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COMPUTER SYSTEMS GROUP
SANTA BARBARA PLANT



SOFTWARE SYSTEMS INDEX

PRODUCT SPECIFICATION

REV LTR	REVISION ISSUE DATE	APPROVED BY	REVISIONS
F	11/12/81	<i>R. Swick</i>	<p>Changes for MARK 10.0 Release</p> <p>5 Updated DMSII, DMS/DASDL, and DMS/RECOVERDB paragraphs. Updated "The following utility programs" paragraph.</p> <p>8 Updated "1400 INTERPRETER" description.</p> <p>11 Added "FORTRAN77 INTERP" to chart.</p> <p>13 Added "FORTRAN77" to chart.</p> <p>15 Updated "Minimum storage requirements". Updated "Disk Sort" description.</p> <p>17 Updated "The set of programs" paragraph. Updated "The host-supported function" paragraph.</p> <p>19 Added description on "SYCOM".</p> <p>20 Added "NDL 11.5K Bytes" paragraph.</p> <p>21 Added "DATA COMMUNICATION BDLC CONFIDENCE PROGRAM".</p> <p>25 Added "CONVERT BACKUP" description.</p> <p>26 Added "FOREIGN/TAPECOPY" description.</p> <p>28 Added "SYSTEM/ODT" description.</p>



PRODUCT SPECIFICATION

REV LTR	REVISION ISSUE DATE	APPROVED BY	REVISIONS
D	05-25-	<i>J. Dale</i>	<p>MARK 8.0 RELEASE</p> <p>22 ADDED SQUASH/USER.DISK P.S. 2222 2574, SYSTEM/COPY P.S. 2222 2905 AND TERMINAL TEST P.S. 2222 2608 TO NORMAL-STATE UTILITIES. DELETED 'DISK/COPY' FROM NORMAL-STATE UTILITIES.</p> <p>23 DELETED 'DISK/COPY IS A ... CHANGING THE FILE-NAME' FROM NORMAL-STATE UTILITIES.</p> <p>24 ADDED SQUASH/USER.DISK PARAGRAPH.</p> <p>25 ADDED SYSTEM/COPY PARAGRAPH.</p> <p>26 ADDED TERMINAL TEST PARAGRAPH.</p>
E	6/11/80	<i>J. Dale</i>	<p>Changes for MARK 9.0 Release</p> <p>Changed SPO to ODT throughout. Deleted PRODUCT: MCPI section.</p> <p>2 Changed 600K bytes to 800K bytes for MCP II disk requirements. Deleted "One Card Reader (80 or 96 Column) (Desirable)" from Required and/or desirable peripherals.</p> <p>3 Changed MTC-2 to MTC-1-2-3 and MTC-4 to MTC-4-5 in "The MCP requires" paragraph. Deleted "System disk, except for Head-Per-Track combinations (1C, 1A, and 5N), must all be the same type." from SYSTEM RESTRICTIONS section. Changed must to should for "d" and "e" in SYSTEM RESTRICTIONS.</p> <p>5 Updated DASDL description.</p> <p>8 Updated "Each 1311 disk" sentence.</p> <p>9-13 All references to IBASIC, COBOL74, and FORTRAN77 added. Added "(B1720 only)" to all headings. Added CACHE (B1800/B1900) section. Updated SDL and RPG INTERP M-memory.</p> <p>13 Updated DISK SEGMENTS and S-MEMORY BYTES for the compilers. Added IBASIC reference.</p> <p>14 Deleted all references to SORT/COLLATE. Updated DISK SEGMENTS and S-MEMORY for SORT PROGRAM.</p>

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E	6/11/80	<i>J. Hale</i>	<p>Changes for MARK 9.0 Release</p> <p>16 Changed "JESG" to "JESI" in DATA COMMUNICATION PROGRAM.</p> <p>17 Added MT686 to list of CANDE terminals.</p> <p>18 Added "memory requirements of DATACOMM."</p> <p>19 Deleted all references to CART/DUMP, CLDST.CASS and CLDST.TAPE. Added COLDSTART/TAPE and description.</p> <p>21 Deleted SORT/COLLATE and SYCOPY. Added CREATE/TABLE, FORTRAN77/ANALYZER, SYSTEM/FILE.INIT and SYSTEM/IS.MAINT. Updated CASSETTE/MAKER description.</p> <p>22 Added description of CREATE/TABLE.</p> <p>23 Added description of FORTRAN77/ANALYZER. Deleted description of SYCOPY. Updated SYSTEM/BACKUP description.</p> <p>24 Updated SYSTEM/BUILDTRAIN description. Added SYSTEM/FILE.INIT and SYSTEM/IS.MAINT descriptions. Updated SYSTEM/LOAD.CAS and SYSTEM/LOAD.DUMP descriptions.</p> <p>25 Updated SYSTEM/MAKEUSER, SYSTEM/SPOLOGOUT and TAPECOPY. descriptions.</p>

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REV LTR	REVISION ISSUE DATE	APPROVED BY	REVISIONS
D	05-25-79	<i>Wale</i>	<p>MARK 8.0 RELEASE</p> <p>1 REWROTE GENERAL DESCRIPTION PARAGRAPH.</p> <p>7 REPLACED P.S. NOT RELEASED WITH CANCELLED FOR DMSII. ADDED DMS/INQUIRY P.S. 2222 2566. ADDED 'DMS/INQUIRY PROVIDES' PARAGRAPH.</p> <p>8 DELETED '(APPROXIMATELY 24-26 KB)' FROM THE 'SYSTEM WORKING SET' PARAGRAPH. UPDATED B500 ENVIRONMENT DIAGRAM.</p> <p>9 ADDED SPD CONTROL-2 AND B500 PROGRAM PARAGRAPHS. REWROTE 1400 INTERPRETER ENVIRONMENT PROGRAM SECTION. DELETED '(APPROXIMATELY 24-26 KB)' FROM THE 'SYSTEM WORKING SET' PARAGRAPH. REPLACED 'ESTABLISHING AN ENVIRONMENT FILE IS ANALOGOUS TO...' IN 1400 INTERPRETER ENVIRONMENT PROGRAM IEP. CHANGED MEMORY REQUIREMENTS AND MCP REQUIREMENTS FOR 1400 INTERPRETER.</p> <p>10 ADDED 1400 ENVIRONMENT DIAGRAM. ADDED 'FIGURES INCLUDE STANDARD PERIPHERALS' PARAGRAPH. REPLACED '.12 KB' WITH '.2 KB' IN 'EACH TAPE STATION OPEN... REQUIRES .2 KB.' IN 1400 INTERPRETER. DELETED 'READABLE EBCDIC FORMAT.' FROM '1311 DISK FILES...' IN 1400 INTERPRETER FIFTH PARAGRAPH. ADDED 'WHICH IS ALSO READABLE BY A' TO '1311 DISK FILES... NORMAL-STATE JOB.' IN 1400 INTERPRETER FIFTH PARAGRAPH.</p> <p>12 DELETED 'DISK' FROM 'EXTERNAL DISK SEGMENT SIZES...' IN REQUESTS AND SIZES SECTION. UPDATED REQUESTS AND SIZES DIAGRAM.</p> <p>14 UPDATED 'STORAGE REQUIREMENTS' IN PRODUCT COMPILERS.</p> <p>15 ADDED SORT/UTILITY P.S. 222 2582. ADDED SORT/UTILITY TO STORAGE REQUIREMENTS SECTION DIAGRAM.</p> <p>16 ADDED SORT/UTILITY AIDS PARAGRAPH AND ABILITIES.</p> <p>17 ADDED RD P.S. 2222 2756.</p> <p>18-19 ADDED REMOTE/DISPLAY (RD) AND ABILITIES PARAGRAPH.</p>

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GENERAL DESCRIPTION

This product specification represents an index of B1900/B1800/B1700 software that operates with the hardware configurations described in the Hardware Systems Index, product specification number 1904 5681. The current release level of this document, with noted exceptions, is Mark 9.0.

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PRODUCT: MASIER CONTROL PROGRAM II

NAME -----	NUMBER -----
B1900/B1800/B1700 Software Operational Guide MCPII	1068731 P.S. 2212 5462

MCPII can be used on any B1900/B1800/B1700 system and requires:

- a. SDL Interpreter
- b. Appropriate system firmware, including the Micro-MCP, GISMO (the I/O Driver).

S-Memory requirements: S-Memory storage requirements are a function of the system configurations and software features utilized as well as the number of files and the access method used by the program. The memory is allocated into overlayable and non-overlayable segments. The non-overlayable areas include:

- a. Portions of the MCP, Micro-MCP, GISMO, and the SDL interpreter -- approximately 22K bytes minimum plus,
- b. User program's interpreter and data areas such as buffers, file headers, and FIB's--these memory requirements are user dependent.

The overlayable area is shared by the overlayable portions of the MCP and Micro-MCP as well as the user program code. However, this memory, although overlayable, will influence the run time of the program substantially. The S-Memory required to avoid thrashing must be determined by taking into consideration the number of files and the access method used by the programmer.

Minimum system storage requirements for support of MCPII are:

Disk -----	S-Memory -----
800K bytes for MCPII	40K bytes (peripherals required are listed below. See also SYSTEM RESTRICTIONS.)

Required and/or desirable peripherals are:

- a. One Line Printer (Desirable)
- b. One ODT (Typewriter, CRT, or TD830 terminal) (Required)
- c. One Disk (HPT, Pack or Cartridge) (Required)

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Peripherals permitted by MCP II include any of the units listed in the hardware section of the Systems Index, P.S. 1904 5681, with the exception of Reader-Sorter Control Three. Restrictions on permissible combinations are specified in P.S. 1912 3553.

The MCP places only the restrictions listed below on the location, number, and type of disk devices which may be connected to a system. Hardware restrictions, if any, exist in the hardware of the disk subsystem itself.

The MCP requires magnetic tape and cassette units to be consecutively numbered from one to maximum. That is to say, 1 through 8 for MTC-1-2-3 (MTA through MTH) and 1 through 15 (MTA through MTO) and 0 (MTP) for MTC-4-5.

System disk packs/cartridges are normally not removable. When attached to a system it is initialized to the channel to which it is attached. If the pack/cartridge is to be moved to another system, it must be placed on the same channel if that system is expected to Clear/Start using that pack.

Data Communication Controls (SLC and MLC) are not strictly under the control of MCP II, but are under the control of a data communications handler. It is required that the user generate the data communication handler via the NDL compiler. The size of the handler depends upon the user specification. The datacommunication handler itself is under the control of the MCP. The handler initiates all I/O operations directly. All interrupts encountered by the MCP which are intended for the handler are passed to the handler for servicing.

SYSTEM RESTRICTIONS

The following disk restrictions govern the use of B1900/B1800/B1700 disk devices:

- a. Fixed disk, if present, must be system disk.
- b. Fixed disk, if present, must have one unit assigned to Unit Zero.
- c. System disk, Unit Zero, must be assigned the lowest numbered channel having system disk.
- d. Removable system disk packs should be assigned to Channel 9.
- e. Removable disk cartridges should be assigned to Channel 5.

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MCP UTILITY PROGRAMS

See **UTILITY PROGRAMS** for individual descriptions of MCP-related utility programs.

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PRODUCE: DATA MANAGEMENT SYSTEM

NAME ----	NUMBER -----
DMSII Reference Manual	1089794
DMS/DASDL Compiler	P.S. 2219 0433
DMS/REORG.READ	P.S. 2219 0540
DMS/REORG.WRIT	P.S. 2219 0540
DMS/RECOVERDB	P.S. 2219 0532
DMS/INQUIRY	P.S. 2222 2566

The DMSII subsystem is an integral part of the MCP. It consists of the code necessary to perform the various Data Management communicate operations requested by the user program and generated by the compilers. The subsystem has no impact on users who do not utilize it.

The DMS/DASDL Compiler allows the user to specify the format and structure of his database to the system. The compiler accepts source language input from the user and generates COBOL source language libraries and/or RPG DMSII libraries which the user then invokes as a part of his program. It also generates the tables and dictionaries needed for the system to reference the various data items of the database.

DMS/REORG.READ and DMS/REORG.WRIT are two programs which are used together to allow the user to change the format and structure of the database without reloading all of the data.

The DMS/RECOVERDB program is a part of the Audit and Recovery feature of the DMSII subsystem. It allows users to recover the data contained in their databases in the event of some form of failure.

The DMS/INQUIRY program provides an environment in which a terminal can be used to extract information from a database produced by DMSII. This program allows nonprogrammers with little training, to utilize the system. At the same time the program maintains the ability to perform complex functions. DMS/BUILDING (described in DMS/INQUIRY product specification) sets up the environment necessary to run DMS/INQUIRY according to the information given by the user. This information includes the database to be accessed, and the valid users of that database.

The following utility programs are provided to assist in the verification and debugging of DMSII. DMS/DECOMPILER will decompile the database description. DMS/DB.MAT will analyze and print portions of the users database. DMS/DASDLANALY will analyze the tables which describe the database and print. DMS/AUDITANALY will analyze and print DMSII audit trails. DMS/REORGANAY will analyze and print the tables which identify

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the reorganization work to be done.

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PRODUCE: HARDWARE VIRTUAL MACHINES

NAME ----	NUMBER -----
B500 Interpreter Environment Program (IEP)	P.S. 2212 2731
B500 Interpreter	P.S. 2212 5348
1400 Interpreter Environment Program (IEP)	P.S. 2212 5504
1400 Interpreter	P.S. 2212 5355

B500 IEP

The B500 Interpreter Environment Program (IEP) accepts free-form parameters specifying the appropriate B100/B200/B300/B500 environment (memory/peripheral resources and special features). It generates a skeleton "code" file, called the environment for the B500 interpreter, which contains a PPB and FPBs but not code. This "code" file must be executed under the B1900/B1800/B1700 MCP II in order to create a virtual B100/B200/B300/B500 processor (as specified) which interprets the user's programs.

B500 Interpreter

The B500 Interpreter allows a B1900/B1800/B1700 system to emulate a B500 system and still run under the B1900/B1800/B1700 MCP II. The Interpreter processes instructions in an operating environment that is the same as that defined for the original B500 program.

The Interpreter requires a B1900/B1800/B1700 system with 64K S-memory, or greater, for users who wish to multiprogram emulation job(s) with other jobs under MCP II (Mark V.1 or higher).

In addition to the system working set requirements, the B500 Interpreter takes 9.7 KB.

Each B500 environment takes:

- 6.5 KB for a 4.8 K B500
- 10.0 KB for a 9.6 K B500
- 17.0 KB for a 19.2 K B500

The above figures include standard peripherals but exclude disk/tape. Each EU of B500 disk (ignoring number of mods) takes 2.5 KB of B1900/B1800/B1700 space. Each tape station open at the same time requires .2 KB. Any tape operations require a single maximum tape buffer (up to 19.2 KB) shared by all tapes in the B500 environment. This is user specified via the B500 IEP.

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Disk requirements are the same as the B500 Emulator with the exception that since each pseudo B500 EU is divided into disk areas (if created by the Interpreter), only those areas that are needed are assigned by the B1900/B1800/B1700 MCP. The B500 Interpreter is also able to view each pseudo B500 EU as a single disk area file as created by the B500 Emulator.

It is recommended that ODT Control-2 with a B9348 (TD801) not be used for the console printer because of possible confusion of the character set.

If B500 programs using magnetic tapes are to be interpreted, the B500 interpreter requires that 7-track, 9-track NRZ, or 9-track PE tape units be attached to the B1900/B1800/B1700 system.

The B500 Interpreter has at least the same capabilities as the B500 Emulator. Because of B1900/B1800/B1700 MCPII considerations, some features may be different from an operational standpoint. Performance will be approximately that of the B500 Emulator.

1400 Interpreter Environment Program (IEP)

The 1400 Interpreter Environment Program (IEP) accepts free-form parameters to establish an environment file for virtual machine execution under the B1900/B1800/B1700 MCP. This environment file is used by the 1400 Interpreter in its processing. The environment describes such things as 1400 memory size, peripheral configuration, 1400 Interpreter special options and B1900/B1800/B1700 MCP information. Establishing an environment file is analogous to the compilation of a program except that no object code is produced. Input to the 1400 IEP consists of specifications which describe the 1400 system, as well as the handling of the peripheral devices with respect to the B1900/B1800/B1700 MCP and system. The input is in free format and the IEP uses default characteristics whenever possible.

1400 Interpreter

The 1400 Interpreter allows the B1900/B1800/B1700 system to emulate an IBM 1400 system and still run under MCPII. The Interpreter processes instructions the same as the 1400 operating environment that was defined for the original 1401/1440/1460 series program.

The Interpreter requires a B1900/B1800/B1700 system with 96 KB or more of S-memory, for users who wish to multiprogram emulation job(s) under MCPII (Mark VI.0 or higher).

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In addition to the system working set requirements the 1400 Interpreter takes approximately 18 KB.

Each 1400 environment takes:

6.0 KB for a 4 K 1400
10.0 KB for a 8 K 1400
14.0 KB for a 12 K 1400
18.0 KB for a 16 K 1400

The above figures include standard peripherals excluding disk/tape. Each 1311 disk takes 2.6 KB of B1900/B1800/B1700 space, with a maximum of five pseudo 1311 disks declared. Each tape station open at the same time requires .2 KB. Any tape operations require a single maximum tape buffer (up to 32 KB) shared by all tapes in the 1400 environment. This is user-specified via the 1400 IEP.

Disk requirements are the same as the 1400 Emulator except pseudo 1311 disk files can be placed anywhere on the disk of the B1900/B1800/B1700 system using regular file directory methods if created by the 1400 Interpreter. This product is also able to view each pseudo 1311 disk file as single area files located at the fixed disk addresses as generated in the 1400 emulation area by the "Create Pseudo 1311 Disk" program. 1311 disk files can also be generated in EBCDIC format, which is also readable by a B1900/B1800/B1700 normal-state job.

The 1400 Interpreter has at least the same capabilities as the 1400 Emulator. Due to an MCP II environment, some features may be different from an operational standpoint. Performance will be approximately that of the 1400 Emulator.

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PRODUCE: S-LANGUAGE INTERPRETERS

NAME ----	NUMBER -----
BASIC S-Language	P.S. 2210 0135
COBOL S-Language	P.S. 2201 6729
COBOL74 S-Language	P.S. 2222 3069
FORTRAN S-Language	P.S. 2201 6737
IBASIC S-Language	P.S. 2228 3410
RPG S-Language	P.S. 2212 5306
SDL S-Language	P.S. 2201 2389

An appropriate S-Language Interpreter and an MCP are required to execute a compiled program. A common interpreter may be shared by more than one program.

S-MEMORY AND M-MEMORY (B1720 and up only)

The microcode of an interpreter is arranged so that the code necessary to interpret the most frequently executed S-operators (S-OPs) is loaded into control store (M-memory or M-string) on a B1720. Each interpreter requests a minimum and a maximum amount of M-memory.

If there is enough M-memory to satisfy at least the minimum requests of all the active interpreters, M-memory will be managed in a "distributed mode". If after allocating the minimums requested, there is still enough M-memory available, it will be divided among the active interpreters until their maximums are satisfied or the available M-memory is exhausted. If M-memory is exhausted before the maximums are satisfied, the remainder of the interpreters' non-overlayable microcode will be loaded into S-memory. Any microcode or tables beyond the maximum requested M-memory will always be loaded into S-memory.

If the sum of the minimums of all active interpreters exceeds that available, M-memory will be managed in "contention mode." In this mode, the entire non-overlayable microcode of all active interpreters is loaded into S-memory. M-memory is loaded with the microcode of the interpreter which is to get control of the processor next, each time the running interpreter is changed. Thus, "contention mode", in which M-memory is a duplication of part of S-memory, is more costly in terms of memory requirements than "distributed mode" because M-memory must be loaded each time the interpreter changes. "Contention mode" implies that M-memory is over-committed and should be avoided if possible by adding more M-memory or having fewer interpreters active at the same time.

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SEGMENTATION

Some interpreters have external segments which contain the microcode to interpret S-ops which are executed infrequently. These external segments normally reside on disk instead of in S-memory, thus reducing the demand for S-memory. These external segments are overlaid from disk into S-memory as needed. All interpreters have a main code block which is non-overlayable and is a candidate for loading into M-memory. External segments are not candidates for loading into M-memory.

REQUISIS AND SIZES (B1720 only)

The sizes of the minimum and maximum M-memory requests, main code sizes, and the number and size of external segments of all the interpreters are listed below. External segment sizes are approximate.

INTERPRETER NAME	MINIMUM M-MEMORY	MAXIMUM M-MEMORY	MAIN CODE BLOCK	EXTERNAL SEGMENTS	LARGEST SEGMENT
-----	-----	-----	----	-----	-----
BASIC INTERP	2KB	5KB	5.8KB	Not Seg	Not Seg
COBOL INTERP	2KB	4KB	3.1KB	3	.3KB
COBOL74 INTERP	2KB	8KB	10KB	Not Seg	Not Seg
FORTRAN INTERP	2KB	5KB	5KB	Not Seg	Not Seg
IBASIC INTERP	4KB	7KB	10KB	Not Seg	Not Seg
RPG INTERP	2KB	3KB	4.8KB	Not Seg	Not Seg
SDL INTERP	3KB	4KB	8KB	6	.8KB without ND 8KB with ND
FORTRAN77 INTERP	5KB	7KB	20KB	Not Seg	Not Seg

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CACHE (B1800/B1900)

On B1800 and B1900 machines, CACHE memory is used instead of M-memory. CACHE is loaded with four words at a time from S-memory as needed by the hardware.

Each time a micro instruction is fetched, the hardware:

1. determines where in CACHE it should be found
2. examines that bank to determine if it already contains the correct micro-code
3. if not present - loads it from S-memory
4. fetches the micro from the CACHE memory bank.

After a period of execution, a working set of the interpreter will present itself into CACHE (assuming not more than one heavily used section of code is contending for the same area of CACHE).

This method of memory management discourages the use of external segments.

Each time step 3 must be performed, an extra 11 clocks are taken to perform the S-memory fetch.

The number of 4 word blocks of micro-code contending for any bank of cache is dependent on the amount of cache memory available. For the more common 8K-CACHE memory systems, a 4 word micro block will contend with those blocks found at 8K word intervals down through the same code segment as well as with other code segments.

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PRODUCE: COMPILERS

NAME ----	NUMBER -----
BASIC S-Language	P.S. 2210 0135
COBOL S-Language	P.S. 2201 6729
COBOL74 S-Language	P.S. 2222 3069
FORTRAN S-Language	P.S. 2201 6737
IBASIC S-Language	P.S. 2228 3410
MIL	P.S. 2212 5298
NDL	P.S. 2212 5223
RPG S-Language	P.S. 2212 5306
SDL S-Language	P.S. 2201 2389
UPL S-Language	P.S. 2201 2389

NAME ----	SOURCE LANGUAGE SPECIFICATION -----
BASIC	Burroughs Corporate Standard for BASIC
COBOL	USASI COBOL (1968)
COBOL74	Burroughs Corporate Standard for COBOL
FORTRAN	Burroughs CSG FORTRAN (#1955 2801)
IBASIC	Refer to P.S. 2222 3044
MIL	P.S. 2212 5298
NDL	P.S. 2212 5223
RPG	Burroughs Corporate Standard for RPG
SDL (BNF Version)	P.S. 2212 5405
UPL	Burroughs UPL Reference Manual
FORTRAN77	Burroughs Corporate Standard for FORTRAN

NAME ----	COMPILER SPECIFICATION -----
BASIC Compiler	P.S. 2212 5280
COBOL Compiler	P.S. 2212 5314
COBOL Compiler Logic	P.S. 2212 5397
COBOL74 Compiler	P.S. 2222 3051
FORTRAN Compiler	P.S. 2212 5322
IBASIC Compiler	P.S. 2222 3044
RPG Compiler	P.S. Not Released
SDL Compiler	P.S. 2212 5389
UPL Compiler	P.S. 2212 5389

Note: All compilers require the presence of the SDL Interpreter and an appropriate MCP.

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Minimum storage requirements and memory for the compilers are as follows:

	DISK SEGMENTS	S-MEMORY BYTES
	-----	-----
BASIC	300	10K
COBOL	2400	20K
COBOL74	3200	56K
FORTRAN	708	20K
IBASIC	1200	56K*
MIL	600	44K
NDL	427	40K
RPG	2000	16K
SDL	1307	30K
UPL	1299	30K
FORTRAN77	1000	56K

* IBASIC memory requirements are 56KB for the first user and 32K bytes for each additional user.

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 P.S. 2219 0078 (F)

PRODUCT: SORT PROGRAMS FOR B1800/B1700 SERIES

NAME ----	NUMBER -----
SORT Language	P.S. 2201 6752
TAPE SORT	P.S. 2212 5181
DISK SORT	P.S. 2212 5264
INPLACE SORT	P.S. 2212 5538
MERGE	P.S. 2212 5207
SORT/UTILITY	P.S. 2222 2582

Minimum storage requirements are as follows:

Program Name -----	Disk Segments -----	S-Memory (Bytes) -----	
		Minimum -----	Default -----
SORT	178	4.5K	
SORT/TAPESORT	114	8K	20K
SORT/VSORT	110	8K	20K
SORT/QSORT	42	8K	10K
SORT/MERGE	42	8K	20K
SORT/UTILITY	321	7K	

B1900/B1800/B1700 SORT Language describes the SORT program that generate the required communicate to the MCP for execution of sort programs. Input to the SORT program consists of a file statement, a sort statement, and a user option statement, each of which is fully described in P.S. 2201 6752. Sorting can take place on either disk or tape and uses either replacement selection or partition exchange sorting techniques. The SORT intrinsics are defined for implementation with SDL, UPL, and COBOL.

B1900/B1800/B1700 TAPE SORT program allows the user to sort a designated file using magnetic tape storage for work files. The virtual collating sequence which is defined at the time of execution can be altered by the user through a Translate Table file.

B1900/B1800/B1700 DISK SORT program allows the user to sort from one to eight files using head-per-track disk, disk cartridge, or disk pack storage for work files. It is defined for implementation with RPG, SDL/UPL, COBOL74, and COBOL. The user can alter the virtual collating sequence which is defined at the time of execution.

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The B1900/B1800/B1700 IN-PLACE SORT program (QSORT) allows the user to sort a designated disk file. QSORT, rather than Disk Sort, is used when limited amounts of disk are available for sorting. QSORT is defined for implementation with RPG, SDL/UPL and COBOL languages for the B1900/B1800/B1700 systems and may also be called using the SORT program.

B1900/B1800/B1700 MERGE program allows the user to merge card, tape, or disk files according to a virtual collating sequence that is defined at the time of execution. The program can merge SDL/UPL, COBOL, and RPG files and handles variable-length records. It assumes a minimum of 20K bytes of memory, and additional buffers can be added (if memory is available) to improve the speed of the merge.

SORT/UTILITY aids former IBM SYSTEM/3 users in converting to B1900/B1800/B1700 equipment by performing all the functions of IBM's SDSORT program including the acceptance of IBM's input specifications. Additionally, SORT/UTILITY accepts free-format input specifications similar to those used by SORT. Procedurally, the SORT/UTILITY program has the ability to:

- define different types of records within an input file
- include or exclude categories within these records
- alter the appearance of the output file
- define keys as character or numeric, right or left signed, packed or unpacked, zone or digit
- specify collating sequence in any order

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PRODUCE: DATA COMMUNICATION PROGRAMS

NAME ----	NUMBER -----
BNA	P.S. 2228 3527
NDL/Library	P.S. 2212 5215
RJE/Terminal (SDL)	P.S. 2212 5231
RJE/Terminal (NDL)	P.S. 2212 5249
DC/AUDIT	P.S. 2212 5421
HASP	P.S. 2212 5256
CANDE	P.S. 2212 5561
CANDE/ANALYZER	P.S. 2219 0185
NDL (BNF Version)	P.S. 2212 5223
MCS Interface	P.S. 2212 5447
Supervisory MCS	P.S. 2219 0482
HOST/RJE	P.S. 2219 0136
SYSTEM/MAKEUSER	P.S. See UTILITY PROGRAMS (NORMAL-STATE)
Data Communications	P.S. 2212 5454
RJE3780	P.S. 2219 0391
RD	P.S. 2222 2756
SYCOM	P.S. 2219 0458
TEXT/EDITOR	P.S. not released

The set of programs that comprise BNA (Burroughs Network Architecture) allows the users to communicate with each other through the Network Services communications mechanism. The user of the system does not see the network as a collection of independently functioning systems; rather, it is considered a collection of logical "host"s whose inter-host communications mechanism is not important. To the user, the important aspect of the network is the availability of resources. The programs which comprise Network Services are BNA/NSP & BNA/NSM.

The host-supported functions that are the interface between the user and the resources of the network are collectively called Host Services. The programs that are included in this set are BNA/HSP, BNA/HSLID, & BNA/PLM. These programs provide support for remote ODT operations, Job Transfers, Station Transfers and the use of ports as an extension to Logical I/O.

B1900/B1800/B1700 Network Definition Language Library consists of procedures used in the operation of terminals that interface with computers. The library is a source language library that contains the REQUESTs and CONTROLs necessary to handle common line disciplines for the terminal devices qualified for use on B1900/B1800/B1700 systems.

RJE/Terminal (SDL) enables a B1900/B1800/B1700 to be used as a remote terminal to a system executing HOST/RJE.

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RJE/Terminal (NDL) enables a B1900/B1800/B1700 to be used as a remote terminal to a system executing HOST/RJE. This version of RJE/Terminal uses NDL to interface with the datacomm line.

B1900/B1800/B1700 DC/AUDIT is a utility program written to monitor RJE, HASP, BNA and NDL line activity. During installation of a datacomm system or when line oriented problems arise, the audit mechanism may be invoked to write information regarding the I/O that has taken place into a disk file that can then be printed out. The audit option can be set or reset dynamically.

HASP is a program that enables the B1900/B1800/B1700 to communicate with an IBM 360 or 370 running the Houston Automatic Spooling Program (HASP) or JESI. The B1900/B1800/B1700 can be connected to an IBM mainframe using leased or switched lines. The B1900/B1800/B1700 looks like a 360/20 or a 360/30 to an IBM mainframe, and HASP interface can be run with the wideband adapter as well as the non-wideband bisynchronous adapter.

B1900/B1800/B1700 CANDE is a command and edit language processor that enables users to create, update and maintain disk files. CANDE is qualified with Model 33 teletypes and TD800, TD820, TD830 and MT686 terminals.

CANDE/ANALYZER is a companion program to B1900/B1800/B1700 CANDE and is intended primarily to aid in debugging CANDE. The program assumes the burden of reading the CANDE audit files and of printing their contents in a format easily read by the user.

The NDL product specification contains a description, including BNF syntax, of the Network Definition Language for the B1900/B1800/B1700 system.

The MCS Interface product specification describes the interface between the network controller and any executing MCS. This interface is composed of the various messages required for any queries or changes in the status of remote stations.

The Supervisory Message Control System is provided for users of interactive data communication systems and offers the capability of a "message control system interface" to the network controller. The SMCS is intended to be the supervisor for a data communications software system which includes such Burroughs software as CANDE, RJE, HASP and other on-line packages of either Burroughs or customer origin. SMCS also serves as a base which can be easily augmented to meet any customer requirements for a specialized or more inclusive systems supervisor.

The HOST/RJE product specification provides a detailed description of the remote job entry (RJE) host system for the B1900/B1800/B1700. The purpose of any RJE system is to increase the availability and convenience of using a central (host) CPU to process input data that is entered at a remote site. The

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HOST/RJE system also allows the remote supervisory console to monitor and control programs at the host site.

The Data Communications product specification is designed to provide a general introduction to data communications (Datacomm) as it exists on B1900/B1800/B1700 systems. It defines both hardware and software components of Datacomm systems and provides a glossary of the basic terms used to describe Datacomm hardware and software. It assumes that the reader has a working knowledge of the basic structure of the B1900/B1800/B1700 processor and its peripherals.

RJE3780 is a program that enables the B1900/B1800/B1700 systems to communicate with an IBM mainframe running DOS. RJE3780 makes the B1900/B1800/B1700 system look like an IBM 3780 terminal. RJE3780 does not support the IBM 2780 discipline.

The program REMOTE/DISPLAY (RD) handles MCP inquiry-type commands in a normal-state program, in order to relieve the MCP of performing these time-consuming functions. RD normally responds to a datacomm terminal but can be directed to run in batch mode, creating printer output. Among the more common functions of RD are its ability to:

- display the system mix
- list file names in a family
- list the ODT queue
- display the system configuration.

The Systems Communications Module (SYCOM) program provides the B1800/B1700 user with: 1) the capability to submit jobs to run on another system, 2) to transfer files between two systems, and 3) in general, to interactively obtain services and information from another system with the ability to communicate with interactive programs in a remote system. Job run output can be returned to the submitting system (upon request) or directed to a peripheral device on the processing system itself. Interactive output data is returned to the User System directly, via Network Controllers.

SYCOM along with its associated Network Controller is responsible for all data communications with other systems. This includes performing the necessary functions to establish line connections, receive/transmit data, and execute the correct line termination procedures.

The Systems Communications Module maintains a secondary level of control (MCP has primary control) over local peripheral devices such as the card reader, card punch, line printer, and magnetic tapes. It reads and transfers card, tape and disk files, accepts input from and displays messages to the Operator's Terminal (ODT) and receives data files/messages for printing, punching, display, or writing to either tape or disk. It provides the mechanism by which a terminal or application program in one system is able to

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communicate with specific application programs in another system. Program selection is based on the servicing system which dictates the processing requirements (programs) optioned to run in that system.

TEXT/EDITOR is a command and edit language processor that enables users to create, update and maintain disk files. TEXT/EDITOR runs on TD700, TD801, TD802, TD821, TD822, TD831 and TD832 terminals.

The minimum memory requirements of datacomm packages are as follows:

NDL	32K
MCP(data comm)	24K
SMCS	35K
SYCOM	32K
CANDE	64K
HASP	32K
RJE3780	24K
BNA	300K
TEXT/EDITOR	11K

All of the above programs except HASP also require NDL and the datacomm code segments in the MCP. For example, the minimum memory requirements for datacomm software of a CANDE system are $64+32+24 = 120$

NDL 11.5K Bytes for a simple controller (i.e. a controller with 1 terminal, 1 station, 1 line and 1 remote file.

- + 61 bits for each additional terminal
- + (275 + 8* station tallies + station toggles) bits for each additional station
- + 2103 + 8* line tallies + line toggles) bits for each additional line
- + 71 bits for each additional remote file
- + 2.25 bytes if a line configuration is declared
- + message queue space
- + autopoll space

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PRODUCE: DATA COMMUNICATION BDLC CONFIDENCE PROGRAM

NAME ----	NUMBER -----
RSVP	P.S. 2228 3535

RSVP (Remote System Link Verification Program) is based on a corporate specification for writing BDLC confidence programs. B1900 RSVP is designed to exercise the various operations associated with the BDLC hardware and ensure confidence in the communications link between two remote systems equipped with BDLC hardware.

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PRODUCT: UTILIY PROGRAMS

SIAND-ALONE UTILIIES

NAME ----	NUMBER -----
CART/INIT	P.S. 2212 5082
CASSETTE/LOADER	P.S. 2212 5140
CLEAR/START	P.S. Not Released
COLDSTART/DISK	P.S. 2219 0128
COLDSTART/TAPE	P.S. Not Released
DISK/DUMP	P.S. 2212 5108
PACK/INIT	P.S. 2212 5090
STANDALONE/INTERCHANG	P.S. 2212 5553

Please refer to the software product specifications listed above for a full description of each stand-alone program. For programs not described in product specifications, consult the Software Operational Guide and/or the MARK <N.N> Release Letter.

CART/INIT is a program used to initialize a disk cartridge before it can be used with the system's software. The initializer assigns addresses to the appropriate segments and writes a pattern in the segments to ensure the segment is not defective. When a segment is found to be bad, the entire track in which it resides will be removed from the master available table on the disk cartridge. If a segment is found to be bad within the first sixty-four segments of a disk cartridge, that cartridge cannot be used due to the system requirements.

CASSETTE/LOADER is the first file written on a cassette by SSLOAD/MAKCAS as the loader portion of all SDL stand-alone programs. When a cassette created by SSLOAD/MAKCAS is loaded, CASSETTE/LOADER will load itself plus GISMO, SDL/INTERP, and the SDL program into memory. (Loads GISMO into M-MEMORY on a B1726.)

COLDSTART/DISK is a stand-alone program designed to coldstart a disk using a second disk to provide the necessary files. Only the first drive of a cartridge, pack or head-per-track can be used as the system disk. Only a user or single system disk can be used as input. Standard code file names will be used in the file search. If these names cannot be found, COLDSTART/DISK will request new names. An option is also provided to copy the remaining files from the input disk after the standard programs have been copied.

COLDSTART/TAPE is a stand-alone program designed to configure a system disk and load from tape the minimum software required to CLEAR/START the MCP. It requires a system disk on the proper channel/unit and a library tape labeled SYSTEM.

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DISK/DUMP is a stand-alone program that can be used to copy cartridges or packs to cartridges or packs with the same or larger capacity. The dump is a sequential, segment-by-segment copy of the entire cartridge or pack. If segments have been removed, on either the input or the output disk, a dump will not be allowed. If an error condition is detected while attempting to read or write, appropriate retries are made. If the retry cannot be made successfully, the copy between the two drives will not be allowed. The pack label is checked for validity, but is not copied.

The PACK/INIT program must be used to initialize a disk pack before it can be used with the system's software. The pack initializer assigns addresses to the appropriate segments and writes a pattern in the segments to ensure they are not defective. When a segment is found to be bad it will be relocated into a spare segment. The program will terminate if the number of errors encountered exceeds the number allowed per pack.

The program STANDALONE/INTERCHANG copies an interchange formatted disk pack received from either a medium or large system and converts it to B1900/B1800/B1700 internal format since the MCP cannot directly handle interchange format. Using two packs insures that the user will retain the unaltered original pack should a hardware or software problem occur during the conversion process. The program also provides for the reverse procedure, that is, conversion from B1900/B1800/B1700 internal format to interchange format.

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NORMAL-STATE UTILITIES

NAME ----	NUMBER -----
CASSETTE/MAKER	P.S. 2212 5157
CHECK/LOAD.DUMP	P.S. 2222 2624
CODE/ANALYZER	P.S. 2222 2657
CONVERT/BACKUP	P.S. 2228 3550
CREATE/TABLE	P.S. 2228 3451
DISKETTE/COPY	P.S. 2219 0219
DISKMAP/UTILITY	P.S. 2222 2632
DISKPACK/INTERCHANG	P.S. 2212 5546
DMPALL	P.S. 2212 5116
DUMP/ANALYZER	P.S. Not Released
FILE/LOADER	P.S. 2212 5132
FILE/PUNCHER	P.S. 2212 5124
FOREIGN/TAPECOPY	P.S. 2228 3493
FORTRAN77/ANALYZER	P.S. 2222 3077
INTRINSICS/AGGR.MAKER	P.S. 2219 0177
MCPII/ANALYZER	P.S. Not Released
QWIKLOG	P.S. 2222 2715
SQUASH/USER.DISK	P.S. 2222 2574
SSLOAD/MAKCAS	P.S. 2212 5165
SYSTEM/BACKUP	P.S. 2222 2681
SYSTEM/BUILDTRAIN	P.S. 2222 2699
SYSTEM/COMPARE	P.S. 2222 2723
SYSTEM/COPY	P.S. 2222 2905
SYSTEM/DISK.DUMP	P.S. 2212 5496
SYSTEM/DISK.INIT	P.S. 2212 5488
SYSTEM/ELOGOUT	P.S. 2222 2673
SYSTEM/FILE.INIT	P.S. 2222 2996
SYSTEM/IS.MAINT	P.S. 2222 3028
SYSTEM/LDCONTRL	P.S. 2222 2665
SYSTEM/LOAD.CAS	P.S. 2228 3402
SYSTEM/LOAD.DUMP	P.S. 2222 2616
SYSTEM/LOGCONVERT	P.S. 2222 2707
SYSTEM/LOGOUT	P.S. 2222 2640
SYSTEM/MAKEUSER	P.S. 2219 0102
SYSTEM/ODT	P.S. 2228 3584
SYSTEM/PATCH	P.S. Not Released
SYSTEM/SPOLOGOUT	P.S. 2222 3010
TAPECOPY	P.S. 2219 0110
TERMINAL TEST	P.S. 2222 2608

Please refer to the software product specifications listed above for a description of the normal-state utility programs. For programs not described in product specification, consult the B1900/B1800/B1700 Software Operational Guide and/or the MARK <N.N> Release Letter.

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CASSETTE/MAKER is a normal-state program which will read any disk file and write it on a cassette to be used by SYSTEM/LOAD.CAS.

CHECK/LOAD.DUMP is a utility which compares the files on a system library tape (created by SYSTEM/LOAD.DUMP) to those files of the same name on disk. NOTE: Beginning with the 9.0 release, files can no longer be created using SYSTEM/LOAD.DUMP.

The function of CODE/ANALYZER is to evaluate a code file, listing information about its files, data and code segments, and calculating an estimate of memory required for the program to run. The code file and any intrinsic files used thereby must be present on disk.

CONVERT/BACKUP is a special purpose utility designed to convert B1000 printer backup files into a format acceptable to the B9270 page printer. The files created are in the form of large systems printer backup format. The program will accept B1000 tape or disk printer backup files, created by software release 9.0 or later.

The B1900/B1800/B1700 CREATE/TABLE generates the required translate table in the form of a disk file to be used by any program in the performance of a translate. The translate function allows the user to change the specified character(s) to any desired bit pattern. This facility is most commonly used to alter collating sequences to obtain a specific ordering.

DISKETTE/COPY copies data from an industry-compatible FLEXIDISK to any B1900/B1800/B1700 hardware peripheral or vice versa. It operates like DMPALL and it does not allow copy between flexidisks.

DISKMAP/UTILITY accesses the MCP disk directory and available tables to produce a "map" of the disk. It can check for integrity errors, sort disk information by file-name or address, and output the information to disk, printer, or cards, depending on the option(s) specified.

DISKPACK/INTERCHANG is a normal-state program which copies an interchange-formatted disk pack received from either a medium or large system and converts it to B1900/B1800/B1700 internal format since the MCP cannot directly handle interchange format. Using two packs insures that the user will retain the unaltered original pack should a hardware or software problem occur during the conversion process, "interchange". The program also provides for the reverse procedure, that is, conversion from B1900/B1800/B1700 internal format to interchange format.

DMPALL is a normal-state conversion program that allows reproduction of files from one medium to another. It can also list files from any of these media in HEX, ALPHA, or combined form and can start or stop its reading of a file at a specified record.

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DUMP/ANALYZER is a system utility program designed to analyze the memory dump files (labeled "DUMPFIL<integer>") produced by the MCP in response to a DM or DP ODT input message, or by a program DUMP communicate, printing the contents in a readable form. The output produced by DUMP/ANALYZER varies according to the S-machine of the program being analyzed, thus allowing the data areas for a program to be analyzed and printed in the appropriate manner for each S-language (e.g., COP Table and PERFORM Stack for COBOL programs, SDL Stacks for SDL and UPL programs).

FILE/LOADER is a utility program which loads card files punched by FILE/PUNCHER to disk.

FILE/PUNCHER is a normal-state utility program used to punch files from disk to cards in a hexadecimal format that is acceptable as input to FILE/LOADER.

FOREIGN/TAPECOPY is designed to copy or list any 7 or 9 track tape. The program will copy the input tape to disk, printer or tape. Disk and Printer output files will be in the Standard B1000 format and Tape files will be an exact copy of the input file. Data on the tape that is bounded by the specified delimiters will be copied to a separate file. The user is allowed to specify the tape format using mnemonics to designate tape marks, header information, data, and labels. Input specifications may be entered via an ODT, remote terminal, or a card file.

FORTTRAN77/ANALYZER is a normal-state program which analyzes either a FORTRAN77 object code file or a FORTRAN77 ICM file. The file to be analyzed thereby must reside on disk. Various portions of a code file or of an ICM file can be listed via options entered by the user.

INTRINSICS/AGGR.MAKER creates one file of all the BASIC or SDL intrinsics with the file name of <multifile-id>/AGGREGATE. The multifile-id is either SDL.INTRIN for all the SDL intrinsics or BAS.INTRN3 for all the BASIC intrinsics. Once the file has been created, individual intrinsics can be added or deleted.

MCPII/ANALYZER is a system utility program designed to analyze the file (labeled "SYSTEM/DUMPFIL") produced by a full system memory dump, printing the contents in a readable form. The analysis includes printing of all relevant MCP and program data structures, I/O descriptor chains, the ODT message queue, and MCP stacks. In addition, detailed error checking is performed on many MCP structures, including I/O descriptors, memory links, dictionaries, disk addresses, and code segments.

QWIKLOG is designed to provide a convenient and compact analysis of job information contained within an MCP log file. The log is a disk file of system activity maintained by the MCP when the LOG option is set.

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The program SQUASH/USER.DISK consolidates the available storage areas on a user disk pack or cartridge. The program can be used while other programs are executing in the mix, but the disk being squashed is made unavailable to programs other than SQUASH/USER.DISK.

SSL0AD/MAKCAS is a normal-state program which creates cassettes for stand-alone SDL and MIL programs.

SYSTEM/BACKUP is an MCP utility which enables the user to print or punch backup files. Printer and punch files may be directed to backup tape or disk for later processing. SYSTEM/BACKUP runs on B1900/B1800/B1700 systems under control of MCP II. The program is executed via the PB control string or automatically, using the Auto Backup (AB) capability. SYSTEM/BACKUP will vie for system resources as any other normal-state program except in Auto Backup mode when SYSTEM/BACKUP has special privileges in obtaining output devices. The program has a working set of approximately 4.5KB.

SYSTEM/BUILDTRAIN is a system utility program that creates the translate tables used by the B1247-4 Train Printer Control. The program generates all the translate tables required by the system and performs additional functions that are controlled by its program switches. It requires a data file, INPUT/PC5.TABLES, as input.

SYSTEM/COMPARE is a utility program which compares pairs of files, printing and identifying by record number all non-matching record pairs. Such non-identical records are printed in EBCDIC and hexadecimal representations with all differing hexades (four-bit hexadecimal digits) flagged with an asterisk pointer character. The files to be compared may be on any combination of disk, card or tape media.

SYSTEM/COPY is a library maintenance program used for copying and comparing disk and tape files. The program conforms to CSG standards for WFL and Structures of Interchangeable Media.

SYSTEM/DISK.DUMP is a normal-state utility program which copies an entire disk cartridge or pack to another cartridge or pack whose capacity is greater than or equal to the original disk.

SYSTEM/DISK.INIT is a normal-state utility program which initializes disk cartridges and packs for use on the B1800/B1700.

The program SYSTEM/ELOGOUT produces formatted reports of the hardware failures reported in a particular system's ELOG file.

SYSTEM/FILE.INIT is a utility program which is used either by the system or by the user to precondition or initialize either entire files or one area of a file each time a write is done into a new area of the file.

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SYSTEM/IS-MAINT is a utility program which provides library maintenance functions for indexed-sequential files. Functions provided include LIST, VERIFY, REMOVE, COPY, CHANGE, and UPDATE.

SYSTEM/LDCONTRL (LOAD CONTROL) is used to create pseudo decks from physical card decks. Essentially it is a specialized card-to-disk program.

SYSTEM/LOAD.CAS is a normal-state program used to load a file or group of files to disk from a cassette that was made by CASSETTE/MAKER. The program can be executed from the ODT. Input from the ODT is required to specify file names.

SYSTEM/LOAD.DUMP is an MCP utility used to copy a file or group of files from a library tape to disk. It is initiated only by a control message from the ODT or card reader or by ZIP messages.

SYSTEM/LOGCONVERT extracts data of greatest potential user interest from the file LOG/#<integer> and creates a new file NEW.LOG/#<integer> containing this data in COBOL/RPG-readable format.

SYSTEM/LOGOUT produces a formatted analysis of the system's operating log as produced by the MCP. The program is automatically executed by the MCP each time a log is transferred upon instruction from the computer operator.

SYSTEM/MAKEUSER is a normal-state utility program used to create, access, or modify (SYSTEM)/USERCODE, the system usercode file of allowable usercode/password combinations. A list of all valid usercodes and passwords is maintained in the (SYSTEM)/USERCODE file that is required to support a file security mechanism for disk files.

SYSTEM/ODT was first supplied with the 10.0 version of the software. This program replaces all code formerly contained in the MCP which was used to interface with the ODT. SYSTEM/ODT is automatically loaded by the COLDSTART routines and is automatically executed by the MCP during the Clear/Start process. The program is capable of performing the necessary I/O operations on Teletypewriters, ODTs and TD 830 terminals.

SYSTEM/PATCH is designed to merge one or more patch clusters to create a single patch file which may be used as the input file "CARDS" for SDL, MIL, or FORTRAN compilation. The program is especially designed to be used when compiling standard B1800/B1700 programs. Instead of a patch file, a pseudodeck may be created.

SYSTEM/SPOLOGOUT produces a formatted listing of the ODT log produced by the MCP. The program can be initiated by a "LG SPO" control message from the ODT or the card reader or through a ZIP message. The user may specify a portion of the log to be

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displayed by giving the date and time frame desired.

TAPECOPY duplicates, compares, merges or concatenates non-library multifile tapes. It allows the user to selectively delete any of the files to be processed or to produce multiple copies of a copied, merged, or concatenated tape. It accepts input files from either tape or disk. TAPECOPY does not accept library (LOAD.DUMP or SYSTEM/COPY) tapes.

TERMINAL/TEST is a general-purpose program used in conjunction with any NDL network controller to test the I/O functions of on-line terminals under MCPII control.