, a controller with diagnostic logic, a power supply, and cable. An optional 1.26-megabyte diskette is available for backup ▶

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▶ purposes. In addition, rack-mounted versions offer 1600 bpi tape backup. The 6220 and 6222 are available for the CS/5 and CS Series 100 only. The 6225 and 6227 are offered for the CS Series 200 only.

6101, 6102 DISK SUBSYSTEMS: The 6101 offers 12.5 million bytes of non-removable disk storage with an additional diskette drive including 1.26 million bytes of storage. The 6102 is the same as the 6101, except the diskette drive is not included. Available for the entire CS family.

6104, 6105 DISK SUBSYSTEMS: The 6104 offers 25 million bytes of non-removable disk storage with an additional diskette drive including 1.26 million bytes of storage. The 6105 is the same as the 6104, except the diskette drive is not included. Available for the entire CS family.

6038, 6039 DISKETTE SYSTEMS: The 6038 supports a 315K-byte diskette medium with controller. The 6039 is a dual diskette subsystem containing two side-by-side 315K-byte drive units, controlled by a single integral controller. Available for the CS Series 100 only.

6095-N CARTRIDGE DISK SUBSYSTEM: Consists of one cartridge disk drive with five million bytes of removable and five million bytes of fixed storage. An integrated controller, associated cables, and one removable disk cartridge are also included. Available for the CS Series 100 only.

6096-A/-B/-C DISKETTE SUBSYSTEMS: The 6096-A consists of a single diskette drive with 1.26 million bytes of storage. Also included are a controller, chassis with power supply, and cable set. The 6096-B is a dual diskette version of the 6096-A, offering 1.26 million bytes of storage per drive; the controller is included. The 6096-C is a single diskette drive for adding an additional 1.26 million bytes of storage to disk drive subsystems of 12.5 or 25 million bytes. Available for the CS Series 100 and 200 only.

6030 DUAL DISKETTE SUBSYSTEM: Includes two diskette drives with 315K bytes per drive, a controller for up to four drives, a chassis with power supply, and cable set. Available for the CS Series 200 only.

6031 SINGLE DISKETTE SUBSYSTEM: Includes a single diskette drive with 315K bytes of storage, a controller for up to four drives, a chassis with power supply, and cable set. Available for the CS Series 200 only.

6045 FIXED/REMOVABLE DISK SUBSYSTEM: Supports 10 million bytes of fixed/removable disk storage. The 6045 also includes a controller and one disk cartridge which stores five million bytes. Available for the CS Series 200 only.

6050/-F ADD-ON CARTRIDGE DISK DRIVES: The 6050 consists of 10 million bytes of cartridge disk storage to add to an existing disk drive subsystem; also includes a power supply and one removable disk cartridge. The 6050-F is a 10-million byte add-on drive for a diskette subsystem. These drives are available for the CS Series 200 only.

6060/-A DISK SUBSYSTEMS: The 6060 includes a disk drive with 96 million bytes of storage, a disk pack, controller, and adapter for up to four drives. The 6060-A offers the same storage as the 6060, allowing second, third, and fourth drives to be added. Available for the CS Series 200 only.

6067/-A PACK DISK SUBSYSTEM: The 6067 supports 50 million bytes of pack disk storage including a controller and an adapter for up to four drives, cables, and four disk packs (1143B). The 6067-A allows for the addition of a second, third, and fourth drive, and includes a 50-million byte disk drive, cables, and a disk pack (1143A). The adapter to the 6067-A's drive cable is 30 feet long. Available only for the CS Series 200.

6070/-A FIXED/REMOVABLE DISK SUBSYSTEM: The 6070 supports 20 million bytes of fixed/removable disk storage. The 6070 also includes one cartridge disk drive with 10 million bytes of removable and 10 million bytes of fixed disk storage, a controller for four drives, associated cables, and six removable disk cartridges. The 6070-A is a 20-million byte add-on cartridge disk drive which includes the power supply, one removable disk cartridge, and cables. Available for the CS Series 200 only.

6097-A/-B DISKETTE SUBSYSTEMS: The 6097-A provides a single diskette drive with 1.26 million bytes of storage. The 6097-A also includes a controller that handles diskette and/or 12.5- or 25-million byte disk drives, as well as a chassis with power supply. The 6097-B is a dual diskette version of the 6097-A, offering 1.26 million bytes of storage per drive. Available for the CS Series 200 only.

6122/-A DISK SUBSYSTEMS: The 6122 includes a disk drive with 277 million bytes of storage, a high speed channel controller, an adapter for up to four drives, cables, and a disk pack. The 6122-A offers the same storage as the 6122, allowing second, third, and fourth drives to be added. Available for the CS Series 200 only.

6100, 6103, 6098, and 6099 DISK/DISKETTE SUBSYSTEMS: Data General's 6100 disk series consists of integrated disk/diskette Winchester-type subsystems. The four models include a 12.5- or 25-megabyte fixed disk, either with or without a 1.26-megabyte diskette as a file transfer and backup medium. The 6100 and 6103 models include 25-megabyte disk drives while the 6098 and 6099 models include 12.5-megabyte units. Models 6100 and 6098 also contain the 1.26-megabyte diskettes. The units are stepper meter driven and are controlled by a microprocessor.

There are 384 tracks per surface in the 25-megabyte disks, with each of the four surfaces divided into two 192-track bands of 512-byte sectors. A separate read/write head accesses each band. Each 8-track cylinder has 131,072 bytes in 256 sectors.

The 12.5-megabyte disks are formatted the same way except that there are four tracks per cylinder.

The data transfer rate for both units varies with different system configurations.

The diskette has 77 tracks per side formatted into 16 sectors of 512 bytes. Average head-positioning time is 100 milliseconds, including settling time. Rotational delay is 83.3 milliseconds at 360 rpm. The data transfer rate is 62.5K bytes per second. Available for the CS Series 200 only.

6160/-A FIXED-DISK SUBSYSTEM: Provides 73 million bytes of disk storage (6160) and a single-board controller to add an additional drive (6160/-A) with 73 million more bytes of mass storage. Each sector contains 512 bytes, with 35 sectors per track, 823 tracks per surface, and five surfaces.

Average rotational delay is 8.33 milliseconds and the data transfer rate is 1.209M bytes per second. The pack requires 30 seconds to come up to speed initially.

The single-board controller in the 6160 interfaces to either a computer's standard data channel or, if available, to its high-speed burst multiplexer channel.

The 6160/-A disk subsystem is supported by both the Advanced Operating System (AOS) and the Real-Time Disk Operating System (RDOS). Available for the CS Series 200 only. ▶

Data General Commercial Systems Family

▶ **6161/-A FIXED-DISK SUBSYSTEM:** Provides 147 million bytes of disk storage (6161) and a single-board controller to add an additional drive (6161/-A) with 147 million more bytes of mass storage. Each sector contains 512 bytes, with 35 sectors per track, 823 tracks per surface, and 10 surfaces.

Average rotational delay is 8.33 milliseconds and the data transfer rate is 1.209M bytes per second. The pack requires 30 seconds to come up to speed initially.

The single-board controller in the 6161 interfaces to either a computer's standard data channel or, if available, to its high-speed burst multiplexer channel.

The 6161/-A disk subsystem is supported by both the Advanced Operating System (AOS) and the Real-Time Disk Operating System (RDOS). Available for the CS Series 200 only.

INPUT/OUTPUT UNITS

See the Peripherals/Terminals table.

COMMUNICATIONS CONTROL

The Data General Communications Subsystem (DG/CS) is a hardware and software system that is modular in nature. It is composed of the ALM-16 and ALM-8 Series asynchronous multiplexers, the SLM-2 Series synchronous multiplexers, the ULM asynchronous and synchronous multiplexer, the 4251 Communications Chassis, and the DCU Data Control Unit. The CAM Communications Access Manager provides software support for teletypewriter terminals and Bisync line protocol.

Low-performance systems can utilize the ULM installed in the main chassis. Medium-performance applications use the ACM and SLM multiplexers in the 4251 chassis, which is connected directly to the host computer I/O bus. For high-performance applications, the DCU is inserted as a "peripheral processor" between the host CPU and the communications subsystem.

The DG/CS supports both full- and half-duplex operation. Line interface support is provided for EIA RS-232-C/CCITT V.24, 20-mA current loop, and 23-mA current loop.

The communications subsystem is supported by the AOS and RDOS operating systems. Other software support includes RJE80, Data General's HASP Workstation Emulator, DCU-resident physical I/O routines, and the aforementioned CAM.

4255/4256 ALM-8 ASYNCHRONOUS LINE MULTI-PLEXER: Offers a line speed of 5 to 9600 bps on a program-selectable basis. The 4255 offers eight lines, while the 4256 offers four. Full-character buffering is standard. Line operation may be full- or half-duplex. Full modem control, including automatic answer capabilities for Bell 103, 202, or equivalent data sets, is standard. Modem control signals include carrier detect, ring indicator, data set ready, request to send, data terminal ready, and clear to send.

Programmable line characteristics include parity type (odd, even, or none); 5-, 6-, 7-, or 8-bit code level; 1 or 2 stop bits; and the aforementioned line speed. Diagnostics and error detection on an off-line basis are standard. Up to 128 asynchronous lines can be supported with a DCU and a 4255. The EIA RS-232-C/CCITT V.24 interface is standard. The 4255/4256 are available for the CS/5 only.

4257/4258 ALM-16 ASYNCHRONOUS LINE MULTI-PLEXER: Provides a line speed of 5 to 9600 bps on a program-selectable basis. The 4257 handles 16 lines, while the 4258 handles 8. Full-character buffering is standard. Line operation may be full- or half-duplex. Programmable line characteristics include parity type (odd, even, or none); 5-, 6-, 7-, or 8-bit code level; 1 or 2 stop bits; and the aforementioned line speed. Diagnostics and error detection on an off-line basis are standard. Up to 256 asynchronous lines can be supported with a DCU and any combination of the 4257 or 4258. Interfacing is by the 4260 4-line, 20-mA current loop module or the 4261 4-line, EIA RS-232-C/CCITT V.24 module. Both modules can be intermixed on the same ALM-16 board. Interfacing is also available to a Bell 103 data set for manual answer-only operations. The 4257/4258 are available for the CS/5 only.

4241/4242/4243 ULM UNIVERSAL LINE MULTI-PLEXER: The 4241 controls four asynchronous lines with the same characteristics as those controlled by the ALM series. The 4242 controls one synchronous line with the characteristics of those controlled by the SLM multiplexer. The 4243 combines the 4241 and 4242. These ULMs are offered for the CS Series 100 and 200 only.

MODEL 4226-P SINGLE LINE SYNCHRONOUS SUBSYSTEM WITH CRC: Interfaces to medium-speed (9600 bps) synchronous/bisynchronous communications lines, and provides a full- and half-duplex EIA RS-232-C/CCITT V.24 interface and full character buffering on reception and transmission. When coupled with the CRC generator, the synchronous line controller can select either of two standard check polynomials, CRC16 or CCITT16. Both idle and sync characters, as well as character size, parity, and loopback testing, are program-selectable. In receive mode, Model 4226 automatically synchronizes data and then strips out the sync character. Standard modem control is supplied for Bell 201, 203, 208, and 209 Series data sets. This synchronous controller also supports IBM Bisynch protocols with full transparency and is program code compatible with the SLM-2 Series synchronous multiplexer used on Data General Nova and Eclipse processors.

Up to four Model 4226 controllers can be configured with a single microNova minicomputer, allowing it to control a maximum of four synchronous lines. Only one CRC generator board is needed per system. Model 4227-P is a prerequisite for the 4226-P. The 4226-P is available for the CS Series 100 only.

4207-S ASYNCHRONOUS INTERFACE BOARD: The 4207-S is a single-line interface board for asynchronous terminals, which performs character assembly/disassembly and provides program interrupt on completion. The 4207-S includes jumper-selectable device code for up to 30 devices, full/half-duplex operation, transmit and receive speeds of 110, 150, 300, 600, 1200, 2400, 4800, 9600, or 19,200 baud. Also included are EIA or 20-mA current loop operation, variable character length and stop bit combinations (5-bit character with 1½ stop bits, or 6-, 7-, or 8-bit character with 1 or 2 stop bits), and even, odd, or no parity. Other features of the 4207-S are modem control for program control over carrier detect, data terminal ready, dataset ready, and ring indicator functions. The 4207-S is offered for the CS Series 100 only.

4227-S ALM-4 PROGRAMMABLE ASYNCHRONOUS LINE MULTIPLEXER: The 4227-S is a four-line programmable asynchronous line multiplexer with full- or half-duplex EIA RS-232-C, CCITT V.24 or 20-mA current loop compatibility. The 4227-P has full modem control and supports Bell 103, 202 or equivalent data sets. Full character buffering and programmable line characteristics with speeds up to 19,200 bps are also provided. The 4227-S is offered for the CS Series 100 only. ▶

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► **4254 DCU/200 DATA CONTROL UNIT:** The 4254 provides a high performance data channel synchronous interface to any Data General Computer. The 4254 performs all character oriented tasks associated with the line multiplexers. Local memory contains 4,096 words. The 4254 uses the 4251 communications chassis, and is offered with AOS-based CS Series 200s for the Xodiac character or bit synchronous communication line.

4346 PROGRAMMABLE SYNCHRONOUS INTER-FACE (CSI): The 4346 is the one-line version of the programmable synchronous multiplexer. Offered with AOS-based CS Series 200s for the Xodiac character communication line.

4340 AMI-8 ASYNCHRONOUS MODEM INTERFACE: The 4340 provides full duplex operation and full modem control for eight lines. The 4340 also supports Bell 103, 202, or equivalent data sets, offers programmable line characteristics speed selection up to 19,200 bps, full character buffering, and compatibility to EIA-RS-232-C and CCITT V.24. The 4340 is available for the CS Series 200 only.

4342-PCA ATI-16 ASYNCHRONOUS TERMINAL INTERFACE: The 4342-PCA handles 16 lines, either local or dedicated, with full duplex operation, providing programmable line characteristics, speed select up to 19,200 bps, and full character buffering. Offered for the CS Series 200 only.

4348 BSI-1 BIT SYNCHRONOUS INTERFACE: The 4348 is offered with AOS-based CS Series 200s for the Xodiac bit synchronous communication line.

4078-P ASYNCHRONOUS SINGLE-LINE CONTROL-LER: Provides a full-duplex interface for a single Teletype Model 37ASR or 37KSR; 6012 CRT display; or Bell System 103, or equivalent, with manual answer. Standard rate is 150 bps for 10- or 11-unit codes. Other rates are optionally available. The 4029 option adds modem control features for Bell System 202 units with Automatic Answer. Offered for the CS Series 200 only.

COMMUNICATIONS SOFTWARE

XODIAC NETWORK MANAGEMENT SYSTEM: Provides network management for systems operating under AOS. It enables users to transparently:

● Access remote terminals as virtual consoles;

● Access remote systems devices and AOS files;

● Transfer files between AOS systems; and

● Communicate with and control processes on remote systems.

It transmits either directly through communications links or inter-computer links, or indirectly through public packet-switched networks. It is based on the X.25 packet switching protocol. For more information about Xodiac, see the Data General Eclipse report, M11-304-201.

REMOTE JOB ENTRY CONTROL PROGRAM (RJE80): Allows for remote job entry and communications between CS Series 100 or 200 processors and IBM 360/370 systems, or between CS Series 100 or 200 processors and other Data General computers. Support is provided for four types of RJE systems:

● Point-to-point communications between a CS system emulating an IBM 2780/3780 and an IBM 360/370 host.

● Point-to-point communications between two Data General systems running RJE80.

● Multi-drop Data General systems emulating IBM 3780 slave terminals, communicating with an IBM 360/370 host.

● Multi-drop Data General Systems emulating IBM 3780 slave terminals, communicating with a Nova or Eclipse master system also running RJE80.

Features of RJE80 include horizontal and vertical printer format control; error detection on transmission and reception; and disk, tape, or card transmission to remote systems. Transmission between host systems may be to unattended RJE80 systems, and because of device-dependent I/O capabilities, any combination of I/O devices can be utilized without additional software.

MP/RJE80 lets CS/5 processors emulate 2780/3780 remote-job-entry workstations in three types of communications networks:

● Point-to-point with any Data General computer running RJE software under the MP/OS, DOS, RTOS, RDOS, ICOS, AOS, or 32-bit AOS/VS operating systems,

● Point-to-point with any other computer also emulating 2780/3780,

● As multi-drop slave stations on dedicated lines to any master RJE80 emulator.

MP/3270 software for the CS/5 emulates an IBM 3271 cluster controller and an IBM 3277 display. The MP/3270 communications utility lets a CS/5 local communications cluster link with an IBM 360/370/303X computer at speeds up to 4800 baud, using standard binary synchronous protocol.

IBM HASP-II WORKSTATION EMULATOR: Lets a CS Series 100 or CS Series 200 emulate an IBM HASP workstation (IBM 360-20), working in conjunction with an IBM 360/370. Other features, of the HASP II workstation emulator program, collect and block data records for transmissions to remote computer systems or terminal systems. Efficiency of data transmission is achieved by interleaving and data compression. Multileaving capability can include up to seven input and seven output data streams. Efficiency of data transmission is achieved by interleaving, and data compression. The emulator supports both disk and tape storage. Hardware requirements include a card reader or magnetic tape drive, line printer, and a real-time clock.

X.25 SOFTWARE PACKAGE: Lets host computers interface to packet-switching networks, supporting point-to-point communications between the CS Series 100 or 200 and other Data General computers. The X.25 package is supported under both the RDOS and AOS operating systems.

SOFTWARE

OPERATING SYSTEMS: Three operating systems are offered with the CS Series family: MP/OS (for the CS/5), RDOS (for the CS Series 100 and 200), and AOS (for the CS Series 100 and 200).

MP/OS: CS/5 operations are controlled by a run-time or development MP/OS operating system. MP/OS can execute application programs written in high-level languages developed on microNova, CS, Nova, or Eclipse computers. Application programs can be transferred from the development processor to the CS/5, and released in a run-time version. The CS/5 can also be used to develop programs in MP/OS Business Basic or MP/OS Interactive Cobol. (MP/OS Interactive Cobol requires a minimum of 5 ► megabytes of disk storage).