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1700 COMPUTER SYSTEMS

1700 MSOS 4.1, FORTRAN 3.2 A/B, AND TIMESHARE 2.0 RELEASE BULLETIN

REVISION RECORD

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Address comments concerning this manual to:

Control Data Corporation
Publications & Graphics Division
4455 Eastgate Mall
La Jolla, California 92037

or use Comment Sheet in the back of this manual.

PREFACE

This manual discusses the new and changed features, PSR level limitations, and restrictions in 1700 MSOS 4.1, 1700 FORTRAN 3.2 A/B, and TIMESHARE 2.0. The hardware FCO levels used in testing the software were current as of January 1, 1974.

Following is a list of 1700 MSOS manuals.

Description	Publication Number
1700 MSOS 4 Reference Manual	60361500
1700 MSOS 4 Installation Handbook	39520900
1700 MSOS 4 Release Bulletin	39520800
1700 MSOS 4 Instant	39520500
1700 MSOS 4 General Information Manual	39522400
MSOS Version 4 Diagnostic Handbook	60361800
MSOS 4.1 Customization Manual	88860300

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PART I

CONVERSION OF MSOS 4.0

TO MSOS 4.1

NEW AND CHANGED FEATURES 1

1700 MSOS 4.1 is an extended version of the standard 1700 MSOS 4.0 operating system. The new version was developed to run on the 1704, 1714, 1774, and 1784 computers. The principal changes from MSOS 4.0 to MSOS 4.1 involve the support of new drivers for peripheral devices in the 1784 product line.

The following list itemizes the new or changed MSOS 4.1 features.

1. A new driver for the 1729-3 Card Reader was added. This driver is basically the 1729-2 Driver with a removal of analysis of status bits not available with the 1729-3.

2. A completely new driver for the 1742-30/1742-120 Line Printers was added. It is smaller and faster and processes unformatted writes correctly. These are advantages over the 1742 Driver in MSOS 4.0. If the 1742-120 is used, a train image table is supplied. The 595-4 is currently supported, but any train can be used simply by supplying a different table.

3. MSOS 4.1 contains a new driver for the 1740/501 and 1742-1 Line Printers. This driver is based on the 1742-30 Driver with changes for pre-print/post-print differences and character output differences.

4. A new driver for the 1752 Drum is included. It is basically a standardization of a QSS driver with minor changes.

5. A new driver for the 1733-2/856-2/856-4 Cartridge Disk handles overlap seek functions.

6. Modifications were made to the 1711 Teletype driver to handle the 713-10/711-100/713-120 CRT characteristics of uppercase and lowercase character entry and slave printer timing. Also, modifications for CRT/TTY parity were made. A bell tone is substituted for the lack of a break on the Model 33 Teletypewriter.

7. A new driver for the 1733-1/853/854 Disk operates a 1x8 overlap seek. This driver is based on the 1738 Driver.

8. A new driver for the 1739-1 Cartridge Disk was added. This driver is based on the 1733-2 Driver.

9. There is a new subroutine to interface to the 1544-1 to -4 Digital Input Module.

10. A new subroutine interfaces to the 1553-1 to -4 and 1555-1 to -3 Digital Output Modules.

11. A new driver for the 1525-3/1536-2/1502-80 Relay Analog Multiplexer was added.

12. A new driver interfaces to the 1525-3/1501-10/1501-11 High-Level Analog Input System.

13. New drivers have been added for the following equipments:

    1711-4/-5 Teletype
    1713-4/-5 Teletype
    1732-2/615-73/615-93/10300-1 Magnetic Tape
    1572-1 Sample Timing Unit

14. A new on-line diagnostic package, the Small Computer Maintenance Monitor, is a standardization and enhancement of the QSS RTMS package. It provides tests for teletype, paper tape I/O, card I/O, magnetic tape I/O, disk I/O, drum I/O, line printer, and cartridge disk I/O.

15. System equipment codes, logical units, interrupt lines, and priorities were standardized. System modularity was increased and configuration reliability improved.

16. The engineering file was redesigned to save device failure data including date, time, error type, and hardware status. It now allows selectable error listing for specified logical units. The need to parameterize a data block program for error data was eliminated.

17. The bad sector system logic was removed to eliminate excessive system and memory overhead and to disallow possibilities of system failures due to faulty philosophy. Capability to certify and test disk packs and cartridges has been retained and enhanced.

18. A new mass memory-resident driver handler was added. The program is independent of the configuration and removes restrictions on driver priorities, quantity of magnetic tape devices, and error returns.

19. Dummy programs were added to replace *1, *2, and *3 user-supplied programs in the standard system to eliminate system failures when calling undefined modules.

20. System specifications have been modified to automatically set the sizes of allocatable core areas 1, 2, and 3. Programs that are not job-oriented now run in area 4.

21. A new background trace program enables tracing of background programs for debugging ease. It is a standardization of a QSS routine.

22. A new background utility prints a listing of the system logical units. This is basically a standardization of a QSS program with some improvement.

23. The mass memory device error handling has been improved. Failure data is logged, including time, error, status, and logical unit. Failure data is saved in core by core-resident programs. Elimination of lost error messages, lost errors, errors with mismatched status, and use of mass memory to log mass memory errors has improved reliability.

24. The software buffer driver was improved to standardize error codes, allow multiple mass memory message buffers, and correct device table specifications.

25. All assembly time options have been removed from the system. The options are either provided by separate programs or by parameters in SYSDAT. This greatly improves maintenance reliability and field configuration control.

26. A comprehensive installation file editing capability has been added to provide the user the full capacity for system maintenance without host computer needs for paper tape, card, and magnetic tape systems.

27. Complete time and data capability is now provided. Information available includes day, month, year, hour, minute, second, system timer counts, military time, and total day minutes. Day is automatically updated with a calendar handler. The user can change or print date and time.

28. The 1744/274 Digigraphic Console Driver is in MSOS from the Graphics package to improve configuration reliability.

29. The MIPRO program has been enhanced to include commands for all MSOS 4 product members as well as the IMPORT product.

30. All system disk drivers have optional compare features, perform a sector address type read if a word address type read starts at the beginning of a sector, and remember the last data transfer to eliminate accesses to get identical data. These features provide for increased reliability and throughput.

31. The pseudo magnetic tape driver has been expanded to be accessed from foreground programs.

32. Reference manual documents have been revised to provide improved explanations and remove errors, inconsistencies, and ambiguities.

33. A new manual, the Release Bulletin, documents the differences between MSOS 4.0 and MSOS 4.1.

34. An updated installation handbook provides more examples of system initialization.

35. A new system customization manual explains system options, their applicability, and the rationale for their use.

36. A new MSOS instant handbook provides handy information on system functions.

37. A new general information manual provides general concepts related to MSOS.

38. A background utility program was added to print program name, size, data size, common size, name block comments, entry points, and externals. It also provides a cross-reference sort of entry points and externals related by program name.

39. A cross-reference sort of symbols, externals, and equivalences was added to the macro assembler listings.

40. Improved software release procedures provide users with a system that is configured and tested prior to shipment. Updates will be available in object form. System installability is greatly improved. Validation capability is provided.

41. The system initializer error recovery and reporting capability has been improved to print error codes and hardware status on failure.

42. Capability has been added to the system initializer for the 1752 Drum, 1733-1 Disk, 1733-2 Cartridge Disk, 1742-30 Line Printer, 1742-120/595-4 Line Printer, 713-10 CRT, and the 1729-3 Card Reader. All code relating to particular hardware devices was moved to the initializer driver interface module. This improves maintainability of the other initializer modules.

43. Capability has been added to the disk-to-tape utility for the 1752 Drum, nine-track magnetic tape, 1733-1 Disk, and the 1733-2 Cartridge Disk. The user interface has been improved and made more forgiving to operator errors. The package has been made more modular to provide for ease of configuration.

44. The FORTRAN run-time interface for 65K systems has been improved and configuration is now possible for several system layout options.

45. All selective stop commands have been removed from the system to enable full utilization of selective stop commands by user programs.

46. MIPRO has been enhanced to allow ease of parameterization; entry of two-, three-, or four-character mnemonics, optional parameter passage to a scheduled program, and capability for start/stop of 1572-1 and 364-4 Timers. Available command mnemonics have been completely documented and the functions clarified.

47. All device drivers that have SCMM diagnostic capability (except mass memory) have a diagnostic logical unit that bypasses error reporting and logging so SCMM can perform error analysis.

48. The handling of the mass memory driver lengths has been automated to eliminate parameterization and configuration errors.

49. The 364-4 Driver capability has been enhanced to include the 361-4 interface and to be compatible with the TIMESHARE 2 product interface.

50. The interface of the compiler and assembler to the maximum scratch sector has been simplified for ease of configuration.

51. The system time bases have been augmented by the addition of capability for the 1572-1 Timing Unit in the sample rate selection, or line sync selection, or 364-4 Communications Multiplexer timer.

52. The 1747 Data Set Interface Driver from the IMPORT product has been integrated into MSOS to enhance system configurability.

53. The SPACE program, which includes system restart, has been enhanced to provide interface to the system time/date functions, improved detection of 32K/65K mode selection, improved program protect handling, and file checking.

54. The software dummy device driver has been simplified to provide use with or without error return from one device table and one driver.

55. A pseudo system timer capability has been added to allow for I/O hangup diagnosis in systems with no hardware timer.

56. The level 2 and level 1 idle loops have been combined to provide a common code re-entrant loop to allow interface to the pseudo timer, and to include an idle time counter. The idle time counter may be used by a user program to calculate how much time is spent in the idle loop.

57. The non-FORTRAN scheduler and dispatcher modules have been combined to eliminate configuration ambiguity.

58. The internal interrupt processor handling of power failures has been improved for reliability, and an optional user program response capability has been added.

59. The line 1 interrupt processor has been enhanced to allow for more efficient handling of interrupts when only one device is present on line 1.

60. The alternate device handler has been improved by eliminating coding for the 1706 Buffered Data Channel allocation and error logging that could cause system failures and misleading error messages. The mass memory driver interface is improved and the error checking on device failure response has been improved.

61. Hardware devices such as unbuffered magnetic tape, card readers, and paper tape I/O that require exclusive use of the A/Q channel now interface to the A/Q allocator program to sequence usage and eliminate lost data or lost interrupt problems. The CRDBSY logic which did not fully address the problem has been removed.

62. The 1706 Buffered Data Channel allocation has been enhanced to allow any or all system 1706s to be shared with any number of devices. The old scheme allowed only one shared 1706 and did not allow any other in the system.

63. The timer interrupt response routine has been moved from TMINT to SYSDAT to improve the interface, to handle interrupts from all possible system timers, and to eliminate waste of memory resources to handle interrupts from timers not present in the system.

64. A new utility core dump routine has been added to support the 1742-30 and 1742-120 Line Printers.

65. The system checkout bootstrap programs have been made more conservative of memory resources by removing the bad sector logic (involving approximately 400 words). New bootstraps have been provided for the 1752 Drum, 1733-1 Disk, and 1733-2 Cartridge Disk.

66. The protect processor has been changed to provide for buffered (swap with I/O in progress) and unbuffered versions to improve configuration control. Capability has been added to allow users to access mass memory sectors above $7FFF.

67. The GETFIL request processor has been improved to enhance the speed of file acquisition from mass memory.

68. The logical unit restoration program has been revised to eliminate unused message buffering logic.

69. All drivers that are capable of residing in mass memory can also be core-resident with no change to the driver; only a SYSDAT change is needed.

70. The 1726/405 Driver has been improved to allow optional hardware code conversion for ASCII-63 and to ease configuration burdens. Buffered and unbuffered driver versions are provided.

71. All card I/O driver conversion tables have been removed from the drivers and made into external tables for configuration control and ease of modification.

72. The 1732-1 Driver has been reconfigured to eliminate the macro orientation, to improve maintainability, and to eliminate configuration control problems. Buffered and unbuffered driver versions are available.

73. The SYSDAT program has been revised to add configuration comments, provide more parameter information, and be easier to use.

74. The paper tape I/O drivers have end-of-file character recognition added and removal of some confusing configuration parameters.

75. All unused externals, symbols, and equivalences have been removed from the product set.

76. The system configurator has been replaced with the library builder and the skeleton editor to interface with new software release procedures.

77. TIMESHARE 2.0 has been added to the MSOS product set. This package will allow up to 15 remote users access to sets of special files and programs in a timeshared environment, while still allowing the normal foreground/background operations to occur.

PROGRAM NAME CHANGES 2

Table 2-1 correlates old and new program names in MSOS 4.1. It also specifies which of the programs were changed. The specific changes are described in Part I, Section 5.

Note that the name of each driver has been changed to a name beginning with the letter D. Each new name contains either the number of the device being driven or a reference to a software item. The initiator, continuator, and error entries were changed to be consistent with this name. The physical device table name and the error interrupt response interface (error timeout) names were also changed according to this new convention.

Table 2-1. Program Name Changes

MSOS 4.0	MSOS 4.1	PROGRAM CHANGES
BUFFER	DSBUFR	Yes
CD1729	D17292	Yes
COBOP	BDK85X	Yes
COBOPC	B17391	Yes
COBOPD	B1751	Yes
COUTV4	DMP421	Yes
	DMP42X	Yes
CSYDRV	DCOSY	Yes
DR1728	D1728	Yes
DR1732	D1732B	Yes
	D1732U	Yes
DR1739	D17391	Yes
DR3644	D3644	Yes
DR38MN, DR38MX	D1738	Yes
DRCORE	DCORE	Yes
DRMDRZ	D1751	Yes
DUMPV4	SNAPOL	No
HASCOD	HASHCD	No

Table 2-1. Program Name Changes (Continued)

MSOS 4.0	MSOS 4.1	PROGRAM CHANGES
PSDTV4	DPSUDO	Yes
PTREAD	D1777R	Yes
PUNCDR	D1777P	Yes
RECVTB	MAXRVB	No
S13001	D1713K	Yes
S13002	D1713R	Yes
S13003	D1713P	Yes
TAPDRB	D1731B	Yes
TAPEDR	D1731U	Yes
TELTYP	D1711	Yes

Table 2-2 presents the new program names in alphabetical order.

Table 2-2. New Program Names

MSOS 4.1	MSOS 4.0
B17391	COBOPC
B1751	COBOPD
BDK85X	COBOP
D1711	TELTYP
D1713K	S13001
D1713P	S13003
D1713R	S13002
D1728	DR1728
D17292	CD1729
D1731B	TAPDRB
D1731U	TAPEDR
D1732B D1732U	DR1732
D1738	DR38MN DR38MX
D17391	DR1739

Table 2-2. New Program Names (Continued)

MSOS 4.1	MSOS 4.0
D1751	DRMDRZ
D1777P	PUNCDR
D1777R	PTREAD
D3644	DR3644
DCORE	DRCORE
DCOSY	CSYDRV
DMP421 DMP42X	COUTV4
DPSUDO	PSDTV4
DSBUFR	BUFFER
HASHCD	HASCOD
MAXRVB	RECVTB
SNAPOL	DUMPV4

NEW PROGRAMS 3

1. MMEXEC is a new program. It is the executive that governs the mass memory drivers in the system. MMEXEC requires no parameterization. It allows dual or single driver operation, depending on the driver buffer size determined at the time of system installation. For single driver operation, the buffer size is set to the size of the largest driver in the system. For continuous dual driver capability, the buffer is sized for the two largest drivers in the system.

2. DMP421 is very similar to DMP42X, except that it is a new program for the 1742-30 and 1742-120 Line Printers. DMP421 assumes that the train image is loaded into the 1742-120 Line Printer. The program has no capability to reload the train image.

3. B1752 is a new program for the 1752 Drum that is a COBOP type bootstrap. Its function is very similar to BDK85X.

4. B17332 is a new program for the 1733-2 disks. It is also a COBOP-type bootstrap that functions similarly to BDK85X.

5. S15721 is a new program that allows interface to the sample rate section of the 1572-1 Timer. If the sample rate mode of the timer is not being used as the basic system time base, the 1572-1 Sample Rate Interrupt may be enabled by calling this subroutine. Other output commands to the sample rate mode aspect of the 1572-1 may also be made by calling S15721. If the 1572-1 is to be used in the system in the sample rate mode for some function other than as the system time base, the user must supply an interrupt handler subroutine that will take the desired action when the 1572-1 Sample Rate Interrupt occurs.

6. L15721 is a program similar to S15721 except that it deals with the line synchronized timer aspects of the 1572-1. It may be called only when the line synchronized timing aspects of the 1572-1 are not being used as the system time base.

7. TOD is the productization of a QSS program used for many years in process control systems. It allows actual wall clock time to be maintained and updated in the system. TOD maintains a record of current system time in hours, minutes, seconds, and timer counts. It maintains military time and total number of elapsed minutes for the day. The interface to update the system time base is very straightforward, requiring only a call to TOD. At the time of system startup, TOD is initiated by the SPACE program; it is self-scheduling on a timed basis thereafter.

8. EFDATA is a new interface between individual drivers and the engineering file. In addition to the error type and hardware status previously stored in the engineering file, EFDATA stores the time corresponding to each hardware failure in hours, minutes, and seconds. The program saves data regarding the last 24 failures for each non-mass memory device on mass memory. Temporarily, the data for the last five non-mass memory failures is saved in a core buffer.

   Mass memory errors are handled separately. Data regarding the last ten mass memory failures is stored in a core buffer. However, the error data for a mass memory failure is not transferred from the core buffer to mass memory, on the premise that mass memory is not reliable because of the failure. If a subsequent non-mass memory failure occurs, mass memory error data is transferred to mass memory. The reasoning is that the system must then be operating if other system I/O errors are being logged. Mass memory failures are also logged on the comment device.

9. ALAQ is the A/Q channel allocator program. CDC 1700 computer I/O is performed via the A/Q channel, which is an unbuffered operation. For devices where the data is contained on a transportable medium such as cards, paper tape, or magnetic tape, and where the controller does not buffer the data, data can be lost if an adequate response time is not available to service a data interrupt. To avoid lost data conditions, these devices must have drivers that run at a high priority and that do not run concurrently with another driver for a device with the same restriction. ALAQ is provided to allocate the A/Q channel if more than one of these devices is present in a system. ALAQ is independent of the system configuration. System configuration parameters are contained in SYSDAT.

10. AL1706 is functionally equivalent to ALAQ. AL1706 allocates the 1706 Buffered Data Channel, and is independent of the system configuration. AL1706 can handle all the 1706s in the system, and can share a given 1706 among any number of devices.

11. DUMMY is the program that handles the dummy device. The dummy device handling code has been moved from SYSDAT to DUMMY. This new program has two functions in the system:

    a. If the dummy driver is defined as an alternate for a device and the device fails, DUMMY completes the I/O request and returns an error indication (bit 15 of Q=1). This is done without operator intervention. DUMMY also restores the failed device to an up condition. The dummy driver is always used as the alternate for the system comment device to prevent system hangups.

    b. The dummy driver logical unit can also be used in place of any other system logical unit. In this case, the I/O request is completed with no error. This facility is useful for bypassing records by transferring them to the dummy device.

12. CP026 is the ASCII-to-Hollerith conversion table used by D1728 when ASCII63 (type 026) code conversion is desired for punching cards. (See also CP029.)

13. CP029 is the ASCII-to-EBCDIC conversion table used by D1728 when ASCII68 (type 029) code conversion is desired for punching cards. Neither CP029 nor CP026 contains any code in addition to the conversion table. In a given system, either CP026 or CP029 is loaded to be used by D1728.

14. CR026 is a table similar to CP026 except that it is the conversion table used for reading cards. All card reader drivers require either CR026 or CR029.

15. CR029 is a table similar to CP029 except that it is the conversion table used for reading cards.

16. D17293 is a new driver similar to D17292 (formerly CD1729). The functional difference between the two drivers is that D17293 does not include the ability to read certain status information, since the 1729-3 hardware does not have the corresponding capability.

17. T5954 is the standard train image table for the 1742-120/595-4 Line Printer. T5954 is used by the D42312 Driver.

18. D17331 is a new driver, added to support the 1733-1 Disk Controller that drives 853 and 854 Disk Drives. D17331 can operate in a 1x8 mode utilizing the complete overlap seek capabilities of the disk drives. (This driver will not operate a 1738 Controller even though the 1738 Driver, D1738, will operate a 1733-1 Controller in a 1x2 mode without overlap seek.) When a word addressing request accesses the first word in a sector, sector addressing is used to save time.

19. D17332 was added to support the 856-2 and 856-4 Cartridge Disk Drives. The driver contains no bad sector logic. D17332 can operate in a 1x4 mode using complete overlap seek.

20. D1752 is a new driver added to support the 1752 Drum. D1752 provides all driver functions necessary for the 1752 to be used as a system library device, a data device, or a scratch device.

21. D17322 is a new driver for the 1732-2/615-73/615-93/10300 Buffered Magnetic Tape Drive. D17322 provides for phase encode tapes at a density of 1600 bpi in addition to seven-track, nine-track, and NRZI tapes.

22. REWCK is a routine included in the D17322 module. It runs at level 4, checking for rewind status after the tape has been rewound.

23. D327TR is the seven-track interface. It is used by the 1732-2 Driver, D17322, only if seven-track tapes will be used by the system.

24. D1747 is the driver for the 1747/1706 Data Set interface. The 1747/1706 is used as the interface between a 1700 System and a 6000/CYBER 70 System. Previously, D1747 was a part of the IMPORT module. It was removed from IMPORT and added to the operating system to allow ease of maintenance and configurability.

25. D1744 is the driver for the 1744/1706/274 Digigraphic Console. It is used with GRAPHICS in a system with a 1700/6000 interface. Previously, D1744 was a part of the GRAPHICS module. For similar reasons, the D1744 Driver was removed from GRAPHICS and made a part of the operating system to allow for ease of maintenance and configurability.

26. D1501 is the 1525-3/1501-10/1501-11 Analog Input Driver. It allows sequential data to be collected at a rate of up to 20 kHz.

27. D1544 is the 1544-1 to -4 Digital Input Driver. It reads in one digital word (16 bits) per request. Since this driver is actually a subroutine, a request is made by making a direct call. This call may be made by either a FORTRAN or an assembly language program. (Refer to the MSOS Reference Manual for the forms of the call.)

28. D5355 is the 1553-1 to -4/1555-1 to -3 Digital Output Driver. For each request, this driver outputs one digital word (16 bits) as a register output or one relay word (8 bits) as a power output. Like D1544, it may be called from either FORTRAN or assembly language programs. (Refer to the MSOS Reference Manual.)

29. D1536 is the 1525-3/1536-2/1502-80 Analog Input Driver. D1536 uses interrupts. It collects and stores data from the relay multiplexer. An unformatted read causes the data to be stored in counts; a formatted read causes the data to be stored after conversion to millivolts.

30. D42312 is the new driver for the 1742-30/1742-120 Line Printers. An unformatted write request to this driver does not space up before printing a record. If the 1742-120 Printer is used with D42312, a train image table must be appended to the driver at load time. The standard train image table is the module, T5954. The user may define any other train image table and use it in place of the standard table if he wishes.

31. ONE is a dummy program. If the user does not supply a program with the *1 statement at the time of system installation, the dummy module ONE is loaded. If an *1 control statement is later entered by the operator when using the job processor, ONE will be executed. ONE simply prints an error message. Loading ONE allows the user to replace it later by a non-dummy program of the same name. The replacement program is loaded by means of LIBEDT.

32. TWO is a dummy program like ONE except that it is loaded if no user program is supplied with an *2 statement at the time of system installation.

33. THREE is a dummy program like ONE except that it is loaded if no user program is supplied with an *3 statement at the time of system installation.

34. EFSTOR interfaces to the EFDATA program. EFSTOR moves the data from the temporary holding buffers in EFDATA to mass memory.

35. EFLIST allows the user to employ MIPRO to dump all the engineering file data, the engineering file data for a given logical unit, or the engineering file data pertaining to mass memory devices.

36. TDFUNC provides calendar functions for date and time maintenance. It allows for entry of a new date. TDFUNC provides interface to the TOD program to update the date when the time indicates a change from one day to the next.

37. MDRIV4 is a new driver to be used by DSKTAP to read or write on the 1739-1 Cartridge Disk.

38. MDR52 is the 1752 Drum Driver for DSKTAP.

39. MDRV56 is the 856 Cartridge Disk Driver for DSKTAP.

40. Q42312 is the new 1742-30/1742-120 Line Printer Driver for the initializer. This driver requires the train image, T5954, if the 1742-120 Line Printer is used.

41. Q1752 is the initializer driver for the 1752 Drum.

42. Q17332 is the initializer driver for the 1733-2/856-2/856-4 Cartridge Disk.

The following bootstrap programs are to be used when installing a system. The particular bootstrap selected depends on whether the install file is on magnetic tape, paper tape, or punched cards. The selection further depends on which hardware device is to be used as the installation device.

43. BOOTC1 is the bootstrap for the 1728-430, 1729-2, or 1729-3 Card Reader.

44. BOOTC2 is the bootstrap for the 1726/405 Card Reader.

45. BOOTP is the paper tape bootstrap.

46. BOOTM1 is the seven-track magnetic tape bootstrap.

47. BOOTM2 is the nine-track magnetic tape bootstrap.

The following bootstraps were added to aid customer engineers. Using these bootstraps, the System Maintenance Monitor (SMM) can be entered from an existing MSOS system.

48. SMM1 is the seven-track magnetic tape bootstrap for SMM.

49. SMM2 is the nine-track magnetic tape bootstrap for SMM.

50. SMM3 is the paper tape bootstrap for SMM.

51. SMM4 is the 1728/430 Card Reader Bootstrap for SMM.

52. VERFY1 is used to initiate system tests for system installation from an install file.

53. SBCONV generates eight-bit binary punched cards to be used by a bootstrap routine.

54. SBCCON defines the last word of the output buffer for SBCONV.

55. FMDUMY was added to allow the system initializer to provide the correct sector address for various file manager request processors.

The following dummy programs were added to eliminate unpatched externals for various initializer drivers:

56. QCDDMY

57. QMTDMY

58. QPRDMY

59. QDKDMY

60. QDMDMY

61. QPTDMY

62. EESORT is a utility program that processes relocatable binary programs. It can list the following information about each program in a set of programs:

    - Program name
    - Name card comments
    - Program length

- Common size
- Data size
- Entry points
- Externals referenced

EESORT can also be used to list alphabetically the program names in a set of programs, together with the declared entry points of each program and the programs in the set that reference these entry points as externals.

The library builder was added to interface to the new operating system installation procedure. The library builder may be used to merge input libraries of relocatable binary programs into a single output library, discarding duplicated programs. The output library may then be used in one of two ways:

a. It may be used by LIBEDT to modify the system library or program library in an existing system.

b. It may be used by the system initializer to build a new operating system.

The library builder includes the following modules:

63. LIBILD

64. LIBIDO

65. MESSY

66. MOVECH

67. PICKUP

68. IOSUB

69. HELPER

70. HELP14

71. LJA2B

72. CONVRS

73. HELP0

74. HELP1

75. HELP2

76. HELP3

77. HELP4

78. HELP5

79. HELP8

80. HELP9

81. HELP10

82. HELP11

83. HELP12

84. HELP13

The skeleton editor was added to aid in the interface to the new MSOS installation procedure. A skeleton is a file that consists of requests to the library builder program. These requests specify the order and identification of the binary programs that are to be retrieved from a set of input library programs. These binary programs are included in the library that is output from the library builder. The skeleton contains no binary programs itself, merely commands that specify which programs the library builder is to put into the output library.

The skeleton editor provides a facility for modifying a skeleton to allow changes to an existing system or library. In addition to the modification commands, it can list part or all of a skeleton, resequence the record numbers within a skeleton, and allow tape motion control.

The skeleton editor consists of two modules, SKED and SKFILE.

85. SKED is the program that is used to load the skeleton editor.

86. SKFILE is the skeleton editor itself.

87. TRACE is a program debugging tool. It is loaded with a user program when requested by the program. Under control of the computer operator, TRACE lists each instruction executed, together with the contents of associated locations at the time of execution.

The Small Computer Maintenance Monitor (SCMM) provides a method of on-line hardware error detection. Entry to SCMM is made by the computer operator from the comment device.

88. SCMEXC is the SCMM main program.

The following are SCMM test programs:

	Test Program	Device Tested
89.	SCMPRT	Line Printer
90.	SCM405	1726/405 Card Reader
91.	SCMTTY	1711/1713 Teletype and 713 CRT
92.	SCMDK1	1738/853-854 Disk
93.	SCMDK2	1738/853-854, 1733-1/853-854 Disk
94.	SCMCRD	1728/430, 1729-2, and 1729-3 Card Readers
95.	SCMMTT	1732/608-609, 1731/601 Magnetic Tape
96.	SCMCD1	1739-1 Cartridge Disk
97.	SCMCD2	

NOTE

SCMCD1 is used when the system disk is being tested. SCMCD1 ensures that a random address is not within the system area.

98.	SCMDRM	1752 Drum
99.	SCMDM1	1751 Drum
100.	SCMPTR	Paper Tape Reader
101.	SCMPTP	Paper Tape Punch

Test Program		Device Tested
102.	SCMDVP	1738/853-854 Positioning Test, 1733-1/853-854 Positioning Test

103. XREF is the macro assembler module that controls the new assembler pass needed for the cross references.

The following macros, items 104 through 133, have been added to the system macro library:

Magnetic Tape Motion Macros:

104. BSR — Backspace record

105. EOF — Write end-of-file(s)

106. REW — Rewind

107. UNL — Unload

108. ADF — Advance file(s)

109. BSF — Backspace file(s)

110. ADR — Advance record(s)

File Manager Request Macros:

111. DEFFIL

112. DEFIDX

113. LOKFIL

114. UNLFIL

115. RELFIL

116. STOSEQ

117. RTVSEQ

118. STOIDX

119. RTVIDX

120. RTVIDO

121. STODIR

122. RTVDIR

123. FLDF

124. STATFL

Jump to Dispatcher

125. DISP

Conversion of a set of variables as specified by format array:

126. DECODE — ASCII to hexadecimal

127. ENCODE — Hexadecimal to ASCII

Conversion of a single variable:

128. HEXASC — Binary to ASCII representation of hexadecimal value

129. HEXDEC — Binary to ASCII representation of decimal value

130. ASCII — ASCII representation of hexadecimal value to binary value.

131. DECHEX — ASCII representation of decimal value to binary value.

132. FLOATG — Floating-point value to ASCII characters.

133. BUFFER — Software buffer MACRO.

134. LULIST is a new program that lists for each logical unit in the system the following information:

- Logical unit number
- Equipment description
- Function
- Class
- Equipment number

135. NXTLOC is a dummy program used when installing the system to note the next available location. It is placed at the end of the Monitor modules to determine the next location available after the Monitor.

REPLACEMENT PROGRAMS 4

1. DBLDRV and MASDRV have been replaced by the new program MMEXEC.

2. EFILE was replaced by EFDATA, SELF was replaced by EFSTOR, and LOGA was replaced by EFLIST.

3. SCHEDU and NDISP have been replaced with a module that combines the capabilities of both. This module is called NDISP. NDISP, for systems without re-entrant FORTRAN, now parallels the functions of RDISP for systems with re-entrant FORTRAN, in that both NDISP and RDISP now contain scheduler as well as dispatcher functions.

4. CR405 has been replaced by two programs: D1726B for the 1706 Buffered Data Channel version, and D1726U, for the unbuffered version. This driver was divided into two programs because of the extensive parameterization required in the previous version. Hollerith/ASCII conversion may be performed by either hardware or software for ASCII63 (Hollerith or type 026) conversion. ASCII68 (EBCDIC or 029 type) conversion must be performed by software. The user must specify hardware/software conversion in the physical device tables. One of the conversion tables, CR026 or CR029, must be loaded for any software conversion indicated.

5. The line printer driver, PRT40, was replaced by the D40421 Driver for the 1740/501/1742-1 Line Printers.

6. Unformatted requests are handled in the same way as the new driver, D42312, handles unformatted requests for the 1742-30/1742-120 Line Printers.

7. The stacking algorithm for the 1777 Paper Tape Reader/Punch Drivers, STCK, has been replaced by a code within the drivers themselves, D1777P and D1777R.

8. DR38MN, the minimum recovery version of the 1738 Disk Driver, and DR38MX, the maximum recovery version of the 1738 Driver, have been replaced by a single driver, D1738. D1738 now interfaces properly with the engineering file. Core requirements were reduced by deleting the bad sector logic previously required.

9. DR1732 has been replaced by two drivers: D1732U, the 1732-1/608/609 Unbuffered Magnetic Tape Driver, and D1732B, the 1732-1/1706/608/609 Buffered Magnetic Tape Driver. Previous options are now either assumed or they may be parameterized through the physical device table in SYSDAT.

10. The bad sector utility program, BSUP, has been removed. The capability to certify and test disk packs and cartridges is now included in the system initializer.

11. The system configurator, SYSCON, has been replaced by the library builder, LIBILD and associated modules, and the skeleton editor modules SKED and SKFILE.

12. FMP0V4 and FMP1V4 appeared in MSOS 4.0 to interpret parameter addresses in file manager requests from Part 0 and Part 1, respectively. These modules are no longer needed, since interpretation of parameter addresses has been made more efficient. The new method of address interpretation is included in the individual file manager modules.

CHANGES TO INDIVIDUAL PROGRAMS 5

1. The program DMP42X (formerly COUTV4) was modified to require standard equipment codes, thus eliminating the need for *S parameterization of the equipment codes at system installation.

2. BDK85X (formerly COBOP) was changed to allow parameterization of the following two items through SYSDAT rather than by *S parameterization at the time of system installation: 1) starting sector of the system failed image, and 2) size of the failed image.

   BDK85X assumes standard equipment codes. It can operate the 1738 as well as the 1733-1 Controller. The bad sector/alternate sector logic was removed from BDK85X, reducing program length from approximately 400 words to approximately 50 words.

3. B17391 (formerly COBOPC) and B1751 (formerly COBOPD) were both changed in the same manner as BDK85X.

4. TMINT was modified to remove the parameterization required for the timer types. Parameterization is now done in SYSDAT. Removal of the timer type selection from TMINT results in a saving of core space. The revised TMINT is independent of any parameterization.

5. NIPROC was changed to modify the power failure interrupt interface and to remove some faulty logic concerning timer restoration of the system time base. NIPROC was also changed to provide for a user-supplied program that would interface to this module after power was restored, so the user can restore his system to the configuration and parameters for his particular system. The linkage to the parity routine was modified slightly to make use of the common subroutine that performs conversion for the printout.

6. The level 2 idle loop, formerly in DRCORE, was moved to SYSDAT so the system could make use of the pseudo timer at level 2 when the system is swapped. DCORE (formerly DRCORE) was also modified to allow motion requests. No action is taken by DCORE on receiving a motion request, but the request does now result in a normal request completion.

7. The alternate device handler, ADEV, was modified in several areas:

   a. The link to the buffer data channel allocator has been removed. The previous analysis is related to the physical device table WES code. The new buffered data channel allocator, AL1706, is independent of the alternate device handler.

b. Similarly, the engineering file interface to log errors that have occured on devices was linked through the alternate device handler. This provided for some possibility of incorrect status matching the failures and loss of some of the failures if they occurred simultaneously. This logic was removed so the alternate device handler is now independent of the engineering file. Engineering file linkage is now from the driver to the engineering file program itself.

c. A third area of modification is the handling of the situation in which there is no response to the message

L,ℓu FAILED code

ACTION

Previously, if no response was received before a timeout, a response of RP was assumed. Now no response is assumed, and the message is repeated.

8. SPACE has been modified:

a. The timer initiation coding now includes capability for the following system time bases:

1572-1 Sample Rate Mode

1572-1 Line Synchronized Timing Mode

364-4 Timer

b. System startup was changed to:

- Print the system PSR level, date of build, and system name.
- Automatically select the mode (32K or 65K).
- Check File Manager file space threads for error and, if errors are present, give the user the option of clearing the files.
- Schedule the TDFUNC module to initialize date and time.
- Change the system startup conversational sequence to aid the operator.

c. The method of determining the sizes of allocatable core areas 1, 2, and 3 has been changed. Areas 1 and 2 are determined by *S statements at the time of system installation. Areas 1 and 2 depend on the sizes of their respective governing modules, and these sizes are now determined automatically. Area 3 is specified through SYSDAT, based on the size of the protect processor overlay.

9. Each driver in the system was modified in the following ways:

a. The driver names were changed as described in Part I, Section 2.

b. An interface to the error logging program was added.

c. Diagnostic logical unit capability has been added wherever SCMM device testing is available for the device. The alternate device handler is not used for a diagnostic logical unit, since SCMM will print more information regarding an error than the alternate device handler would.

d. All error codes were standardized.

e. Any parameterization previously required by assembly time options has been deleted. Parameterization is now done through SYSDAT or by the use of a separate module.

f. All drivers that can reside on mass memory can be made core-resident with no change in the driver. Any necessary parameterization changes are done through SYSDAT.

In the following discussion, a driver is not mentioned if the only changes to it were those listed above.

10. D3644 has been modified so that it now handles the 361-4 Communications Adapter in addition to the 361-1.

11. D1713K, D1713R, and D1713P are the new names for the 1713 Keyboard, 1713 Reader, and 1713 Punch Drivers, respectively. The parameterization required by the old programs, DBLDRV and MASDRV, is now done in SYSDAT, but the information regarding which portion of the 1713 is currently in use (i.e., keyboard, reader, or punch) is now contained in the keyboard driver, D1713K. This is because the keyboard driver is always core-resident, whereas D1713P and D1713R may be either core-reisdent or mass memory-resident. The capability for handling end-of-files was added in the same manner as for D1777R and D1777P, which are discussed later in this section.

12. D1728 (formerly DR1728), the 1728-430 Card Reader/Punch driver was modified by removing the Hollerith/ASCII conversion tables. (These tables are now contained in the new programs CP026, CP029, CR026, and CR029.) One of the following pairs of programs must be loaded with D1728:

    CP026 and CR026, or

    CP029 and CR029

13. When D1728 is punching binary records and it encounters a record beginning with the ASCII code for an asterisk, it assumes this record is to be punched as a name card. D1728 resets card sequence numbers to zero at this point.

14. D1777R (formerly PTREAD) and D1777P (formerly PUNCDR) were modified in the following ways:

    a. The stacking algorithm module, STCK, is no longer required since this logic is now contained within the drivers.

b. The capability for handling end-of-files was added to the 1777 Paper Tape Station Drivers. D1777P punches a $001C as the first frame of a record to denote an end-of-file. Such an end-of-file is recognized by D1777R when processing an ASCII or formatted binary request. Capability to advance files is not provided. An advance files motion request takes no action, but does not cause a system error.

15. D17391 (formerly DR1739) now interfaces properly with the engineering file. Core requirements were reduced by deleting the bad sector logic previously required.

16. DSBUFR (formerly BUFFER), the software buffer driver, was modified so that the buffer could reside on more than one of the system mass memory devices if desired. Other changes allow easier parameterization through the BUFFER macro. The new standardized error codes are documented in the Diagnostic Handbook.

17. DPSUDO (previously PSDTV4), the pseudo tape driver, was modified to allow proper handling of motion requests and foreground operation of pseudo tapes.

18. BPROTK, the buffered protect processor module, and UPROTK, the unbuffered protect processor module, were modified by removing assembly time options. The previously available timer options and the types of unprotected requests have been made standard. The main difference in the two modules now is in their action when protected input/output is in progress in the background. In this situation UPROTK does not allow swapping. If the I/O operation involves less than 96 words per record, BPROTK swaps core, retaining the I/O operation and the buffer within itself.

19. JPFLV4 was modified to print the date on job output. The date is obtained from the TOD program.

20. NAMEV4 was modified to print the date from the TOD program, the system identification, and the date of system generation in the job heading.

21. The RESTOR program was changed by removing the message buffer interface logic, since this logic is no longer in use.

22. MIPRO was changed in the following ways:

    a. The method of adding user commands was simplified. Comments within the program were improved to explain more clearly how a user parameterizes MIPRO to add his own commands.

    b. Commands were changed to be consistent with current MSOS usage.

    c. The following interfaces were added to MIPRO:

        - AUTRAN 2
        - TIMESHARE 2 utility package

- IMPORT
- SCMM
- Date and time setting programs
- Timer start and stop routines for the specific timer being used by the system.

23. The method of specifying the location of the failed system image was changed. SYSCOP was modified to interface properly with this new specification in SYSDAT.

24. The C02ND program was modified by updating the type code for each hardware device in the system. The updated type codes are documented in the MSOS Reference Manual.

25. The DSKTAP module was modified to improve user interface to DSKTAP, to improve error checking and error recovery, to print hardware status of failures, and to allow a more universal type of interface to drivers.

26. The initializer modules were changed in the following ways:

    a. Standard equipment codes and standard program names are now used.

    b. Error codes have been standardized.

    c. Relevant error codes for failures are now printed in addition to hardware status. These are now printed by the IDRIV module.

    d. Initializer drivers were modified to pass error codes and hardware status back to the IDRIV module.

NOTE

Initializer card reader drivers require parameterization of the ASCII code set that is going to be used for conversion.

27. CONTRL, the control module of the initializer, was modified in the following ways:

    a. The bad sector interface was removed. It was replaced with the capability to write address tags and to run a surface check on any disk mass memory device. A control statement was added for each of these capabilities.

    b. The capability for a larger disk and a larger sector availability table was added. The larger sector availability table of 30 sectors was parameterized.

28. I2 was modified to interface to the autoload generation without the bad sector logic.

29. All modules of the assembler were modified to allow the new cross references listing.

LIMITATIONS AND DEFICIENCIES 6

KNOWN LIMITATIONS

The FORTRAN compiler on occasion generates a relocatable base address for an indexed variable that is intended to fall in front of data, common, or the program. Since this relocatable address is expressed in 15 bits, the loader on a 16-bit load has no way of knowing that this is not a forward relocation. To accommodate this, the loader assumes that any relocatable address in the range $7F80 to $7FFF is intended as backward relocation. This range can be changed by reassembling the loader module, RBDBZ1. Specifically, COSY line number D1500224 in RBDBZ1 must be changed if the value $7F80 is to be modified.

The macro assembler punches a tape leader following the paper tape binary output from each program assembled, but not preceding any load and go. Although this provides a separator between programs, it does not assure that a leader will precede each program, especially the first program.

The assembler will not allow any pseudo-operation codes to appear before the MAC definition of any user macros. The assembler does not check for error conditions following completion of a request; thus, it may process invalid or improper data if control is returned to the assembler following an I/O error. Unless incorrect data generates assembly diagnostics, disk errors are denoted by MASS STG ERRORS only.

When using COSY, with standard input assigned to the teletypewriter, COSY still expects an input unit record of 80 characters.

When using System Checkout 2.0, the failed image must reside entirely on either disk 0 or disk 1 when using the 1733-2/856-2/856-4 Disk or the 1739-1 Cartridge Disk.

Unformatted read/write magnetic tape requests are not compatible between a 601 Magnetic Tape and a 608 Magnetic Tape. This means that a tape written on a 601 Drive with unformatted requests cannot be mounted on a 608 Drive and be read. Similarly, a tape with unformatted information from a 608 Drive cannot be read from a 601 Drive.

Because bad sector logic is contained in an MSOS 4.0 system and bad sector logic is not contained in an MSOS 4.1 system, there are incompatibilities between the mass storage layout in an MSOS 4.0 system and the layout in an MSOS 4.1 system. For this reason, a tape copy of mass memory made using DSKTAP under a 4.0 system cannot be loaded onto mass memory using DSKTAP under a 4.1 system. For the same reason, a tape copy of mass memory made under a 4.1 system cannot be loaded onto mass memory using a 4.0 system.

KNOWN DEFICIENCIES

If a mass storage-resident program that is loaded into partitioned core has nothing but common in the last partition of the block into which it is loaded, the record of the last partition is lost. When core is allocated to run the program, one too few partitions is allocated.

When using the macro assembler, a user-defined macro that is used as input to LIBMAC must not contain any images with an * in column 1. A macro that is defined directly within a subprogram may have these images with no restriction.

The TIMESHARE Text Editor contains text alignment commands for FORTRAN and assembly language text files. The assembly pseudo operator ALF is incorrectly aligned.

When using the TIMESHARE desk calculator package (CALCUL), a subtraction operation will produce a result of all asterisks if both numbers are positive floating point numbers raised to at least a power of five and if they differ only in their sixth significant digit.

Use of cards as the COSY source media for compression/decompression is not possible due to binary format incompatibilities with the end-of-file and asterisk detection algorithms in the card reader drivers.

MSOS 4.1 AND FORTRAN 3.2

The release includes all PSRs up to and including Summary Level 81, plus the following PSRs from Summary Level 82:

2173

2200 - 2206

2209 - 2217

2221 - 2225

2227 - 2228

2233 - 2234

NOTE

All applicable 4.0 PSRs are included.

TIMESHARE 2.0

The TIMESHARE product released in Summary Level 85 is designed to run on an MSOS 4.1 system that contains all PSRs through Summary 83 plus the following additional MSOS PSRs:

2565 from Summary 85

2729 from Summary 86

2308 from Summary 86

2760 from Summary 87

PART II

CONVERSION OF FORTRAN 3.1

TO FORTRAN 3.2

NEW AND CHANGED FEATURES 1

There are no entirely new programs in FORTRAN 3.2.

Features new to FORTRAN 3.2 are as follows:

1. Core requirements have been reduced to approximately 8K for FORTRAN 3.2A.

The following changes hold for both FORTRAN 3.2A and FORTRAN 3.2B.

2. Program, blank common, and labeled common lengths are printed in decimal as well as in hexadecimal.

3. FORMAT statements allow use of the Z format field descriptor.

4. Compiler accepts ASCII character codes from $20 through $5F in Hollerith fields of DATA and FORMAT statements.

5. The incidence of two-word addressing in compiled code has been further reduced.

PROGRAM NAME CHANGES 2

In FORTRAN 3.2A, the names of the following programs were changed. In addition to the name change, each module was modified to facilitate overlay processing. In each case, the program name is the same as the COSY deck name.

FORTRAN 3.1A	FORTRAN 3.2A
DUMYA1	DUMYAA
DUMYA2	DUMYAB
DUMYA3	DUMYAC
DUMYA4	DUMYAD
DUMYA5	DUMYAE
DUMYA6	DUMYAF
DUMYA7	DUMYAG
DUMYA8	DUMYAH
DUMYA9	DUMYAI
LOCLA1	LOCLAA
LOCLA2	LOCLAB
LOCLA3	LOCLAC
LOCLA4	LOCLAD
LOCLA5	LOCLAE
LOCLA6	LOCLAF
LOCLA7	LOCLAG
LOCLA8	LOCLAH
LOCLA9	LOCLAI

REPLACEMENT PROGRAMS 3

The programs ARITH2 and GETF2 from FORTRAN 3.1A have been combined to form ARITH1 in FORTRAN 3.2A. ARITH1 is like WARITH in FORTRAN 3.1B. The program, WARITH, remains unchanged in FORTRAN 3.2B.

All the preceding names are COSY deck names.

CHANGES TO INDIVIDUAL PROGRAMS 4

All names in the following discussion are COSY deck names unless otherwise identified. All changes apply to both FORTRAN 3.2A and FORTRAN 3.2B unless otherwise stated.

1. The programs GNST, DATAPR, and FGETC were modified to include all 64 ASCII characters with codes $20 through $5F. In addition, FGETC was modified to accept the Z format field descriptor.

2. CHOP and PHASEC were modified to increase code optimization by reducing the number of two-word instructions generated in compiled code.

3. The program SYMBL1 was modified to enhance storage and retrieval of symbols in the symbol table.

4. The following programs were modified to print program, blank common, and labeled common lengths in decimal as well as hexadecimal:

Program Name	FORTRAN 3.2A	FORTRAN 3.2B
BEGIN0	BEGN01 BEGN02	WGIN01
FINISH	FNISH1 FNISH2	WFIN1

5. In FORTRAN 3.2A only, the following routines were changed to pass parameters in blank common:

   AFIDL

   ASUPER

   SUBPR1

   SUBPR2

   SUBPR3

   ACP

   PHASEB

6. In FORTRAN 3.2A only, modules IOPRBA, IOPRBB, IOPRBC, IOPRBD, and IOPRBE were modified to facilitate overlay processing.

KNOWN LIMITATIONS

1. If superfluous information is included on an END line, the program is terminated but no diagnostic is given.

2. No check is made on the parameter type of the arguments of the intrinsic functions, the external functions, or the statement functions.

3. No diagnostic is issued if a function is not assigned a value.

4. No diagnostic is issued on attempted backward extension of COMMON.

5. In an arithmetic IF statement of the form IF (a-b) ℓ_1, ℓ_2, ℓ_3, if the absolute difference |a-b| exceeds $7FFF (= 32,767), control will not be transferred properly. Similarly, in a logical IF statement any expression that causes overflow on evaluation will not be evaluated correctly, causing improper execution of the statement.

6. A test for negative zero using a relational operator gives invalid results.

KNOWN DEFICIENCIES

There are no known deficiencies.

PSR LEVEL 6

The release includes all PSRs up to and including Summary Level 81.

In addition, PSR number 2219 from Summary Level 82 is included in both FORTRAN 3.2A and FORTRAN 3.2B. PSR number 2207 from Summary Level 82 is included in FORTRAN 3.2A only.

CROSS REFERENCES FOR PROGRAM NAMES FOUND IN PART I

A

The following list contains each program name appearing in Part I, together with an indication of the section(s) of Part I in which the program name appears.

NOTE

Some of the names refer to drivers. Drivers, listed with a reference to Section 5, may not be mentioned specifically there, but only in the general discussion regarding changes made to drivers.

Program Name	Part I Section Number
ADEV	5
ADF	3
ADR	3
AL1706	3
ALAQ	3
ASCII	3
B1751	2, 5
B1752	3
B17332	3
B17391	2, 5
BDK85X	2, 5
BOOTC1	3
BOOTC2	3
BOOTM1	3
BOOTM2	3
BOOTP	3
BPROTK	5
BSF	3
BSR	3

Program Name	Part I Section Number
BSUP	4
BUFFER	2, 3, 5
CD1729	2
CO2ND	5
COBOP	2, 5
COBOPC	2, 5
COBOPD	2
CONTRL	5
CONVRS	3
COUTV4	2, 5
CP026	3
CP029	3
CR026	3
CR029	3
CR405	4
CSYDRV	2
D1501	3
D1536	3
D1544	3
D1711	2, 5
D1713K	2, 5
D1713P	2, 5
D1713R	2, 5
D1726B	4
D1726U	4
D1728	2, 5
D17292	2, 5
D17293	3
D1731B	2, 5
D1731U	2, 5
D1732B	2, 4, 5
D1732U	2, 4, 5

Program Name	Part I Section Number
D17331	3
D17332	3
D1738	2, 5
D17391	2, 5
D1744	3
D1747	3
D1751	2, 5
D1777P	2, 4, 5
D1777R	2, 4, 5
D327TR	3
D3644	2, 5
D5355	3
D40421	4
D42312	3
DBLDRV	4, 5
DCORE	2, 5
DCOSY	2, 5
DECHEX	3
DECODE	3
DEFFIL	3
DEFIDX	3
DISP	3
DMP421	2, 3
DMP42X	2, 5
DPSUDO	2, 5
DR1728	2, 5
DR1732	2, 4
DR1739	2, 5
DR3644	2
DR38MN	2, 4
DR38MX	2, 4
DRCORE	2, 5

Program Name	Part I Section Number
DRMDRZ	2
DUMMY	3
DUMPV4	2, 5
DSBUFR	2, 5
DSKTAP	5
EFDATA	3, 4
EFILE	4
EFLIST	3, 4
EFSTOR	3, 4
ENCODE	3
EOF	3
EESORT	3
FLDF	3
FLOATG	3
FMDUMY	3
FMP0V4	4
FMP1V4	4
HASCOD	2
HASHCD	2
HELP0	3
HELP1	3
HELP2	3
HELP3	3
HELP4	3
HELP5	3
HELP8	3
HELP9	3
HELP10	3
HELP11	3
HELP12	3
HELP13	3
HELP14	3

Program Name	Part I Section Number
HELPER	3
HEXASC	3
HEXDEC	3
I2	5
IDRIV	5
IOSUB	3
JPFLV4	5
L15721	3
LIBIDO	3
LIBILD	3, 4
LJA2B	3
LOGA	4
LOKFIL	3
MASDRV	4, 5
MAXRVB	2
MDR52	3
MDRIV4	3
MDRV56	3
MIPRO	5
MMEXEC	3, 4
MESSY	3
MOVECH	3
NAMEV4	5
NDISP	4
NIPROC	5
NXTLOC	3
ONE	3
PICKUP	3
PRT40	4
PSDTV4	2, 5
PTREAD	2, 5

Program Name	Part I Section Number
PUNCDR	2, 5
Q17332	3
Q1752	3
Q42312	3
QCDDMY	3
QDKDMY	3
QDMDMY	3
QMTDMY	3
QPRDMY	3
QPTDMY	3
RECVTB	2
RELFIL	3
RESTOR	5
REW	3
REWCK	3
RTVDIR	3
RTVIDO	3
RTVIDX	3
RTVSEQ	3
S13001	2
S13002	2
S13003	2
S15721	3
SBCCON	3
SBCONV	3
SCHEDU	4
SCM405	3
SCMCD1	3
SCMCD2	3
SCMCRD	3
SCMDK1	3
SCMDK2	3

Program Name	Part I Section Number
SCMDM1	3
SCMDRM	3
SCMDVP	3
SCMEXC	3
SCMMTT	3
SCMPRT	3
SCMPTP	3
SCMTTY	3
SCMPTR	3
SELF	4
SKED	3, 4
SKFILE	3, 4
SMM1	3
SMM2	3
SMM3	3
SMM4	3
SNAPOL	2
SPACE	5
STATFL	3
STCK	4
STODIR	3
STOIDX	3
STOSEQ	3
SYSCON	4
SYSCOP	5
T5954	3
TABLST	3
TAPDRB	2
TAPEDR	2
TDFUNC	3
TELTYP	2

Program Name	Part I Section Number
THREE	3
TMINT	5
TOD	3
TRACE	3
TWO	3
UNL	3
UNLFIL	3
UPROTK	5
VERFY1	3
XREF	3

CROSS REFERENCES FOR PROGRAM NAMES FOUND IN PART II

B

The following list contains each program name appearing in Part II, together with an indication of the section(s) of Part II in which the program name appears. Each name is a COSY deck name unless followed by an asterisk, in which case it is a program name.

COSY Deck Name	Part II Section Number
ACP	4
AFIDL	4
ARITH1	3
ARITH2	3
ASUPER	4
BEGINO*	4
BEGNO1	4
BEGNO2	4
CHOP	4
DATAPR	4
DUMYA1	2
DUMYA2	2
DUMYA3	2
DUMYA4	2
DUMYA5	2
DUMYA6	2
DUMYA7	2
DUMYA8	2
DUMYA9	2
DUMYAA	2
DUMYAB	2
DUMYAC	2
DUMYAD	2

COSY Deck Name	Part II Section Number
DUMYAE	2
DUMYAF	2
DUMYAG	2
DUMYAH	2
DUMYAI	2
FGETC	4
FINISH*	4
FNISH1	4
FNISH2	4
GETF2	3
GNST	4
IOPRBA	4
IOPRBB	4
IOPRBC	4
LOCLA1	2
LOCLA2	2
LOCLA3	2
LOCLA4	2
LOCLA5	2
LOCLA6	2
LOCLA7	2
LOCLA8	2
LOCLA9	2
LOCLAA	2
LOCLAB	2
LOCLAC	2
LOCLAD	2
LOCLAE	2
LOCLAF	2
LOCLAG	2
LOCLAH	2

COSY Deck Name	Part II Section Number
LOCLAI	2
PHASEB	4
PHASEC	4
SUBPR1	4
SUBPR2	4
SUBPR3	4
SYMBL1	4
WARITH	3
WFIN1	4
WGINO1	4

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