# DEC Datasystem 350

## MANAGEMENT SUMMARY

The Datasystem 350 is the latest in a line of DEC minicomputer systems directed specifically toward commercial data processing users. The line had its origins in early 1972 with the introduction of the first model of the Datasystem 500, which was based on the 16-bit PDP-11 processor, then just about a year old. In mid-1972, DEC introduced the Datasystem 340, based on the company's mainstay, the 12-bit PDP-8 processor. A new Datasystem, the 310, was announced in early 1975, based on the PDP-8/A microprocessor, and the Datasystem 500 was kept fresh with continual new enhancements and models. But all of the Datasystem 500's were based on the high end of the PDP-11 line. There is a large capability gap between the Datasystem 340 and 500 systems.

The Datasystem 350, announced on July 15, 1975, neatly fills the gap between the two, with three models based on the low (but not lowest) and middle models of the PDP-11 family.

In equipment configuration, the Datasystem 350 partially overlaps the low end of the Datasystem 500 product line, but the differences in software capabilities prevent the two lines from competing with each other.

The DS350 line effectively provides a growth path for DS340 users who have expanded beyond the capabilities of that system. Although no hardware compatibility exists, language compatibility (through DIBOL) does, and programs developed for the DS340 can be recompiled, with changes, for use with the DS350.

All of the three DS350 models use a disk-based operating system, COS 350, which is built on the PDP-11 RT-11 ▷

The Datasystem 350 is a disk-based family of packaged systems that effectively completes a series of packaged product lines ranging from tiny to substantial. Without competing with any of DEC's other products (except customer-assembled systems), the Datasystem 350 spans a broad range of computing power with PDP-11/10 or 11/40 processors and diskette, cartridge, or disk pack storage.

## CHARACTERISTICS

MANUFACTURER: Digital Equipment Corporation, Business Products Group, 146 Main Street, Maynard, Massachusetts 01754. Telephone (617) 897-5111.

VENDORS: Manufacturer and OEM suppliers. Contact DEC's Business Products Group to find the OEM supplier in your locale.

MODELS: DEC Datasystem 352, 354, and 356, based on the DEC PDP-11/10 or PDP-11/40 processor.

### DATA FORMATS

BASIC UNIT: 16-bit word. Programmers see only 8-bit ASCII for numeric and alphabetic data.

FIXED-POINT OPERANDS: Programmers see only DIBOL-specified operands of up to 18 digits. Manual scaling is required, but DEC offers subroutines to simplify this task.

FLOATING-POINT OPERANDS: None.

INSTRUCTIONS: The programmer sees the system in terms of the DIBOL language syntax, which is a COBOL-like programming language. The internal arrange- ▶

*The DS356 system shown is the most powerful basic member of the Datasystem 350 family because of the twin 20-megabyte disk pack drives included as standard equipment. Other models use diskette drives and cartridge drives to provide more modest and less expensive system capabilities. Each model can be expanded beyond the basic disk facilities. This configuration also includes two VT50H DECscope CRT workstations, a 30-cps printer, and a 300-lpm printer. In the processor cabinet in the background, a diskette drive can be seen; this is used for software distribution and diagnostics.*
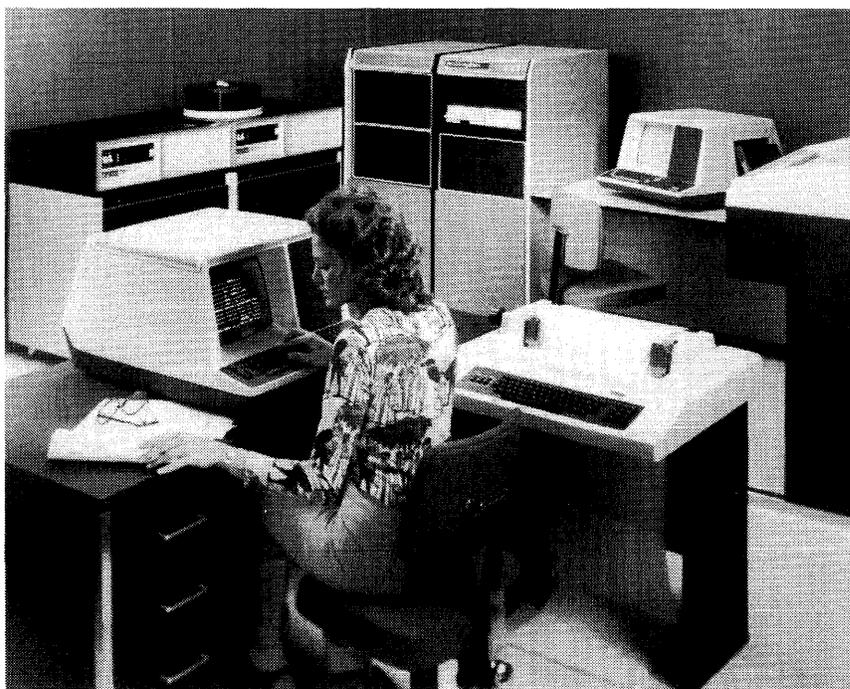
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system. In the smallest model, the DS352, disk storage is implemented as two or four diskette drives providing a storage capacity of 512K to 1024K bytes. The middle model, the DS354, utilizes from two to eight disk cartridge drives to provide a storage capacity of from 4.8 to 19.2 million bytes. The largest model, the DS356, uses from two to eight disk pack drives to provide a storage capacity of from 40 to 160 million bytes.

The PDP-11/10 processor forms the base for all three systems, with the PDP-11/40 available as an alternative choice for the DS354 and DS356. Main memory is 32K, 48K (except in PDP-11/40 based systems), or 64K bytes. As is normal with the PDP-11 architecture, the upper 8K-byte area is unavailable for program space because it is dedicated to I/O functions, a trade-off considered worthwhile by most users.

The DS352 is normally a single-user system. The DS354 and 356 can have up to four users simultaneously executing independent programs. In the multi-user environment, programs not requiring operator interaction can be detached and run, with the terminals then free to initiate new programs. The only programming language supported in any configuration is DIBOL-11, a superset of the business language first devised for the PDP-8 in the 1960's. Existing programs written in PDP-8 DIBOL can be compiled and executed on the DS350 with a few changes.

All executing programs are resident in memory simultaneously, with dynamic rearrangement of memory as programs are completed and new ones initiated. The limitation on memory size is eased through a flexible overlay facility. Program development and utility programs run only in a single-user mode. Only DIBOL user programs and sorts can run in the multi-user mode.

To see exactly where the DS350 family fits in, examine the following thumbnail sketches of the four DEC Datasystem product lines.

- Datasystem 310—Single user; based on PDP-8/A; supports DIBOL language.

- Datasystem 340—Single processing user with up to six additional inquiry users; based on PDP-8/E; supports DIBOL language.

- Datasystem 350—Up to four concurrent users plus additional detached tasks; based on PDP-11/10 or 11/40; supports DIBOL language.

- Datasystem 500—Up to 32 concurrent users plus additional detached tasks; based on PDP-11/40, 11/45, or 11/70; supports BASIC, COBOL, RPG, FORTRAN IV, MUMPS (data base oriented processing), and assembly languages.

The gap between the DS340 and the DS500 is most evident, meaning that the DS340 user formerly had no easy expansion step within the DEC umbrella beyond buying PDP-11 components and software and building his own system. Going from the packaged-system concept into the system-building business can be traumatic. The DS350 eases that trauma by providing a comfortable growth step.

ment of the system is the PDP-11 instruction set and architecture.

INTERNAL CODE: ASCII.

## MAIN STORAGE

TYPE: Magnetic core.

CYCLE TIME: 0.98 microsecond per 16-bit word.

CAPACITY: 32,768, 49,152, or 65,536 bytes for PDP-11/10 based systems; 32K or 65K bytes for PDP-11/40 based systems. The upper limit is usually specified as 56K bytes to reflect use of the high-order 8K bytes for I/O registers.

CHECKING: Byte parity, on PDP-11/40 based systems only.

STORAGE PROTECTION: None.

RESERVED STORAGE: High-order 8K bytes of memory are reserved for I/O registers.

## CENTRAL PROCESSOR

Please refer to Report M11-384-301 for a discussion of the PDP-11 processor architecture and instruction set. The Datasystem 352 is based on the PDP-11/10; the 354 and 356 can be based on either the PDP-11/10 or PDP-11/40. The PDP-11/40 is about two to four times faster internally, but not all of this difference will be observed in instructions requiring memory referencing, because the same 0.98-microsecond memory is used for both models. The DEC Datasystem 350 programmer will not, in general, get involved with the internal workings of the processor. The programmer's interface with the system is through the high-level DIBOL language.

## INPUT/OUTPUT CONTROL

See Report M11-384-301 for a discussion of the Unibus, the I/O architecture common to both the PDP-11/10 and PDP-11/40.

Configuration rules for PDP-11 systems are primarily a function of physical space and hardware for attaching modules. In DEC's terminology, these rules are resolved into system units (SU) and small peripheral controller (SPC) slots. One system unit provides space for mounting four SPC's. Each of the five basic Datasystem 350 configurations includes 32K bytes of memory, one terminal interface, and dual diskette, cartridge, or disk pack drives. Available space for expansion within the cabinets included in the basic configuration is tabulated below:

|  | System Units | SPC |
| --- | --- | --- |
| DS352 (PDP-11/10) | 3 | 1 |
| DS354 (PDP-11/10) | 2 | 2 |
| DS354 (PDP-11/40) | 3 | 3 |
| DS356 (PDP-11/10) | 3 | 1 |
| DS356 (PDP-11/40) | 4 | 2 |

PDP-11/10 based systems can include expanded memory at the expense of one SU for the 16KB module and two SU's for the 32KB module. A special factory option provides memory expansion at a lower cost if included when ordered, and at the cost of two SU's for the 16KB module and three SU's for the 32KB module. Memory expansion for PDP-11/40 based systems does not require any SU's.

Disk capability can be expanded to the configuration limits of four floppies (DS352), eight cartridge drives (DS354), or eight disk pack drives (DS356) without expanding any SU or SPC spaces. Each terminal after the first, each card reader, and each printer require one SPC. The 2780 communications option requires two SPC slots, one for the basic interface and one for the CRC/LRC error-checking arithmetic module. Nine-track, 800-bpi tape drives can be added without using an SU or SPC space; however, the

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## PERIPHERALS/TERMINALS

| DEVICE | DESCRIPTION & SPEED | MANUFACTURER |
|---|---|---|
| MAGNETIC TAPE EQUIPMENT | | |
| TU10 | 9-track, 800 bpi, 45 ips; 36 KBS | DEC |
| TS03 | 9-track, 800 bpi, 7-inch reel, 12.5 ips; 10 KBS | NA |
| TJU16 | 9-track, 800/1600 bpi, 45 ips; 36/72 KBS | DEC |
| PRINTERS | | |
| LA35 | 132 positions, 96 characters, 7 x 7 dot matrix; 30 cps continuous | DEC |
| LA11 | 132 positions, 96 characters; 180 cps | DEC |
| LP11-WA | 132 positions, 96 characters; 230 lpm | Dataproducts |
| LP11-VA | 132 positions, 64 characters; 300 lpm | Dataproducts |
| CARD UNITS | | |
| CR11 | Card reader, 80-column; 300 cpm | Documation |
| TERMINALS | | |
| LA36 | DECwriter II, printer/keyboard, 132 positions, 96 characters, 7 x 7 dot matrix; 300 bps | DEC |
| VT50H | DECscope, CRT/keyboard, 960 characters, 80 chars. by 12 lines, numeric keypad, direct cursor addressing, 64-character set; 9600 bps | DEC |
| VT52 | DECscope, CRT/keyboard, 1920 characters, 80 chars. by 24 lines, numeric keypad, 96-character set; 9600 bps | DEC |

▷ The step between the DS350 and DS500 is also a comfortable one except for the current lack of a compatible language, which would entail reprogramming to achieve conversion. However, by the time DS350 users are ready for that step, it is likely that the DIBOL language will have been added to the repertoire of the DS500.

The DS350 also fills a former gap in the DEC product line in an area that is well served by the smaller multi-user systems from competing computer vendors and a host of systems houses with products for general or dedicated applications. Transaction processing, a concept once reserved for accounting-machine-oriented systems operating on magnetic ledger cards, has proven to be a valid technique for creating, maintaining, updating, and interrogating data files. Just as the glamour of CRT's for key/disk data entry fixed their place in data preparation, CRT's for transaction-oriented, multi-user systems are rapidly achieving "standard practice" status. When data entry is combined with file updating and processing, the user is presented with a more comprehensive data processing capability at a lower cost than when these functions are segregated. When presented with the convenience of "soft" processing, the small business user is unlikely to mourn the passing of the voluminous printouts that too often characterize data processing.

There are indications that the Datasystem 350 will be a dynamic product line. Already, since the July 1975 announcement, peripheral changes have been made to include newly announced DEC-manufactured peripherals. In addition, a second software release is being readied for November 1975. That release will include remote workstation capability and a performance enhancement. Presently, the multi-user file access technique assumes multi-access to all open files, with a disk access made for ▷

► 800/1600-bpi tape drive requires two SU's for the controller, but no additional space on the chassis for the drives.

A cabinet with one or more Expander Boxes can be added to expand the peripheral capabilities. Each Expander Box provides five additional system units. A Peripheral System Unit can be installed in each system unit to provide four Small Peripheral Controller slots. In general, the cartridge and disk pack controllers require a system unit, and the floppy disk controller requires an SPC. The cartridge and pack controllers support up to eight drives, whereas the floppy controller supports only two.

## MASS STORAGE

**RX11 FLOPPY DISK DRIVES:** A DS352 subsystem consists of a controller and two drives; one additional subsystem is permitted. A single drive with controller is included on the DS356 for initial program loading of distributed software and for field diagnostics.

Data is recorded in 77 tracks on one side of the diskette. Each track is formatted into 26 sectors of 128 bytes each. Head movement time is 10 milliseconds per track plus 20 milliseconds head settling time. Rotational speed is 360 rpm, giving an average rotational delay of 83 milliseconds. Average access time is 357 milliseconds. The data transfer rate is 55,600 bytes per second. Track capacity is 3328 bytes, and the total capacity of one diskette is 256,256 bytes. The subsystem is manufactured by DEC.

**RK05 CARTRIDGE DISK DRIVES:** A DS354 includes a controller and two drives; up to six drives can be added for a total of eight. Data is recorded on both sides of a single disk contained in an IBM 2315-style, front-loading cartridge. There are 200 tracks plus 3 spares on each surface. Data is recorded in 12 sectors of 256 bytes per track. The capacity of one cartridge is 2.4 million bytes. The capacity of the two-cartridge standard DS354 subsystem is 4.8 million bytes. The capacity of the fully expanded eight-drive subsystem is 19.2 million bytes. Head movement time is 10 milliseconds for a single-track move, 85 milliseconds for a maximum 200-track move, and 50 milliseconds average. Rotational delay averages 20 milliseconds. Data transfer rate is 180K bytes per second. The subsystem is manufactured by DEC. ►

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each new record, even though disk data is transferred in blocks of multiple records and the requested record may already be in memory, particularly during sequential processing. The new release causes the disk buffer to be searched prior to disk access if only one user has opened the file. DEC states that this can increase the effective processing speed by a factor of up to two for certain processing operations. □

**RPR02 DISK PACK DRIVES:** A DS356 includes a controller and two drives; up to six drives can be added for a total of eight. Data is recorded on 20 surfaces of an 11-disk high, IBM 2316-style disk pack. There are 200 tracks on each recording surface. Data is recorded in 20 sectors of 256 bytes per track. Total capacity of one pack is 20.5 million bytes. The capacity of the standard two-drive subsystem is 40 million bytes, and the fully expanded eight-drive subsystem stores 160 million bytes. Head movement time is 20 milliseconds for a single-track move, 80 milliseconds for a maximum 200-track move, and 50 milliseconds average. Rotational delay averages 12.5 milliseconds. Data transfer rate is 312K bytes per second. The drives are manufactured by Memorex.

## INPUT/OUTPUT UNITS

See Peripherals/Terminals table.

## COMMUNICATIONS CONTROL

*COS 350 2780/RCS* is a hardware/software option that allows the Datasystem 350 to function as a remote job entry terminal or for high-speed communications between two DS350's or between a DS350 and a DS500 system.

The hardware portion is composed of the DU11 Synchronous Life Interface and the KG11 CRC/LRC Arithmetic Element for performing error-checking calculations. The hardware/software combination conforms with IBM 2780 binary synchronous line protocol and error checking. Line speed is a function of the modem used and can be up to 9600 bps. Transmission is half- or full-duplex. Automatic answering is included.

The RCS software module of COS 350 provides support for communicating with an IBM System/360 or 370 computer running under HASP, ASP/RJP, POWER, or RJE. Similar support is provided for communicating with a DECsystem 10. Point-to-point batch transmission is supported between two DECsystem 350's or between a DECsystem 350 and 500 system.

## SOFTWARE

Software support for the Datasystem 350 is bundled in the price of the system and includes the COS 350 operating system, DIBOL programming language, and utilities.

OPERATING SYSTEM: COS 350 is based on RT-11, a foreground/background operating system available with the PDP-11. The I/O handlers and utilities are retained, and a time-sharing facility is added. The time-sharing facility time-slices processor availability among active, core-resident tasks on a round-robin basis. If the same program is being executed by more than one user, separate copies are loaded into memory. The duration of the time slice can be adjusted.

Two modes of operation are provided. A single-user mode is used for program development, running utilities, and execution of single DIBOL programs. The multi-user mode permits concurrent execution of up to four independent DIBOL programs through the operator workstations, plus additional detached programs. Single-user operation requires 10K bytes of memory for the operating system; multi-user operation requires 20K bytes.

The multi-user version of COS 350 implements the multiprogramming environment through multiple,

dynamically allocated partitions, one for each active job. If a task is initiated and a sufficiently large contiguous segment of memory is not available, executing tasks are moved together to free up a large enough segment for the new task, if possible. Multiple tasks can access the same file simultaneously. A record lock is established to prevent simultaneous accessing and updating of the same record and the resulting errors. Output to the printer can be spooled on disk for later printing; this prevents interleaving of dissimilar records or long waits for the printer.

Jobs that do not require interactive data entry can be "detached." Once a job is detached, the operator can initiate another task on that terminal, with the operating system controlling execution of the detached program.

Direct or sequential access to files is provided, and files can extend across the physical boundaries of a disk drive (multi-volume files) without special programming. The limit on the number of interactive and detached jobs that can be executed simultaneously is dependent on memory space available. Conservation of memory space can be aided by the overlay facilities provided by the LINKER utility routine.

Transmission of data between two programs can be accomplished through an area reserved in memory. Variables are "sent" to that area. Another program can request, by variable name, values from that area.

In the single-user environment, a number of utilities are provided to assist program development. The EDIT routine provides for interactive creation and editing of DIBOL source-code files. LIBR is used to create and maintain subroutine libraries. LINKER is used to assemble the object modules of separately compiled program and subroutine modules from libraries maintained under LIBR. Another function of LINKER is to implement the overlay structure specified by the programmer. Overlay facilities are flexible and permit the programmer to establish any number of overlays for any number of memory areas, subject only to memory size. PIP permits transfer of files between peripheral devices in any standard format and includes capabilities for renaming, consolidating disk space, merging segmented files, and operating on groups of files. Also included are utility routines for dumping a file in octal or ASCII and for patching the operating system.

The SORT routine can be used in either single-user or multi-user operation. It permits ascending or descending ordering of fixed-length records based on up to eight keys.

The DICOMP program is the translator for DIBOL source programs. Optionally, a source program listing and/or an alphabetic cross-listing of all symbolic names with the statement numbers (where used) can be output.

LANGUAGE: DIBOL-11 is a compatible extension of the language first used for the PDP-8. The language was designed to permit writing business-oriented programs for a minicomputer. It is structured into data definition and procedures sections, similar to COBOL.

Records and numeric integer or alphanumeric fields are defined in the data definition section. Variable names of up to six characters are supported. Files are associated with record/field definition through OPEN statements in the procedures section. Printed output formatting is accomplished through an edit mask facility much like that of COBOL. In arithmetic operations, a precision of 18 digits is maintained. The language includes complete facilities for handling the display during program execution and for calling external subroutines.

DIBOL programs can be written interactively using the EDIT program. The source module is stored on disk and submitted to the DICOMP language translator when translation is desired. DIBOL programs are executed through a run-time interpreter. A dynamic snapshot facility, called DDT for DIBOL Debugging Technique, permits stopping a program with display of variable values; the values can be modified and a new checkpoint established.

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▶ The principal differences between DIBOL-8 and DIBOL-11 are cosmetic changes, to make DIBOL-11 look a little more like COBOL, and differences in the handling of file devices. DIBOL-11 makes use of a directory structure. DEC provides a translator that accounts for the cosmetic changes and flags the I/O syntax changes required.

APPLICATIONS PROGRAMS: DEC does not furnish any application programs for the Datasystem 350 family.

## PRICING

POLICY: DEC Data system 350 systems are available for purchase or on third-party, full-payout leases for one-, two-, three-, and five-year terms, which are arranged by DEC through Digital Leasing, a joint venture with U.S. Leasing Corporation. Five-year lease terms, for example, are available at a cost of 2.4 percent of the purchase price per month.

Typically, low-volume purchases are referred to distributors, with DEC handling large-volume sales directly.

All software is included in the price of the system. The prices given in the following section include a software license, updates for one year, and a subscription to *Software Dispatch*, which provides information on problems, fixes, and other aids. For multiple-system procurements, the second and subsequent systems are available without software support, but with a license for its use, for $500 less than the system costs listed.

Separately priced hardware maintenance by DEC is available through a field support force of over 2,500 personnel. Purchase prices includes full on-site installation/setup of hardware and software. A 90-day on-site warranty is included. The maintenance prices quoted below are for eight hours per day, five days per week. Extended-period maintenance is available at extra cost.

EQUIPMENT: The prices for the following typical systems include all required controllers, adapters, cables, and software.

MINIMUM SINGLE-USER DS352: Includes PDP-11/10 processor with 32KB memory, dual floppy disk drives (512K bytes total), desk, VT50H display, and 30-cps LA35 printer. Purchase price is $20,850; monthly maintenance costs $132.

TWO-USER DS354: Includes PDP-11/10 processor with 32KB memory, dual cartridge disk drives (4.8 million bytes total), desk, two 960-character VT50 DECscope terminals, and LA11 180-cps printer. Purchase price is $35,890; monthly maintenance costs $273.

LIMITED FOUR-USER DS356: Includes PDP-11/10 processor with 65KB memory (36KB available to users), two disk pack drives (40 million bytes total), desk, four 960-character VT50H DECscope terminals, 300-lpm printer, and one 4-SPC System Unit module. Purchase price is $73,135; monthly maintenance costs $550.

HIGH-PERFORMANCE FOUR-USER DS356: Includes PDP-11/40 processor with 65KB memory (36KB available to users), four disk pack drives (80 million bytes total), desk, four 1920-character VT52 DECscope terminals, two 300-lpm printer, and one 4-SPC System Unit module. Purchase price is $112,320; monthly maintenance costs $919. ■

## EQUPMENT PRICES

| | | Purchase Price | Monthly Maint. | Field Instal. Charge |
|---|---|---|---|---|
| **DATASYSTEM 350 BASIC SYSTEMS** | | | | |
| DS352 AA | PDP-11/10 with 32KB memory, real-time clock, bootstrap loader, dual 256KB floppy disk drives and controller, one terminal interface, desks, cabinet, COS 350 software license, training, one-year update service, and installation; includes 3 SU's and 1 SPC for memory and peripheral expension | $17,245 | $ 85 | $ — |
| DS354 AA | Same as DS352 AA, except two 2.4-megabyte RK05 disk drives and controller replace dual floppy drives; provides 2 SU's and 25 SPC's for memory and peripheral expansion | 28,600 | 170 | — |
| DS354 GA | Same as 354 AA, except PDP-11/40 processor with 32KB memory replaces PDP-11/10; provides 3 SU's and 3 SPC's for memory and peripheral expansion | 40,230 | 200 | — |
| DS356 AA | Same as DS352 AA, except two 20-megabyte RPR02 disk drives replace dual floppy drives, and one floppy drive with controller is added; provides 3 SU's and 1 SPC for memory and peripheral expansion | 49,345 | 340 | — |
| DS356 GA | Same as DS356 AA, except PDP-11/40 processor with 32KB memory replaces PDP-11/10; provides 4 SU's and 2 SPC's for memory and peripheral expansion | 56,530 | 360 | — |
| **MEMORY** | | | | |
| MM11-S | 16KB core memory module for PDP-11/10 based DS350 systems; requires 1 SU | 2,100 | 38 | 125 |
| MF11-U | 32KB core memory module for PDP-11/10 based DS350 systems; requires 2 SU's | 4,900 | 32 | 125 |
| DS3M-AA | Production-only memory add-on for DS350 system to give 48KB memory; requires 2 SU's | 1,500 | 32 | NA |
| DS3M-AB | Production-only memory add-on for DS350 system to give 64KB memory; requires 3 SU's | 2,500 | 34 | NA |
| MM11-UP | 32KB parity core memory module for PDP-11/40 based DS350 systems; requires no SU | 5,600 | 27 | 150 |
| **MASS STORAGE** | | | | |
| For Expansion of DS350 Systems— | | | | |
| RX11-BA | Dual 256K floppy disk drives and controller; for DS352; requires 1 SPC | 3,900 | 33 | 251 |
| RK05-AA | 2.4-megabyte cartridge disk drive; 6 maximum (in addition to 2 standard); for DS354; requires no SU or SPC; 4 per H967 HA babinet | 5,100 | 64 | 260 |
| RPR02-AM | 20-megabyte disk pack drive in free-standing cabinet; 6 maximum (in addition to two standard); for DS354; requires no SU or SPC | 9,500 | 145 | 400 |

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## EQUIPMENT PRICES

| | | Purchase Price | Monthly Maint. | Field Instal. Charge |
|---|---|---|---|---|
| **For Upgrade of DS350 Systems—** | | | | |
| DS5RE BA | 2.4-megabyte disk cartridge drive and contol unit mounted in cabinet; controller can accommodate 8 drives total; requires 1 SU | $ 11,000 | $ 106 | $ 500 |
| DS5RJ AA | 20-megabyte disk pack drive and control unit mounted in cabinet; controller can accommodate 8 drives total; requires no SU | 19,500 | 219 | 640 |
| **MAGNETIC TAPE EQUIPMENT** | | | | |
| DS5TA-EA | TU10 9-track, 800-bpi, 45-ips magnetic tape transport and control unit mounted in cabinet; controller can accommodate 8 drives total; requires no SU | 11,500 | 101 | 640 |
| TU10D-EE | Add-on drive for DS5TA | 8,000 | 74 | 400 |
| DS5TD-MA | TS03 9-track, 800-bpi, 12.5-ips, 7-inch reel magnetic tape transport and control unit mounted in cabinet; conroller can accommodate 2 drives total; requires no SU | 7,750 | 75 | 425 |
| TS03-SA | Slave drive for DS5TD | 3,500 | 50 | 270 |
| DS5TB-EA | TJU16 9-track, 800/1600-bpi, 45-ips magnetic tape transport and control unit mounted in cabinet; controller can accommodate 8 drives total; requires 2 SU's | 15,500 | 120 | 550 |
| DS5TB-EE | Add-on drive for DS5TB-EA | 8,950 | 60 | 280 |
| **PRINTERS** | | | | |
| DS3D6-AA | 30 cps LA35; requires 1 SPC | 1,995 | 25 | 95 |
| LA11-P | 180 cps (65 lpm), 132 columns, 96 characters; requires 1 SPC | 3,585 | 53 | 95 |
| LP11-WA | 230 lpm, 132 columns, 96 characters; requires 1 SPC | 12,500 | 72 | 220 |
| LP11-VA | 300 lpm, 132 columns, 64 characters; requires 1 SPC | 10,500 | 72 | 220 |
| **CARD EQUIPMENT** | | | | |
| CR11 | 300-cpm, 80-column card reader; requires 1 SPC | 5,100 | 53 | 240 |
| **TERMINALS** | | | | |
| | LA36 DECwriter II; 30 cps printer/keyboard; requires cable— | | | |
| LA36-CA | If first terminal added to system | 2,175 | 25 | 95 |
| LA36-EE | If not first terminal added to system; requires interface and cable | 2,235 | 25 | 95 |
| VT50-HA | VT50H DECscope; 960-character CRT/keyboard; requires two cables and interface if not first terminal | 1,500 | 22 | 95 |
| VT52-AE | VT52 DECscope; 1920-character CRT/keyboard; requires cable and interface if not first terminal | 1,995 | 20 | 95 |
| **COMMUNICATIONS** | | | | |
| DU11-DA | Synchronous EIA serial interface for 2780 communications; requires 1 SPC | 950 | 5 | 103 |
| KG11-A | CRC/LRC arithmetic element for 2780 communications; requires 1 SPC | 950 | 6 | 60 |
| **MOUNTING HARDWARE, CABINETS, AND CABLES** | | | | |
| H967-HA | Expander cabinet | 850 | — | — |
| BA11-KE | Expander box, 10½ inches; provides space for 5 additional system units (SU) | 1,950 | 16 | 90 |
| DD11-B | Peripheral system unit, prewired for 4 SPC slots; requires 1 SU | 275 | — | 50 |
| **Interfaces for Terminals—** | | | | |
| DS5C4-BE | 300 bps EIA terminal interface; requires 1 SPC | 595 | 6 | 60 |
| DS5C4-BL | 2400 bps EIA terminal interface; requires 1 SPC | 595 | 6 | 60 |
| DS5C4-BQ | 9600 bps EIA terminal interface; requires 1 SPC | 595 | 6 | 60 |
| **Cables for Terminals—** | | | | |
| BN50A-7F | EIA cable for VT50 | 60 | — | 75 |
| BC03M-25 | Data cable, 25 feet, 9600 bps maximum | 50 | — | — |
| BC03M-A0 | Data cable, 100 feet, 9600 bps maximum | 100 | — | — |
| BC03M-B5 | Data cable, 250 feet, 9600 bps maximum | 150 | — | — |
| BC03M-E0 | Data cable, 500 feet, 4800 bps maximum | 250 | — | — |
| BC03M-L0 | Data cable, 1000 feet, 4800 bps maximum | 500 | — | — |