# DEC Datasystem 150 and 300 Series

## MANAGEMENT SUMMARY

DEC has revised and reconfigured the Datasystem product line over the past five years in order to fine tune a comprehensive offering for the small business user. The packaged small business computer market is competitive and DEC has been working to maintain their edge. New software, additional disk storage, and increased processor capabilities all contribute to the Datasystem's continued success. The new D315 entry level system is another example of DEC's commitment to this market.

The Datasystem series starts with the D150 line based on the LSI-11 processor while the D325 incorporates the PDP-11/03 as its processor. The new D315 system and the D330 series models D335 and D336 use the PDP-11/23 processor while the D350 series models D356 and D358 are based on the PDP-11/34A. Rather than maintaining strict hardware capability, DEC modified its COBOL-like DIBOL-11 programming language to provide source code compatibility for the LSI processor.

The LSI-11 technology enables Digital to put an N-channel MOS processor, 4096-word random-access memory, a vectored automatic priority interrupt logic, real-time clock input, power failure/auto-restart logic, and buffered parallel 16-bit I/O port on one 8.5-by-10-inch circuit board. The PDP-11/34A offers more power by allowing users to address up to 253,952 bytes of MOS memory, and with Version 6 of the CTS-300 operating system, to support up to 12 terminals.

DEC has divided the PDP-11 based Datasystems into two broad groupings—those systems running under CTS-300 and everything else. Here is a quick look at the current

**Digital's Datasystems now comprise an extensive offering of packaged small business systems. Based on the PDP-11 and LSI-11 processors, the Datasystems range from a 1-terminal table-top D150 configuration to a 12 terminal, hard-disk, magnetic tape D350 system. Software and files are transportable between the models so that upward growth capability is assured to meet the needs of a small business.**

**MAIN MEMORY: 32K to 256K bytes.**
**DISK CAPACITY: Up to 224 megabytes.**
**WORKSTATIONS: Up to 12.**
**PRINTERS: Up to 300 lpm.**
**OTHER I/O: Magnetic tape on D350.**

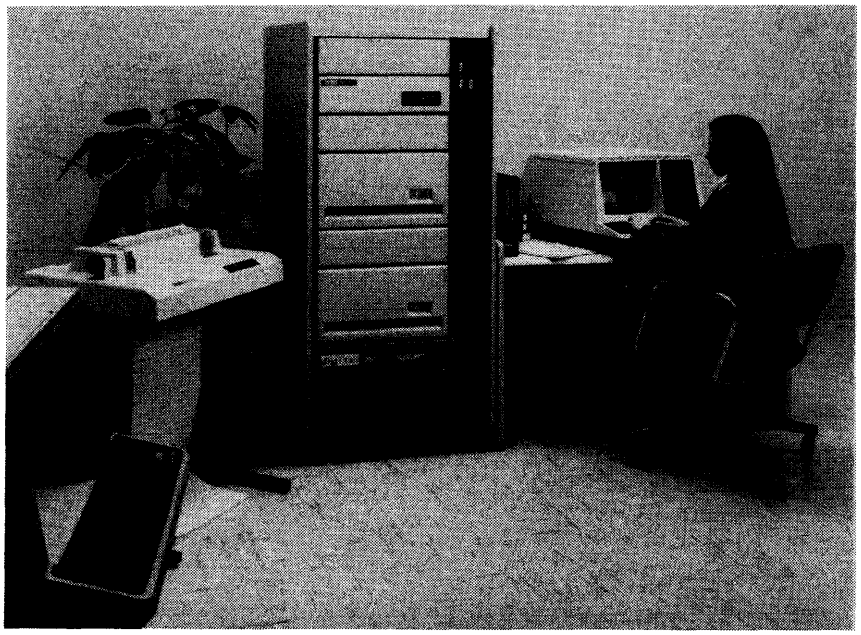
## CHARACTERISTICS

**MANUFACTURER: Digital Equipment Corporation, Commercial Products Group, Continental Boulevard, Merrimack, New Hampshire 03054. Telephone (603) 884-5111.**

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

**MODELS: DEC Datasystems D150 (LSI-11 based); D325 (PDP-11/03 based); D315, D335, D336 (PDP-11/23 based); D356, D358 (PDP-11/34A based).**

**DATE ANNOUNCED: D150, January 1979; D315, October 1980; D320, January 1977; D330, October 1979; D350, July 1978.**



This Datasystem 325 configuration consists of a PDP-11/03 processor with 56K bytes of MOS memory, a cabinet holding dual RL01 removable disk drives with a total of 10 megabytes of on-line storage, a 4-line asynchronous serial interface, two DECscope consoles, and an LA180 printer rated at 180 cps. The price is $34,500, including the CTS-300 operating system and DIBOL compiler.

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## CHARACTERISTICS OF THE DEC DATASYSTEM 150 AND 300 FAMILY

| MODEL | 150 | 315 | 325 | 335 | 336 | 356 | 358 |
|---|---|---|---|---|---|---|---|
| Processor | LSI-11 | PDP-11/23 | PDP-11/03 | PDP-11/23 | PDP-11/23 | PDP-11/34A | PDP-11/34A |
| Maximum number of terminals | 1 | 3 | 4 | 8 | 8 | 12 | 12 |
| Recommended number of terminals | 1 | 1 | 1 to 3 | 2 to 6 | 2 to 6 | 8 to 10 | 8 to 10 |
| Standard disk model | RX01 floppy | RX02 floppy | RL01 | RL01 | RL02 | RL02 | RK07 |
| Standard disk capacity | 512K bytes | 1 megabyte | 10.4 megabytes | 10.4 megabytes | 20.8 megabytes | 20.8 megabytes | 56.0 megabytes |
| MOS memory capacity, bytes: | | | | | | | |
| Minimum | 32K | 64K | 64K | 128K | 128K | 128K | 128K |
| Maximum | 64K | 256K | 64K | 256K | 256K | 256K | 256K |

NOTE: All models include one VT100 DECscope console, CTS-300 Operating System, DIBOL-11, and DECform software. Printers are optional.

Datasystem product line running under CTS-300. (Those "everything-else" models use CTS-500, RSX-11M, and RSX-11M PLUS are covered separately in Report M11-385-101.)

- Model D150—tabletop configuration, supports 1 terminal using the LSI-11 processor with up to 64K bytes of MOS memory. One RX01 floppy disk drive with 512K bytes of storage is standard.
- Model D315—tabletop or under desk configuration, supports 3 lines and 64K bytes of memory with a PDP-11/23 processor. Dual RX02 floppy disks are included for 1 megabyte of storage.
- Model D325—supports up to 4 terminals using the PDP-11/03 processor with up to 64K bytes of MOS memory. Two RL01 cartridge disks with 10.4 megabytes of storage are standard.
- Model D335—supports up to 8 terminals using the PDP-11/23 processor with up to 256K bytes of MOS memory. Two RL01 cartridge disks with 10.4 megabytes of storage are standard.
- Model D336—supports up to 8 terminals using the PDP-11/23 processor with up to 256K bytes of MOS memory. Two RL02 cartridge disks with 20.8 megabytes of storage are standard.
- Model D356—supports up to 12 terminals using the PDP-11/34A processor with up to 256K bytes of parity MOS memory. Two RL02 cartridge disks with 20.8 megabytes of storage are standard.
- Model D358—supports up to 12 terminals using the PDP-11/34A processor with up to 256K bytes of parity MOS memory. Two RK07 cartridge disks with 56.0 megabytes of storage are standard.

Growth has been cited as the main advantage in the DEC Datasystem product line. These computers are directed toward "Fortune 1000" companies that can effectively utilize small, multi-user computer systems at multiple remote installations to implement distributed data

**DATE OF FIRST DELIVERY: D150, March 1979; D315, scheduled November 1980; D320, March 1977; D330, April 1980; D350, September 1978.**

**NUMBER INSTALLED TO DATE: Specific model information is not available. The total number installed is approximately 18,000 systems.**

## DATA FORMATS

**BASIC UNIT: 16-bit word plus 2 parity bits. The processor can also handle 8-bit bytes, and is capable of bit manipulation.**

**FIXED-POINT OPERANDS: 16-bit words or 8-bit bytes are used as operands in both single- and double-operand instructions. Bit manipulation is provided through Boolean AND/OR instructions.**

**FLOATING POINT OPERANDS: Optional 32-bit single-precision operands with an 8-bit exponent and signed 24-bit fractions on the LSI-11 and PDP-11/34A; or 64-bit double-precision operands with an 8-bit exponent and signed 56-bit fraction on the PDP 11/34A.**

**INSTRUCTIONS: The programmer sees the system in terms of the DIBOL language syntax, which is a COBOL-like programming language. The internal arrangement of the system is the LSI-11 (D150 Series), PDP-11/03 (D320 Series), PDP-11/23 (D330 Series) or PDP-11/34A (D350 Series) instruction set and architecture.**

**INTERNAL CODE: ASCII.**

## MAIN STORAGE

**TYPE: MOS (metal oxide semiconductor).**

**CYCLE TIME: 570 nanoseconds on D150 Series; 550 nanoseconds on D320 Series; 500 nanoseconds on D330 Series; or 510 nanoseconds on D350 Series. The optional 2K cache memory, available on the D350 Series, has a cycle time of 150 nanoseconds.**

**CAPACITY: Datasystem 150: 32K to 64K bytes; Datasystem 315: 64K to 256K bytes; Datasystem 320: 64K bytes; Datasystem 330 and 350: 128K to 256K bytes.**

**CHECKING: Parity checking is standard on the Datasystem 150, 315, 330, and 350 Series. No checking is available for the Datasystem 320 Series.**

**STORAGE PROTECTION: Via the memory management function on the Datasystem 350 Series. Memory mapping automatically provides hardware storage protection.**

# DEC Datasystem 150 and 300 Series

## PERIPHERALS/TERMINALS

| DEVICE | DESCRIPTION & SPEED |
|---|---|
| MAGNETIC TAPE | (D350 Series only) |
| TS11-BA | Subsystem; 9-track, 45 ips, 1600 bpi |
| TJE16-AA/TWE16-AA | Subsystem; 9-track, 45 ips, 800/1600 bpi |
| TME11-EA | Subsystem; 9-track, 45 ips, 800 bpi |
| PRINTERS | |
| LA11-P | Serial impact; 7 x 7 dot matrix, 132 positions, 96 ASCII character set, 3- to 14.9-inch paper, 6 lines per inch, 10 characters per inch; 180 cps (D350 Series) |
| LP11-A | Drum; 132 positions, 64-character set, 4- to 19-inch paper, 6 lines per inch, 10 characters per inch, 12-channel VFU, 285 lpm |
| LP11-B | Drum; 132 positions, 64- and 96-character set; 285 and 204 lpm |
| LP11-V | Drum; 132 positions, 64-character set, 4- to 16.8-inch paper (width), 6 or 8 lines per inch, 10 characters per inch; 300 lpm (D350 Series) |
| LP11-W | Same as LP11-V but 96-character set; 240 lpm |
| LPV11-A | Drum; 132 positions; 64-character set; 285 lpm (D320 and D330 Series) |
| LPV11-B | Drum; 132 positions; 64- and 96-character set, 285 and 204 lpm (D320 and D330 Series) |
| LPV11-P | Drum; 132 positions; 96-character set; 180 lpm (D320 and D330 Series) |
| LPV11-V | Drum; 132 positions; 64-character set; 300 lpm (D320 and D330 Series) |
| LPV11-W | Drum; 132 positions; 96-character set; 240 lpm (D320 and D330 Series) |
| TERMINALS* | |
| LA34 | DECwriter IV, 30 cps, 9 x 7 dot matrix; adjustable character width, 7 character sets, superscripts and subscripts |
| LA38 | Tabletop or freestanding DECwriter IV printing terminal, 18-button numeric keypad, 30 cps, 300 bps |
| LA120 | EIA version high speed interactive hardcopy terminal; 7 x 7 dot matrix, typewriter-style keyboard, 180 cps, 50 to 9600 bps |
| VT55 | Graphic Display; capabilities as an alphanumeric CRT, graphic display, and printer/plotter; two displays of up to 512 data points at a screen resolution of 512 x 236; alphanumeric display is 7 x 7 dot matrix on 24 lines of 80 characters each; hard copy via electrolytic process; keyboard is of multiple-key rollover construction and is of typewriter style with separate numeric keypad; full or half duplex, 20 mA interface; 75 to 9600 bps |
| VT62 | Alphanumeric Video Display Terminal; EIA/CCITT interface; 24 x 80-columns upper/lower case display |
| VT100 | Video Display Terminal; 80 columns by 24 lines or 132 columns by 14 lines, detached keyboard, scrolling, reverse video or underlining; double-width/double-size characters; split screen |

*Terminals can be intermixed since each one transmits a self-identifying code so that the software can identify the features of each model.

processing, as well as toward those "turnkey" operations that might be looking for packaged configurations of both hardware and software by DEC's Commercial OEMs.

The recently announced D315 supports this growth concept to the fullest. Based on the PDP-11/23, the D315

**RESERVED STORAGE: Uppermost 8K bytes of memory reserved for I/O registers.**

## CENTRAL PROCESSORS

**Please refer to Report M11-384-301, DEC PDP-11 Family, for details on the LSI-11 and PDP-11 processors.**

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offers a memory capacity ranging from 64K bytes to 256K bytes. The system can be used as an entry level business system, as a network node, or as a store and forward terminal.

DIBOL-11, DEC's own COBOL-like programming language, provides compatibility throughout the Datasystem product line. A DIBOL-11 program running on a D315 can be run on a D335 or D358 without recompilation. This software transferrability is the key to the Datasystem's success.

CTS-300 is the operating system for all members of the Datasystem 150 and 300 series. This updated version of COS-350 is able to address 256K bytes of memory. CTS-300 Version 6, DEC's new software release, supports up to 16 concurrent tasks, 12 terminals, printer spooling, 3 methods of file access, and numerous utilities. The new editor will allow 2 to 6 programmers to simultaneously edit, compile, link, and debug DIBOL programs, providing the system is hard-disk based with 128K bytes or more of memory.

"Big block send and receive" is available on all Datasystems. This novel feature allows information to be passed between programs, thus enabling the sharing of programming resources. Although several jobs might be running simultaneously, they can all share the same screen formatting program or disk accessing programs, thereby saving memory and programming efforts.

DEC does not offer any application programs for the Datasystem at the present time, but numerous systems houses offer turnkey systems that are based upon the Datasystem hardware and are oriented toward specific applications. DEC does provide a reference source, the Application Interchange Program (AIP), as an aid to users looking for application software.

Disk drives and processor types determine the differences among the Datasystem models. The D150 is a table-top configuration with two RX01 floppy disks with 512K bytes of storage, while the D315 has two RX02 floppy disk units with 1 megabyte of storage included in the base system. The D325 and D335 each include two RX02 cartridge disks with 10.4 megabytes of storage as standard equipment. The D336 and D356 move up to two RL02 cartridge disk units with 20.8 megabytes of storage while the remaining model D358 stands alone with two RK07 cartridge disk units as standard equipment for 56.0 megabytes of storage.

All Datasystems include one VT100 DEC scope terminal as an operator console and data entry device. An alternate terminal choice is the LA34 DECwriter IV. The LA34 offers a 9 x 7 dot matrix, adjustable character width, 7 different character sits, and subscripts and superscripts.

Users can intermix terminals types, since each one transmits a self-identifying code that tells the software the individual characteristics of that terminal.

## INPUT/OUTPUT CONTROL

**Please refer to Report M11-384-301 for a discussion of the LSI-11 and PDP-11 I/O architecture.**

## CONFIGURATION RULES

**Maximum configuration parameters for the Datasystem Series are as follows:**

- **Up to 256K bytes of main memory.**
- **Up to 224 megabytes of on-line disk storage.**
- **Up to 12 terminals.**
- **Up to 8 magnetic tape drives.**
- **Up to 4 line printers.**

**WORKSTATIONS: A maximum of 12 terminals are supported on the D350 Series: 8 terminals on the D330; 4 terminals on the D320; 3 on the D315; and 1 on the D150. The terminals attach to the bus structure by way of either a single line asynchronous interface or an asynchronous multiplexer.**

**DISK STORAGE: The Datasystem Series supports a variety of disk storage media. The D150, as a tabletop system, includes an integral dual-drive flexible disk unit for a maximum capacity of .5 megabytes of data. The remaining Datasystems support a 1 megabyte dual-drive flexible disk system which can be augmented by either a cartridge disk or disk pack subsystems. The 320 and 330 Series support up to 4 single-access RL01 drives for a system capacity of 20 megabytes or up to 4 single-access RL02 drives for a system capacity of 40 megabytes. The D350 Series also handles a single-access 28.0 megabyte cartridge disk subsystem expandable to 224 megabytes. A single-access 67.0 megabyte disk pack drive and controller also provides on line storage capability.**

**MAGNETIC TAPE UNITS: The D350 Series supports either a dual mode 800/1600 bpi, 9-track magnetic tape subsystem or a 800 bpi, 9 track system. Both units are expandable to nine transports.**

**LINE PRINTERS: Up to 4 line printers can be supported on D320, D330, and D350. The units offered range in capacity with a maximum print speed of 300 lpm.**

## MASS STORAGE

**Please refer to Report M11-384-301 for a discussion of the mass storage devices available for the Datasystem Series.**

## INPUT/OUTPUT UNITS

**See PERIPHERALS/TERMINALS table.**

## DATA COMMUNICATIONS

**Please refer to Report M11-384-301 for a discussion of the DL11 and DUP-11 interfaces and the DZ11 and DH11 multiplexers.**

## COMMUNICATIONS CONTROL

**The RDCP/2780/3780 communications package is designed for use with all of the Datasystem models. The batch-oriented communications package allows Datasystems to communicate with one another and with IBM mainframes using both 2780 and 3780 protocols. The software allows users to transfer data on a batch basis concurrently with other Datasystem operations. Both data and software can be**

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The D315 is available in a table top configuration or in an optional wheeled stand. This stand mounts the CPU and floppy disk drive in a stack-and-roll configuration less than 22 inches high. This wheeled stand will fit under most desks and tables to economize on floor space.

## USER REACTION

Seventeen respondents to the 1980 Datapro survey were Datasystem users. The average system life was 20.3 months with the individual responses ranging from 3 to 49 months. The majority of the systems were purchased and only 4 users leased their Datasystems.

The principal application with 14 users responding was accounting. Payroll came in second with 5 responses and service bureau functions rated 4 entries.

The primary program language with 15 responses was DIBOL. DEC's claim concerning the programming ease of DIBOL can be supported by the fact that 12 of the 17 respondents reported in-house personnel to be their source of application programs. Only 3 users claimed "ready-made" programs from the manufacturer as their program source. Proprietary software packages did rate 9 responses indicating a general availability of Datasystem packages.

In answer to the question concerning replacing the present computer system in 1980, 12 respondents gave a resounding no. Three users are expecting to replace their systems with another DEC configuration while two respondents are planning to go to another manufacturer. Both of the users planning to leave the DEC family currently have PDP-8 Datasystem configurations and had expressed concern over expansion capability and response time.

Here are the ratings assigned by these Datasystem users in 14 specific categories:

| | Excellent | Good | Fair | Poor | WA* |
|---|---|---|---|---|---|
| Ease of operation | 8 | 8 | 1 | 0 | 3.4 |
| Reliability of mainframe | 12 | 3 | 0 | 0 | 3.8 |
| Reliability of peripherals | 9 | 7 | 1 | 0 | 3.5 |
| Maintenance service: | | | | | |
| Responsiveness | 6 | 8 | 2 | 1 | 3.1 |
| Effectiveness | 5 | 10 | 1 | 1 | 3.3 |
| Technical support: | | | | | |
| Trouble shooting | 4 | 6 | 2 | 1 | 3.0 |
| Documentation | 3 | 7 | 3 | 3 | 2.6 |
| Education | 3 | 7 | 2 | 2 | 2.8 |
| Manufacturer's software: | | | | | |
| Operating system | 7 | 7 | 3 | 0 | 3.2 |
| Compilers and assemblers | 7 | 8 | 2 | 0 | 3.3 |
| Applications programs | 5 | 4 | 2 | 1 | 3.1 |
| Ease of programming | 5 | 8 | 3 | 1 | 3.0 |
| Ease of conversion | 3 | 5 | 2 | 3 | 2.6 |
| Overall satisfaction | 6 | 10 | 0 | 1 | 3.2 |

*Weighted Average on a scale of 4.0 for Excellent.

transferred. Minimum memory requirement is 56K bytes. The RDCP/2780/3780 software is aimed at users in the manufacturing, transportation, insurance, and banking industries which require remote computers to communicate with a central host.

DICAM/3271 (Datasystems Interactive Communications Access Method) is a communications option that permits a user-written DIBOL applications program execution on a Datasystem to communicate with a user-written application program running on an IBM/360 or 370 under CICS. With the 360/370, DICAM uses the same interactive communications facilities as the 3271 remote keyboard display controller. DICAM/3271 requires a Datasystem 150, 315, 320, or 350 with at least 8K bytes of memory available for DICAM and at least 500 bytes of memory available for one buffer.

## SOFTWARE

OPERATING SYSTEM: CTS-300 (Commercial Transaction System) supports up to 4 tasks on a D150, D315, or a D320, 8 tasks on a D330, and 16 on a D350. This disk-resident operating system is an enhanced version of COS-300, which was available on the DS-340. Included with CTS-300 is a DIBOL-11 (Digital's version of COBOL) compiler, utilities that include sort/merge, and DECFORM. CTS-300 supports either interactive or batch processing, and offers sequential, indexed sequential, or random file access. According to DEC, CTS-300 supports multiple terminals running independent tasks on unique or shared files.

CTS-300 includes the following features: text editor, printer spooling, DIBOL-11 debugging techniques, cross references, sorting and merging utilities, Peripheral Interchange Program (PIP) for file maintenance, SYSGEN, and PATCH for updating the operating system. CTS-300 requires 20K bytes of memory in a multi-user environment.

"Big block send and receive" is a noteworthy feature of CTS-300. A maximum of 252 bytes of information can be transferred between various programs. This feature allows various jobs to share specialized programs that might handle one specific function, such as screen I/O or disk I/O. By sharing resources, six jobs would use the same disk accessing program, etc., thereby eliminating repetitious programming and saving memory at the same time.

CTS-300 Version 6, a more powerful version of the CTS-300 operating system, offers improved system functions plus modified and improved utilities. A new keyboard editor, an improved print utility, and greater disk economics are featured. Version 6 allows program development and debugging to be performed concurrently with standard applications. Remote debugging can be performed if the remote system has 128K bytes of memory or more. Utility execution times as well as system documentation are improved through CTS 300 Version 6.

LANGUAGE: *DIBOL-11*, an enhanced version of the DIBOL language that was available for use on other DEC computers, provides software compatibility throughout the Datasystem family.

DIBOL-11 is a compatible extension of the language first used on 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/file definition through OPEN statements in the procedures section. Printed output formatting is accom-

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There were no significant problem areas which rated more than a few responses. Four users commented that the delivery and/or installation was late. Three respondents commented that the vendor did not supply all of the promised software and support. All three of these users reported that proprietary software packages were their source of application programs so it is not clear if DEC or a software vendor were to blame.

The respondents were generally lavish in their praise of the Datasystems. Nine users were happy with their response time; eight noted the ease with which you could reconfigure or expand the system; and five reported that the productivity aids did keep programming costs down.

The critical question, "Would you recommend this system to another user in your situation?" received an outstanding response with 16 users saying yes and only 1 indicating no.

The ratings are largely self-explanatory. DEC has enjoyed a good reputation for reliable equipment throughout its product line, and is clearly maintaining that reputation in the Datasystems.

Fewer than half of the Datasystems now being manufactured are delivered directly to end users to do their own programming. At present, more than half of the systems are sold on an OEM basis to firms that customize software and resell the DEC equipment with packaged programs. DEC estimates that close to 95 percent of their smaller Datasystems (configured with a system price less than $50,000) are shipped to OEMs for application customization. Thus, overall user satisfaction (or lack thereof) with a particular system will tend to reflect both the hardware and the application software, whatever its source.□

plished 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-11 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-11 programs are executed through a run-time interpreter. A dynamic snapshot facility, called DDT for DIBOL-11 Debugging Technique, permits stopping a program with display of variable values; the values can be modified and a new checkpoint established.

*DECFORM* is a generative programming aid that allows a customer to tailor screen formatting and editing procedures. According to DEC, DECFORM is capable of screen formatting, checking, prompting, and inquiring; is easy to use; and is compatible with both CTS-300 and CTS-500.

Five basic tasks can be performed: 1) Add—for basic data entry; 2) Inquiry— for examination without change; 3) Change—for file maintenance; 4) Verify—for re-keying pre-selected fields; and 5) Delete (not available for sequential files).

Screen formatting is simply a matter of building a table of field size, field name, horizontal position, and vertical position for each desired field on the screen. This table is passed over to the DECFORM compiler along with the name of the file to be accessed; the DECFORM compiler then generates a DIBOL-11 program. Formats may be divided into multiple screens to allow for more logical layouts and to eliminate crowding. Provisions are also made for passwords and other security procedures. Once the format is displayed, the operator may begin keying in data, and will receive prompting and error messages as they are needed.

The following edits are incorporated into DECFORM: display leading zeros; stop after every field is entered; retain previous screen when starting a new record; override checks through special characters; automatic duplication of fields; automatic incrementing of fields; establish initial values for fields; check digits; perform arithmetic functions (extensions, taxes, etc.); hide a field; and list running totals.

The following checks are available: alphanumeric, numeric, fields required, field must be filled, constant insertion, range checks on numeric fields, table look-up, cross-field comparisons, field protection (unalterable), subfield checking to individual characters, and data retrieval from other files.

According to DEC, it is possible to use the DECFORM procedures to extend, discount, and tax an invoice, while pulling alphabetic descriptions from a table.

## UTILITIES

Please refer to Report M11-384-301 for a discussion of the Datasystem utilities.

## APPLICATIONS SOFTWARE

DEC does not sell or support applications software directly. DEC's Datasystem Application Software is developed and marketed by its large base of commercial OEMs and distributors. The DEC Datasystems are covered in the AIP (Applications Interchange Program) catalog distributed by the Commercial Products Group. The applications are grouped by industry and application. DEC acts as a clearinghouse only and has no role in any contractual agreements with the supplier.

## PRICING

POLICY: DEC generally provides the Datasystems on a purchase basis, with separately priced maintenance agreements. Leasing arrangements are available through DEC's joint venture with U.S. Leasing Corp. or through TEC Leasing Corp. of New York. Lease rates vary with the prime interest rate, the customer's volume of business with DEC, and the value of the equipment being leased.

Software maintenance is offered through several levels of optional service, ranging from a periodic software newsletter to automatic updates of software and manuals (software subscription service). In addition, software components, including documents and updates, can be purchased separately from Digital's Software Distribution Center.

The Digital Equipment Computer Users Society (DECUS) is a voluntary, non-profit users' group supported by DEC. DECUS provides an extensive program library, users' groups, special interest groups, and workshops/symposia. Technical symposia are sponsored twice a year in the United States and once a year in Europe, Canada, and Australia. In terms of documentation, the society has the responsibility of maintaining the DECUS program library and publishing a

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library catalog, the proceedings of symposia, and a periodic newsletter, *DECUSCOPE*.

Training credits are issued with the systems, allowing the customer to obtain free training in programming techniques and systems operation and applications. Each individual student week of instruction or fraction thereof requires one training credit. Training is offered in 17 DEC facilities found in Japan, Australia, Great Britain, Germany, France, The Netherlands, Sweden, Italy, Canada, and throughout the United States. At present, over 100 courses are offered. Digital also offers on-site instruction in both standard and customized courses and self-paced audio/visual (A/V) courses. A/V courses are presented through mixed media of audio/film-strip cartridges, video cassettes, and workbooks. DEC's Special Systems group offers training in both hardware and software areas on-site and in DEC training centers.

Field service is offered on several levels to meet varying customer needs. For customers with in-house troubleshooting and self-maintenance capabilities, DEC offers the off-site facilities of its Product Repair Center (PRC), with 17 locations throughout the world. Services provided by PRC include return-to-PRC agreements which cover all repairs (user performed troubleshooting) on a specific CPU, peripheral, or system for one year; exchange service providing teletypewriters, punches, and selected disk drive exchange at a flat rate; a fixed quote service, which provides a quote on equipment repair before any work is performed; and a loose piece module repair plan for modules and subassemblies. Under the repair plan, DEC estimates a typical turn-around repair time of 20 working days after receipt at the customer returns area (CRA). PRC also offers a module exchange service on a yearly contract basis, allowing a customer to replace a defective module within seven working days after the time it is received at the CRA. DEC supplies special mailers for both the loose piece module repair plan and the module exchange service. Also available for this class of customer is a customer spares program, which includes component and subassembly spares, engineer-designed spares kits, memory stack spares, maintenance test equipment, maintenance documentation service, and emergency parts service.

On-site field service is offered worldwide through a network of 300 offices, 190 of which are located in North America. These offices provide both field service and spare parts inventory. Over 6000 service representatives are assigned to these offices.

Per Call On Site Service is offered to customers for whom downtime may not be critical and who have sufficient expertise to perform first-line maintenance, or as a supplementary program for standard service agreement customers if remedial maintenance is required outside their normal hours of coverage. Labor rate charges are portal-to-portal; parts and travel expenses are rated separately. Labor rates from 8 a.m. to 5 p.m. Monday through Friday are $63 per hour; all other times, including Digital holidays, are priced at $75 per hour. A two-hour minimum is in effect for per call service. Travel charges are based on a portal-to-portal rate of 16 cents per mile plus any commercial travel expenses incurred. Normal response for per call service is one to two days. If unanswered in three working days, per call requests are placed in the same category as standard service agreement or warranty customers.

The basic field service agreement includes remedial maintenance; preventive maintenance; an assigned service representative; all parts, material, and labor; engineering modifications; and documentation. Hours of coverage are 8 a.m. to 5 p.m. Monday through Friday. (Preventive maintenance time is extended by 3 hours to 8 p.m. on weekdays.) Extensions are available to allow coverage up to 24 hours a day, 7 days a week.

The DECservice agreement is the same as the basic field service agreement except for these additions: response time of four hours or less if a call is made during coverage hours; continuous service until system level repairs are complete; and no extra charge for service continued after coverage hours.

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

D150 including an LSI-11 processor, 32K bytes of MOS memory, one RX01 floppy disk, one VT100 console, and the CTS-300 operating system: $12,100.

D315 with PDP-11/23 processor, 64K bytes of MOS memory, dual RX02 floppy disks, one VT100 console, and the CTS-300 operating system: $15,500.

D325 including a PDP-11/03 processor, 64K bytes of MOS memory, a bootstrap loader, a 4-line asynchronous serial interface, two RL01 disks, one VT100 console, the CTS-300 operating system, and DIBOL: $28,400.

D335 including a PDP/11-23 processor, 128K bytes of MOS memory, a 4-line asynchronous serial interface, two RL01 disks, one VT100 console, the CTS-300 operating system, and DIBOL-11: $29,900.

D336 including a PDP-11/23 processor, 128K bytes of MOS memory, a 4-line asynchronous serial interface, two RL02 disks, one VT100 console, the CTS-300 operating system, and DIBOL-11: $33,700.

D356 including a PDP/11-34A processor, 128K bytes of parity MOS memory, hardware memory management, a bootstrap loader, a serial line interface, a real-time clock, two RL02 disks, one VT100 console, the CTS-300 operating system, and DIBOL-11: $40,400.

D358 including a PDP-11/34A processor, 128K bytes of parity MOS memory, hardware memory management, a bootstrap loader, a serial line interface, a real-time clock, two RK07 disks, one VT100 console, the CTS-100 operating system and DIBOL-11: $52,400.■

## EQUIPMENT PRICES

| BASIC SYSTEMS | | Purchase Price | Monthly Maint. |
|---|---|---|---|
| **DATASYSTEM 150 SERIES** | | | |
| D150A-A | LSI-11/03 processor, 32K bytes of MOS memory, dual RX01 disks (512K bytes total), one VT100 console, and the CTS-300 operating system, table-top configuration | $12,100 | $62 |
| D150A-B | Same as D150A-A except 64K bytes of MOS memory | 12,900 | 62 |
| D150A-F | Same as D150A-B except LA120 hardcopy terminal included | 15,700 | 87 |

# DEC Datasystem 150 and 300 Series

## EQUIPMENT PRICES

| | | Purchase Price | Monthly Maint. |
|---|---|---|---|
| **DATASYSTEM 315 SERIES** | | | |
| D315 | PDP-11/23 processor, dual RX02 disks (1 megabyte total), 4 lines, one VT100 console, and the CTS-300 operating system | 15,500 | 120 |
| **DATASYSTEM 320 SERIES** | | | |
| D325C-A | PDP-11/03 processor, 64K bytes of MOS memory, bootstrap loader, 4-line asynchronous serial interface, two RL01 disks (10.4 megabytes total) and controller, one VT100 console, 40 inch cabinet and workstation, the CTS-300 operating system, and DIBOL-11 instruction set | 28,400 | 200 |
| D325C-B | Same as D325C-A except LA180 printer included | 29,400 | 250 |
| **DATASYSTEM 330 SERIES** | | | |
| D335C-A | PDP-11/23 processor, 128K bytes of MOS memory, 4-line asynchronous serial interface, two RL01 disks (10.4 megabyte total) and controller, one VT100 console, 40 inch cabinet and workstation, the CTS-300 operating system, and DIBOL-11 programming language | 29,900 | 212 |
| D335C-B | Same as D335C-A except LA180 printer included | 31,000 | 267 |
| D336C-A | PDP-11/23 processor, 128K bytes of MOS memory, 4-line asynchronous serial interface, two RL02 disks (20.8 megabytes total) and controller, one VT100 console, 40 inch cabinet and workstation, the CTS-300 operating system, and DIBOL-11 programming language | 33,700 | 232 |
| D336C-B | Same as D336C-A except LA180 printer included | 34,800 | 287 |
| D336C-J | Same as D336C-A except LP25 printer included | 42,300 | 322 |
| **DATASYSTEM 350 SERIES** | | | |
| D356D-A | PDP-11/34A processor, 128K bytes of parity MOS memory, hardware memory management, bootstrap loader, serial line interface, real-time clock, two RL02 disks (20.8 megabytes total) and controller, one VT100 console, two 40 inch cabinets, one workstation, the CTS-300 operating system, and DIBOL-11 programming language | 40,400 | 274 |
| D356D-B | Same as D356D-A except LA180 printer included | 42,500 | 329 |
| D356D-J | Same as D356D-A except LP25 printer included | 49,000 | 364 |
| D358D-A | PDP-11/34A processor, 128K bytes of parity MOS memory, hardware memory management, bootstrap loader, serial line interface, real-time clock, two RK07 disks (56.0 megabytes total) and controller, one VT100 console, three 40 inch cabinets and 1 workstation, the CTS-300 operating system and DIBOL-11 programming language | 52,400 | 406 |
| D358D-B | Same as D358C-A except LA180 printer included | 54,500 | 461 |
| D358D-J | Same as D358C-A except LP25 printer included | 61,000 | 496 |
| **PROCESSOR OPTIONS AND MEMORY FOR PDP-11/03 (D320 SERIES)** | | | |
| MSV11-DC | 32K bytes of MOS memory | 1,450 | 15 |
| MSV11-DD | 64K bytes of MOS memory | 1,600 | 25 |
| **PROCESSOR OPTIONS AND MEMORY FOR PDP/23 (D330 SERIES)** | | | |
| KEF11-AA | Single or double precision point microcode | 420 | NC |
| MSV11-DC | 32K bytes of MOS memory | 1,450 | 15 |
| MSV11-DD | 64K bytes of MOS memory | 1,600 | 25 |
| **PROCESSOR OPTIONS AND MEMORY FOR PDP-11/32A (D350 SERIES)** | | | |
| FP11-A | Floating point processor with single or double precision (32-bit or 64-bit) | 3,100 | 23 |
| KK11-A | 2K bytes of RAM cache memory | 4,150 | 17 |
| MS11-JP | 32K bytes of parity MOS memory | 2,350 | 25 |
| MS11-LB | 128K bytes of parity MOS memory | 4,300 | 40 |
| MS11-LD | 256K bytes of parity MOS memory | 6,400 | 75 |
| **MASS STORAGE** | | | |
| RXV21-BA | 1 megabyte Floppy disk subsystem; includes controller and two 512K byte RX02 drives; 61K bytes/second transfer rate; 263 millisecond average access time (D320 and D330 Series) | 4,150 | 45 |
| RX211-BA | 1 megabyte Floppy disk subsystem; includes controller and two 512K byte RX02 drives; 61K bytes/second transfer rate; 263 millisecond average access time (D350 Series) | 4,150 | 45 |
| RK711-PA | Single-access 28.0 megabyte cartridge disk RK07 drive and controller; 538K bytes/second transfer rate; 49 milliseconds average access time (D350 Series) | 15,500 | 145 |
| RL211-AK | Single-access 10.4 megabyte removable RL02 cartridge disk drive and controller; 512K bytes/second transfer rate; 67.5 milliseconds average access time (D350 Series) | 6,900 | 68 |
| RL11-AK | Single-access 5.2 megabyte removable RL01 cartridge disk drive and controller; 512K bytes/second transfer rate; 67.5 milliseconds average access time (D350 Series) | 5,500 | 58 |
| RLV11-AK | Single-access 5.2 megabyte removable RL01 cartridge disk drive and controller; 512K bytes/second transfer rate; 67.5 milliseconds average access time (D320 and D330 Series) | 5,500 | 58 |
| RLV21-AK | Single-access 10.4 megabyte removable RL02 cartridge disk drive and controller; 512K bytes/second transfer rate; 67.5 milliseconds average access time (D320 and D330 Series) | 6,900 | 68 |
| RK07-PA | Single-access 28.0 megabyte disk and cartridge | 11,200 | 115 |
| RL01-AK | Single-access 5.2 megabyte removable RL01 cartridge disk drive | 4,050 | 50 |
| RL02-AK | Single-access 10.4 megabyte removable RL02 cartridge disk drive | 5,600 | 60 |

# DEC Datasystem 150 and 300 Series

## EQUIPMENT PRICES

| | MASS STORAGE (Continued) | Purchase Price | Monthly Maint. |
|---|---|---|---|
| RK07K-DC | 28.0 megabyte disk cartridge for RK07 | 349 | NC |
| RK07-AC | 28.0 megabyte alignment cartridge for RK07 | 1,386 | NC |
| RK07K-EF | Error-free 28.0 megabyte disk cartridge for RK07 | 449 | NC |
| RL01K-DC | 5.2 megabyte data cartridge for RL01 | 159 | NA |
| RL02-DC | 10.4 megabyte data cartridge for RL02 | 213 | NA |
| RJM02-AA | Single-access 67.0 megabyte RM02 disk pack drive and controller; 806K bytes/second transfer rate; 42 milliseconds average access time (D350 Series) | 25,700 | 170 |
| RM02-AA | Single-access 67.0 megabyte disk pack drive | 19,300 | 140 |
| RM03-P | 67.0 megabyte disk pack for RM02/RM03 drives | 635 | NA |
| | **MAGNETIC TAPE EQUIPMENT** | | |
| TJE16-AA | Tape transport and controller; 45 inches/second; 9-track; 800/1600 bpi; single width high-boy cabinet (D350 Series) | 20,200 | 147 |
| TME11-EA | Tape transport and controller; 45 inches/second; 9-track; 800 bpi; 72 inch cabinet (D350 Series) | 16,100 | 142 |
| TS11-DA | Tape transport and controller; 45 inches/second; 9-track, 1600 bpi, 72 inch cabinet (D350 Series) | 15,400 | 75 |
| TJE16-EA | TJE16-AA in 72 inch cabinet | 20,200 | 147 |
| TE16-AE | Tape transport; 45 inches/second; 9-track; 800/1600 bpi; requires TJE16-A; single width high-boy cabinet | 12,800 | 87 |
| TE16-EE | Tape transport; 45 inches/second; 9-track; 800/1600 bpi; requires TJE16-E; 72 inch cabinet | 12,800 | 87 |
| TE10W-EE | Tape transport; 45 inches/second; 9-track; 800/1600 bpi; requires TME11-E; 72 inch cabinet | 12,800 | 104 |
| | **PRINTERS** | | |
| LA11-PA | 132 columns; 96 char.; 180 cps (LA180) (D350 Series) | 4,050 | 55 |
| LP11-AA | 64 char.; 285 lpm (LP25); plus cable | 7,800 | 90 |
| LP11-BA | 96 char.; 285 lpm (LP25); plus cable | 8,400 | 90 |
| LP11-VA | 132 columns; 64 char.; 300 lpm (D350 Series) | 12,600 | 155 |
| LP11-WA | 132 columns; 96 char.; 240 lpm | 15,000 | 155 |
| LPV11-AA | 64 char., 285 lpm (LP25), (D320 and D330 Series) | 7,800 | 90 |
| LPV11-BA | 96 char.; 285 lpm (LP25) (D320 and D330 Series) | 8,400 | 90 |
| LPV11-PA | 132 columns; 96 char.; 180 lpm (LA180) (D320 and D330 Series) | 4,050 | 55 |
| LPV11-VA | 132 columns; 64 char.; 300 lpm (D320 and D330 Series) | 12,600 | 156 |
| LPV11-WA | 132 columns; 96 char.; 240 lpm (D320 and D330 Series) | 15,000 | 156 |
| | **TERMINALS** | | |
| LA34-AA | DECwriter IV; 30 cps; 9 x 7 dot matrix; adjustable char. width; 7 character sets; superscripts and subscripts | 1,600 | — |
| LA38-GA | Table-top DECwriter IV printing terminal; 18 button numeric keypad; 300 bps; 30 cps; EIA interface and null modem cable | 1,600 | 16 |
| LA38-HA | Same as LA38-GA except free-standing | 1,700 | 16 |
| LA120-DA | Free-standing hardcopy terminal; EIA interface to 9600 baud; 180 cps; 7 x 7 dot matrix | 2,800 | 30 |
| LA120-RA | DECprinter III hardcopy receive-only terminal; 180 cps; EIA/CCITT interface | 2,700 | 35 |
| VT62-AC | Alphanumeric Video Display Terminal; EIA/CCITT interface; 24 x 80-character upper/lower case display | 3,350 | 50 |
| VT100-AA | High Performance Video Display Terminal; EIA interface; 24 x 80-columns or 14 x 132-columns; features double width/double-size characters, 83-character detachable keyboard; split screen | 2,050 | 17 |
| VT100-NA | Same as VT100-AA except DECform keycaps included | 2,050 | 17 |
| VT1XX-AB | Advanced Video Option for VT100; adds 10 lines of 132-column data for total of 24 x 132 columns; provides BOLD, BLINK, UNDERLINE, and REVERSE VIDEO attributes in any combination | 390 | 3 |
| VT1XX-AC | Printer Port Option for VT100; local or remote print capability; requires VT1XX-AB and null modem cable | 385 | |
| VT55-FE | EIA version of table-top CRT display terminal with graphics and alphanumeric capabilities; integral hard copy device | 5,400 | 65 |
| VT55-FA | 20 mA version of VT55-FE | 5,400 | 65 |
| | **COMMUNICATIONS** | | |
| | **SINGLE LINE ASYNCHRONOUS INTERFACES (D320 and D330 SERIES)** | | |
| DLV11 | Serial interface unit; optically-isolated 20 mA current loop or EIA/CCITT interface levels; selectable stop and data bits; data rates from 50 to 9600 bits per second; no modem control; no cables | 320 | 5 |
| DLV11-EB | Asynchronous line interface with EIA interface levels; seletable stop and data bits; data rates from 50 to 19,200 bits per second; full modem control; includes cable | 430 | 7 |
| DLV11-E | DLV-11EB without cable | 320 | 7 |

# DEC Datasystem 150 and 300 Series

## EQUIPMENT PRICES

| | | Purchase Price | Monthly Maint. |
|---|---|---|---|
| **SINGLE LINE ASYNCHRONOUS INTERFACES (D320 and D330 SERIES) (Continued)** | | | |
| DLV11FB | EIA/CCITT asynchronous line interface module; selectable stop and data bits; data rates from 50 to 19,200 bits per second; no modem control; includes cable | 360 | 7 |
| DLV11FA | 20 mA asynchronous line interface module; selectable stop and data bits; data rates from 50 to 19,200 bits per second; no modem control; includes cable | 360 | 7 |
| DLV11-F | Asynchronous line interface module; supports 20 mA current loop or EIA/CCITT interface levels; selectable stop and data bits; data rates from 50 to 19,200 bits per second; no modem control; no cables | 310 | 7 |
| **SINGLE LINE ASYNCHRONOUS INTERFACES (D350 SERIES)** | | | |
| DL11-WB | EIA/CCITT serial line interface and line frequency real-time clock. Switch selectable character size, parity, stop bits and speed of operation; requires null modem for local devices; includes cables | 820 | 6 |
| DL11-WA | 20 mA serial line interface and line frequency real-time clock; switch selectable character size, parity, stop bits and speed of operation; includes cable | 820 | 6 |
| DL11-E | Modem controlling EIA/CCITT serial line interface with switch selectable speed, character size, parity, and stop bit size; includes cable | 820 | 7 |
| **ASYNCHRONOUS MULTIPLEXERS (D320 AND D330 SERIES)** | | | |
| DLV11-J | 4-line asynchronous EIA/CCITT serial line unit; data rates from 150 to 38,400 bits per second; bi-directional data input/output lines; no modem control; no cables | 500 | 9 |
| DLV11-KA | EIA to 20 mA converter with cable for DLV11-J | 160 | 6 |
| DZV11-B | Asynchronous 4 line multiplexer for EIA/CCITT terminals or lines; programmable speeds to 9600 bits per second on a per-line basis; includes data set control for BELL 103/113 modems or equivalent | 1,000 | 9 |
| **ASYNCHRONOUS MULTIPLEXERS (D320 AND D330 SERIES)** | | | |
| DZ11-A | EIA/CCITT Asynchronous 8-line Multiplexer; speeds and formats are programmable on a per-line basis; expandable to 16 lines; to 9600 bits per second | 2,450 | 29 |
| DZ11-B | EIA/CCITT 8-line Multiplexer Expansion Unit for DZ11-A | 1,950 | 25 |
| DZ11-C | 20 mA Current Loop version of DZ11-A | 2,550 | 29 |
| DZ11-D | 20 mA Current Loop 8-line expansion unit for DZ11-C | 2,000 | 25 |
| DZ11-E | Asynchronous 16-line multiplexer; EIA/CCITT terminals or lines, speeds and formats are programmable on a per-line basis; to 9600 bits per second | 4,100 | 50 |
| DZ11-F | 20 mA Current Loop version of DZ11-E | 4,250 | 50 |
| DH11-AD | Programmable Asynchronous 16-line Multiplexer; EIA/CCITT interface and modem controls; cables not included | 8,100 | 61 |
| DH11-AE | Same as DH11-AD without modem controls | 7,200 | 51 |
| **SINGLE LINE SYNCHRONOUS INTERFACES** | | | |
| DUV11-DA | Full/Half Duplex Synchronous Interface; provides serial-to-parallel and parallel-to-serial data conversion, and modem control; connects LSI-11s to modem (D320 and D330 Series) | 800 | 7 |
| DUP11-DA | Full/Half Duplex Synchronous Interface; programmable characteristics; speed to 9600 bps (D350 Series) | 1,500 | 10 |
| KG11-A | Communications arithmetic option; computes cyclic redundancy check (CRC), longitudinal redundancy check (LRC), and block check characters (BCC) (D350 Series with DUP11-DA only) | 1,350 | 6 |
| **SOFTWARE/HARDWARE PACKAGES FOR D150 SERIES** | | | |
| DS3CK-AY | CTS-300 2780/3780 Remote Data Communications Package (RDCP) | 3,000 | NA |
| DS3CP-AY | CTS-300 Datasystem Interactive Communications (DICAM/3271) | 3,400 | NC |
| **SOFTWARE/HARDWARE PACKAGES FOR D320 and D330 SERIES** | | | |
| DS3CJ-A | RDCP | 3,800 | 7 |
| DS3CN-A | DICAM/3271 | 4,050 | 7 |
| **SOFTWARE/HARDWARE PACKAGES FOR D350 SERIES** | | | |
| DS3CH-1 | RDCP | 4,450 | 9 |
| DS3CQ-A | DICAM/3271 | 4,750 | 9 |
| QP527-A | CTS-300 to CTS-500 Level 3 Upgrade; for any peripheral except RK06 DECpack or RK07 cartridge disk | 13,800 | - |
| QP527-A | CTS-300 to CTS-500 Level 3 upgrade; for RK06 DECpack or RK07 cartridge disk | 14,400 | -- |