GC33-5007-1

Systems

DOS Version 4

DOS Release 27.1

IBM

Second Edition (August 1973)

This is a reprint of GC33-5007-0 incorporating changes released in Technical Newsletter GN33-8722 (dated November 1, 1972).
This edition relates to Version 4, Release 27.1, of DOS and to all subsequent Version 4 releases until otherwise indicated in new editions or technical newsletters.

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A form for readers' comments is provided at the back of this publication. If the form has been removed, comments may be addressed to IBM Laboratory, Publications Dept., P.O. Box 24, Uithoorn, The Netherlands.

Preface

WHAT YOU MUST KNOW

The status of the IBM Disk Operating System as of Version 4 (from now on referred to as DOS Version 4) is described in a set of three manuals. The three are:

DOS Version 4, GC33-5007.

DOS Version 4 System Generation, GC33-5008.

DOS Version 4 Messages, GC33-5009.

This manual, DOS Version 4, contains information required by installation managers, systems programmers, applications programmers, and operators who work with DOS Version 4 on an IBM System/370 Model 135, 145, or 155. The manual contains update information to the existing DOS library. The manuals that are updated are:

DOS System Control and Service, GC24-5036.

DOS Data Management Concepts, GC24-3065.

DOS Supervisor and I/O Macros, GC24-5037.

DOS Operating Guide, GC24-5022.

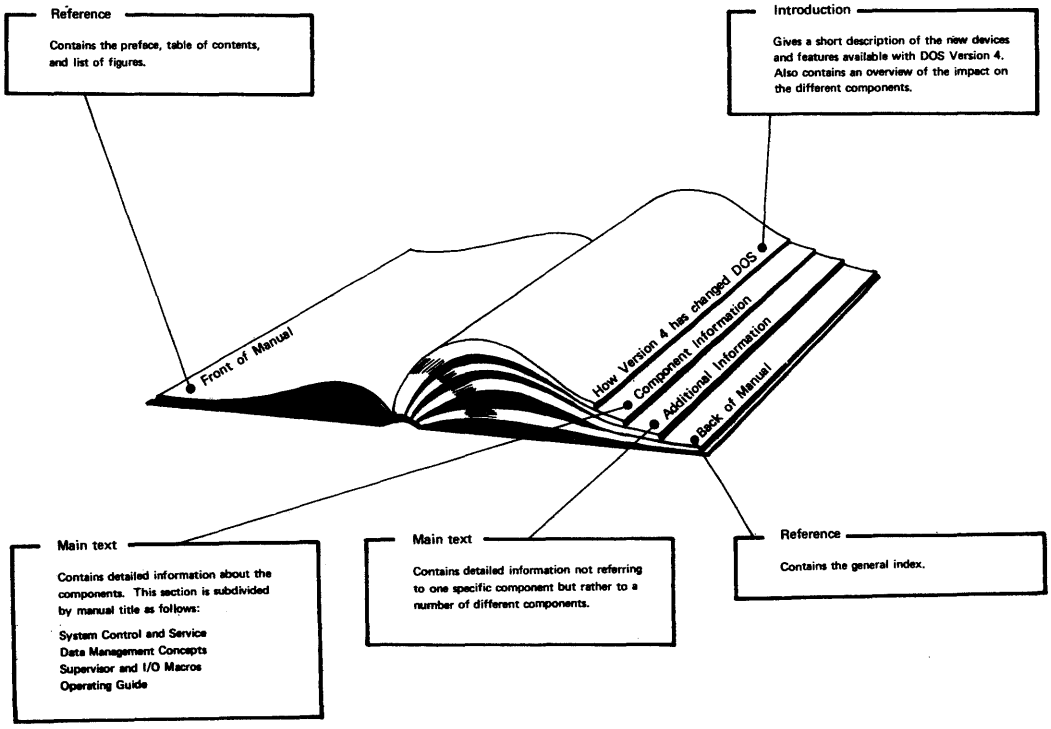
DOS and TOS Utility Programs, GC24-3465.

DOS and TOS Assembler Language, GC24-3414.

Because this manual supplements a set of existing manuals, it is important that you possess or obtain the manuals mentioned above and that you have a good understanding of their contents. This manual should not be used as a stand-alone document.

In principle the information contained in this manual adds to the information contained in the base publications. If completely new information is introduced or if a set of sections in the base publication are replaced by the information in this manual, it is specifically stated.

This publication is organized as follows:



The modules "System Control and Service", "Data Management Concepts", "Supervisor and I/O Macros", and "Operating Guide" contain the information in the same order as in the corresponding base publications. A topic discussed in this manual can be retrieved in the base publication through the headings used; the headings, as listed in the Table of Contents, in this manual correspond to those in the base publication.

Because the modules contain their own introduction, contents, and index, they can each taken out of this manual and kept with the base publication. If, however, you decide to keep the modules together, you should use the General Index rather than the module indexes.

The last module, "Additional Information", gathers together information on a series of topics. The information contained in this module mainly pertains to more than one basic publication.

Contents

Module 1. System Control and Service

Module 2. Data Management Concepts

Module 3. Supervisor and I/O Macros

Module 4. Operating Guide

Module 5. Additional Information

Figures

How Version 4 has Changed DOS

IBM SYSTEM/370

The new IBM System/370 Computing System extends the architecture of System/360 and adds the benefit of newer technology. This results in improved processing and price/performance.

Version 4 of the Disk Operating System supports three models of the System/370:

- System/370 Model 135, with 96K to 240K bytes of main storage.
- System/370 Model 145, with 112K to 256K bytes of main storage.
- System/370 Model 155, with 256K to 2,048K bytes of main storage.

The major advantages of the new System/370 computing system line are:

- Large processor storage increments at low cost increments.
- Faster internal performance.
- Improved channel capabilities.
- Improved reliability, availability, and serviceability features.
- Improved programming support package.
- Integrated emulation.

System Configuration

The minimum features required to run DOS on a System/370 computing system are:

- 28K bytes of main storage; 14K bytes are required for the minimum supervisor while the minimum partition size for DOS Version 4 is also 14K bytes. (This is a theoretical demand since the smallest System/370 Model has 96K bytes of main storage.)
- Standard instruction set (see note 1).
- Two I/O channels (one multiplexer, and one selector or the integrated file adapter, see note 2).
- One Card Reader (1442, 2501, 2520, 2540, or 3505). See note 3.
- One Card Punch (1442, 2520, 2540, or 3525). See note 3.
- One Printer (1403, 1443, or 3211). See note 3.
- One 3210 Model 1 or 3215 Console Printer-Keyboard.
- One 2311 Disk Storage Drive, or one 2314 Direct Access Storage Facility, or one 2319 Disk Storage, or one 3330 Disk Storage.

Notes:

1. Language translators may require extended instruction sets.
2. Telecommunications devices should not be on the same selector channel as SYSRES.

   MICR processing requires either the direct control feature or the external interrupt feature.
3. One 2400-series (7 or 9-track), 3410 (9-track), or 3420 (7 or 9-track) Magnetic Tape Unit, or a disk extent, may be substituted for this device; these are not valid substitutes for a card reader during IPL, however.

Additional features that are available with any model of the System/370 are:

- Simultaneous read-while-write tape control (2404 or 2804).
- Any channel configuration up to one multiplexer channel and six selector channels.
- Tape switching unit (2816).
- Universal Character Set (UCS) feature.
- Selective tape listing feature (on the 1403 or 3211) for continuous paper tapes.
- Dual address adapter (for the 1419 and 1275) to allow more stacker selection processing.
- Integrated file adapter (for models 135 and 145 only). This permits the native attachment of a 2319 Model A1 with up to eight drives.

Problem program can request I/O operations for the following devices:

CARD READERS AND PUNCHES

- 1442 Card Reader Punch
- 2501 Card Reader
- 2520 Card Read Punch
- 2540 Card Read Punch
- 2596 Card Read Punch (96-column cards)
- 3505 Card Reader
- 3525 Card Punch.

PRINTERS

- 1403 Printer
- 1443 Printer
- 3211 Printer
- 3525 Card Punch with optional print feature.

CONSOLE PRINTER-KEYBOARDS

- 3210 Model 1 Console Printer-Keyboard
- 3215 Console Printer-Keyboard.

PAPER TAPE UNITS

- 1017 Paper Tape Reader with 2826 Control Unit Model 1.
- 1017 Paper Tape Reader with 2826 Control Unit Model 2.
- 1018 Paper Tape Punch.
- 2671 Paper Tape Reader.

DASD

- 2311 Disk Storage Drive
- 2314 Direct Access Storage Facility
- 2319 Disk Storage
- 2321 Data Cell Drive
- 3330 Disk Storage.

MAGNETIC TAPE

- 2400-series Magnetic Tape Units
- 2495 Tape Cartridge Reader
- 3410 Magnetic Tape Unit
- 3420 Magnetic Tape Unit.

OPTICAL READERS AND SORTERS

- 1270 Optical Reader Sorter (see note 1)
- 1275 Optical Reader Sorter (see note 1)
- 1287 Optical Reader (see note 2)
- 1288 Optical Page Reader (see note 2).

MAGNETIC CHARACTER READERS

- 1255 Magnetic Character Reader (see note 1).
- 1259 Magnetic Character Reader (see note 1).
- 1419 Magnetic Character Reader (see note 1).
- 1419P primary control unit address on 1275/1419 Dual Address Adapter.
- 1419S secondary control unit address on 1275/1419 Dual Address Adapter.
- 7770 Audio Response Unit.

TELEPROCESSING DEVICES

- Teleprocessing devices specified in BTAM and QTAM publications.

Notes:

1. The maximum number supported depends on the system configuration.

2. A total of eight 1287 Optical Readers and/or 1288 Optical Page Readers in any combination is supported by the system.

Size of the Programming Package

The minimum size DOS supervisor that can run on a System/370 CPU is 14K; for a multiprogramming supervisor (MPS) the same amount of main storage is required.

Summary of Announced Features

The following features have been announced and are available in DCS Version 4:

- Programming support for:

  IBM System/370 Model 135

  IBM 3330 Disk Storage

  IBM 3410 and 3420 Magnetic Tape Units

  IBM 2596 Card Read Punch, IBM 3505 Card Reader, and IBM 3525 Card Punch.

- Time-of-Day Clock Support.

- Recovery Management Support Recorder (RMSR).

In addition, programming support released independently following Release 26

is available with DOS Version 4 for the following teleprocessing devices:

- IBM 2798 Guidance Display Unit
- IBM 3270 Information Display System
- IBM 3575 Programmable Buffered Terminal.

SUPPORT FOR THE MODEL 135

The IBM System/370 Model 135 has monolithic main storage capacities of 96K to 240K bytes. The main benefits are improved performance (2 to 7 times as fast as a System/360 Model 30, depending on the application) and improved serviceability.

Generally, all programs written for a System/360 (Model 25 and up) will operate on a System/370 Model 135 having a comparable hardware configuration, with the following exceptions:

- Time dependent programs.
- Programs using machine dependent data.
- Programs written to cause data checks.
- Programs using the ASCII bit.
- Programs that depend upon the nonusable lower storage area being smaller than 512 bytes.
- Programs that depend upon the validity of data after the system power has been turned off and restored.

The standard features of the Model 135 are:

- Commercial instruction set.
- OS/DOS compatibility feature.
- 14 new instructions.
- Byte-oriented operand feature.
- Interval timer.
- Time-of-day clock.
- Store and fetch protection.
- Byte multiplexer channel.
- Console file.
- Control registers.
- Audible alarm.
- Error checking and correction on main and control storage.
- Automatic instruction retry.
- Channel command retry.
- 24K bytes of Reloadable Control Storage.

The minimum hardware configuration for a Model 135 consists of a 3135 Processing Unit and a 3046 Power Unit Model 1, a disk on Selector Channel 1 (or the integrated file adapter feature with the 2319-A1), a line printer, a card reader, and a 3210 Model 1 or 3215 Console Printer-Keyboard.

SUPPORT FOR 3330

The IBM 3330 Disk Storage combines large storage capacity with high performance. The maximum storage capacity of a 3330 is approximately 800 million bytes. The disk packs (IBM 3336) can easily be mounted and demounted. You can therefore use these disk packs to extend your offline storage. The following list gives the major performance and storage characteristics of the 3330 as compared to the characteristics for the IBM 2314 Direct Access Storage Facility.

	3330	2314
Data transfer rate (Kb/sec)	806	312
Minimum access time (msec)	10	25
Average access time (msec)	30	75
Maximum access time (msec)	55	135
Number of tracks/cylinder	19	20
Number of cylinders/pack	404+7	200+3
Number of tracks/pack	7,676	4,000
Track capacity in bytes	13,030	7,294
Total capacity (Mbytes)	800	233

The functions of the 3330 are compatible with 2314/2319 functions; programming support for the 3330 is an extension of 2314/2319 support. These extensions mainly allow for improved error recovery and increased data transfer rate. This manual only points out those places where programming support as it exists for the 2314/2319 has been changed to support the 3330. For all areas of the base publications not mentioned in this manual the full compatibility of the devices should be assumed. Differences between the 2314 and 3330 disks in number of tracks, number of cylinders, and track capacity should always be taken into account.

What is the Impact?

Programming support for the IBM 3330 Disk Storage has caused a number of changes in the System Generation, System Control and Service, Data Management Concepts, Supervisor and I/O Macros, Operating Guide, Messages, and System Utilities publications. The new and changed messages for the 3330 are contained in DOS Version 4 Messages, GC33-5009.

System Generation: In order to allow the supervisor to accept the 3330, the following changes have been made:

- The DASDFP parameter of the FOPT macro allows 3330 as a valid entry.
- The SYSFIL parameter of the FOPT macro accepts YES as a specification for the 3330.
- The DISK parameter of the PIOCS macro allows 3330 as a valid entry.
- 3330 can be specified in the DVCTYP parameter of the DVCGEN macro.
- To reserve PUB2 space for the 3330, the D3330= parameter must be specified in the IOTAB macro.

Complete and detailed information about the changes that have been made to the system generation procedure can be found in DOS Version 4 System Generation, GC33-5008.

System Control and Service: Changes have been made to the following areas to support the 3330:

- Label information for 3330 files can only be supplied by the // DLBL and // EXTENT job control statements.
- Librarian support for the new disk device is compatible with 2314 librarian support, but the larger storage capacity of the 3330 allows for more effective use of available space. The formulas to calculate the storage space required for libraries and directories are identical for the 2314 and 3330. Of course, the different number of tracks (20 and 19 respectively) has to be taken into consideration. The increased track capacities and different number of tracks and cylinders of the 3330 also have an impact on functions such as condense.

Data Management: The changes and addition that have been made for the 3330 are:

- ISFMS. Storage space formulas for the new disk device have been added.
- DAM. The track capacity has increased for 3330. Therefore, the capacity record figure has been updated to include the values for the 3330.
- DASD. A description of the new disk device, which includes its record and storage capacities, has been added.

Supervisor and I/O Macros. The following changes have been made in the supervisor area:

- The largest DTFSD BLKSIZE specification allowed is now 13,030.
- 3330 can be specified in the DEVICE operand of the DTFSD.
- The IOAREA1 operand of the DTFSD must be no larger than 13,030 for spanned record processing.
- In order to handle the extended disk address (404 cylinders) of the 3330, the NOTE macro instruction now returns cchr in register 1; this value is used by the POINTR and POINTW macro instructions.
- 3330 may be specified in the DEVICE operand of the DTFDA.
- The maximum specification of the CYLOFL operand in the DTFIS for the 3330 is 17.
- DEVICE=3330 can be specified in the DTFIS.
- 3330 are valid specifications for the HINDEX operand of the DTFIS.
- The DEVICE operand of the DTFPH also accepts 3330 as a valid entry.

Operating Guide. A number of new restrictions have been added for the new disk devices.

- Label information for the 3330 should only be supplied through the use of // DLBL and // EXTENT.
- The write-protect switch on the 3330 is supported as under OS; in other words, if you try to write on a 3330 on which the switch is in the READ=ONLY position, message

  OP45I WR INHIBIT

  is printed on the console and the operation is terminated. A red light in the operator control panel of the

3330 indicates that the disk is write protected.

Utilities. The changes required for the new disk are:

- The track location parameter of ALTDK can address cylinders 0-403. If a track of a 3330 has been assigned defective, you can never be reassigned it.
- The quick initialization parameter (IQ) has been added to INTDK for the 3330; IA and IR are invalid for the 3330.
- A number of new restrictions and considerations apply to the calculation of the available I/O areas.
- The E=(e) parameter of all other system utilities now accepts 3330.

SUPPORT FOR 3410 AND 3420

The 3400-series Magnetic Tape Units offer better performance and reliability than the 2400-series tapes.

Programs run on 2400-series tape units that make use of the DTFMT and DTFDI macro instructions can be run on 3400-series magnetic tape units without any changes. Additional features of the 3410 and 3420 are data security erase (DSE) and improved tape ERP facilities.

IBM 3410 Magnetic Tape Unit

There are three models of the 3410, Models X1, X2, and X3, with tape speeds of 12.5 ips, 25 ips, and 50 ips respectively. The tape density is 1600 bpi, unless you specify 800 bpi. The 3411 Control Unit can control 4 models X1, 6 Models X2, or 8 Models X3. An optional feature of the 3410 is:

- 9-track NRZI, 800 bpi, or 9-track PE, 1600 bpi.

IBM 3420 Magnetic Tape Unit

There are three models of the 3420, Models 3, 5, and 7, with tape speeds of 75 ips, 125 ips, and 200 ips, respectively. The 3803 Control Unit can control up to 16 tape units, 8 of which can be directly attached. The tape used is 9-track, 1600 bpi, 1/2 inch magnetic tape. Optional features are:

- 2-channel switch.
- 9-track NRZI, 800 bpi, or 9-track PE, 1600 bpi.
- 7-track NRZI, with either 556 or 800 bpi.
- Device switching.

What is the Impact?

Programming support for the 3400-series magnetic tape units is compatible with programming support for the 2400-series magnetic tape units. Therefore only a few changes have been made to System Generation, System Control and Service, Operating Guide, and Messages. The information about changed and new messages can be found in DOS Version 4 Messages, GC33-5009.

System Generation. In order to have the 3410 and 3420 accepted as valid devices at system generation time, the following changes have been made:

- 3410T9, 3420T9, and 3420T7 can be specified in the DVCTYP parameter of the DVCGEN macro.
- To reserve PUB2 space for the 3410 and 3420, the D3410= and D3420= parameters must be specified in the IOTAB macro.

Detailed information about the changes that have been made to the procedure of generating a system are contained in DOS Version 4 System Generation, GC33-5009.

System Control and Service. The following item has been changed in system control and service procedures to support the 3400-series tapes.

- A new parameter has been added to the MTC command. This parameter, DSE (data security erase), allows for the quick erasure of a 3400-series tape.

Operating Guide. The following has been added to the information currently in the Operating Guide.

- To include data security erase (the quick erasure of a 3400-series magnetic tape) the DSE parameter has been added to the MTC command.

SUPPORT FOR 2596, 3505, AND 3525

IBM 2596 Card Read Punch

The 2596 is a card unit which reads and punches 96-column cards. It consists of two 2000-card capacity input hoppers: one for the read feed, one for the punch feed. The four 600-card capacity stackers are each assigned one of the functions:

1. Normal read stacking
2. Selective read stacking
3. Normal punch stacking
4. Selective punch stacking.

An optional feature is interpretive printing of the data punched into the card. Interpreting is performed on the same pass as punching with no loss of card punching speed. Printing consists of three lines of 32 characters each.

The maximum speeds of the 2596 are as follows:

- Reading at 500 cards per minute.
- Punching at 120 cards per minute.
- Punching and printing at 120 cards per minute.

IBM 3505 Card Reader

The IBM 3505 is a serial card reader which performs the functions presently performed by the IBM 2501 Card Reader and the read portion of the IBM 2540 Card Read Punch. It offers advantages not found in either of these devices. Normal punched-hole reading as well as new functions such as Optical Mark Read (OMR) and Read Column Eliminate (RCE) are provided. OMR reads preprinted marks or pencil marks on cards; RCE allows data in selected columns of a card to be ignored.

The two models of the 3505 that are supported under DOS Version 4 are:

3505 B1 - 800 cards per minute
3505 B2 - 1200 cards per minute.

The 3505 also includes an 80-column image buffer which allows both a reread function and the associated error recovery procedures. The 3505 has two stackers (1R and 1L) which both work as stacker 1; it may optionally include a second stacker.

The 3505 can perform normal reading, buffering, and stacker selection. The features of the device include:

- Reading in either card image mode or EBCDIC mode.
- Reading in OMR or RCE mode.
- Performing stacker selection with an optional third stacker.

IBM 3525 Card Punch

The IBM 3525 is an 80-column card punch which offers functions not found in punches such as the IBM 1442 and 2540.

The models that are supported under DOS Version 4 are:

3525-P1 - 100 cards per minute.
3525-P2 - 200 cards per minute.
3525-P3 - 300 cards per minute.

The 3525 has one hopper from which it passes its data cards. These cards can subsequently be read, punched, printed, and stacker-selected into one of the two available primary stackers. If during a punch-only or punch/print operation a card is found to be mispunched, it is passed to a third stacker and two new cards are punched; one to replace the mispunched card and one to go with the mispunched card to stacker 3.

The 3525 can perform normal reading, punching, and printing. The features of the device include:

- Reading and punching in either card image or EBCDIC mode.
- Automatic or user controlled line positioning.
- Printing two or more than two lines on a card.
- Performing stacker selection.
- Performing any combination of reading, punching, and printing.
- Reading in RCE mode.
- Punching and interpreting data on a card.

What is the Impact?

Inclusion of the 2596, 3505, and 3525 has resulted in changes and additions to System Generation, Data Management Concepts, and Supervisor and I/O Macros.

System Generation. The major change in this area is:

- The provision for specifying 2596, 3505, 3525P, or 3525RP in the DVCTYP parameter of the DVCGEN macro.

Further information required at system generation time is included in DOS Version 4 System Generation, GC33-5008.

Data Management. The inclusion of the 3505 and 3525 has caused the following additions in Data Management:

- A description of the OMR and RCE record formats.
- The layout of the format descriptor cards.
- A description of the changes required to accept the new record formats of the 3505 and 3525.

Supervisor and I/O Macros. A large number of changes, additions, and restrictions have been incorporated in this area. They are:

- The BLKSIZE parameter of the DTFCD has default values of 96 (for the 2596) and of 160 (for the 3505 and 3525 in column binary mode).
- The DTFCD CONTROL parameter is not valid for a 3525 input file.
- Only DEVADDR=SYSnnn may be specified in the DTFCD for the 2596.
- The DTFCD BLKSIZE parameter now accepts the specification of 2596, 3505, and 3525.
- IOAREA2 may not be specified for 3525 associated files in the DTFCD. A 3525 associated file is a card file that is processed on a 3525 and on which any combination of read, punch, and print operations is performed.
- If a 3505 or 3525 is used and FUNC=I is specified in the DFTCD, RECFORM=FIXUNB should be specified or the RECFORM parameter should be omitted.
- The ASOCFLE, ERROPT, FUNC, and MODE parameters have been added to the DTFCD.
- The CONTROL, DEVICE, IOAREA2, and RECFORM operands of CDMOD have undergone the same changes as the corresponding operands in the DTF; the FUNC operand has been added to this macro. These changes and additions result in an increased number of module names for CDMOD.
- The default of the BLKSIZE operand of the DFTPR for the 3525 is 64.
- If CTLCHR=ASA is specified in the DTFPR and a 3525 is used, the + character may not be used.
- Only DEVADDR=SYSnnn may be specified in the DTFPR for the 3525.
- The DTFPR DEVICE operand allows the specification of 3525.
- A new specification (IGNCRE) for the ERROPT operand of the DTFPR has been added for the 3525.
- The ASOCFLE and FUNC operands have been added to the DTFPR.
- The CTLCHR, DEVICE, and ERROPT operand of the PRMOD have undergone the same changes as the corresponding operands in the DTF; the FUNC operand has been added. This results in an increaded number of module names for PRMOD.
- OPEN(R) has been changed to verify the 3505 and 3525 format descriptor card.
- A number of new considerations have been added to the PUT macro when processing a 3525 print file.
- The updating function for a 3525 file, performed through associated files, has been added.
- Card control codes for the 2596, 3505, and 3525 have been added.
- Special considerations apply to the PRTOV macro when it is used with a 3525.
- Some new functions have been added to CLOSE(R) for 3505 and 3525 files; the 3505 and 3525 are reset to normal mode after processing in either CMR or RCE mode has been completed.

SUPPORT FOR NEW TELEPROCESSING DEVICES

Through the macro instruction facilities of BTAM (Basic Telecommunications Access Method), support is provided for the IBM

2798 Guidance Display Unit, the IBM 3270 Information Display System, and the IBM 3735 Programmable Buffered Terminal. Detailed information about the 2798 and the 3270 can be found in DOS Version 4 Basic Telecommunications Access Method, GC27-6978; information about the 3735 is contained in OS/DOS 3735 Programmer's Guide, GC30-3001.

IBM 2798 Guidance Display Unit

The 2798 is an addition to the 2790 Data Communications System. The 2798 is a versatile input/output unit that can be used for applications requiring interactive inquiry/response transactions. Applications include initial data entry, updating, and inquiry functions that require alphameric data input and output related to people, parts, machines, vendors, time, quality, and so forth. Major features include:

- Alphameric 64-character keyboard.
- Data entry with visual verification of up to 16 characters per transaction.
- Illuminated guidance panel for operator instruction.

IBM 3270 Information Display System

The 3270 provides advanced alphameric display capabilities with improved response time and transaction rates based on increased transmission and operator efficiency. Major features include:

- Local or remote configurations, or both.
- Choice of 480-character or 1920-character display stations.
- Choice of typewriter, data entry, and operator console keyboards and a selector pen.
- Data security features.
- Capability of converting from 2260 data formats to 3270 data formats.

IBM 3735 Programmable Buffered Terminal

The 3735 combines the power and flexibility of the interactive terminal with the efficiency of batch transmission to provide a new dimension in source-document preparation and data capture. The 3735 consists of the IBM Selectric® Keyboard Printer with a desk-side control unit. Designed primarily for applications using preprinted (fixed-format) forms and batch processing, the 3735 can be tailored to fit the requirements of a wide variety of data processing environments via its own internal program.

TIME-OF-DAY CLOCK

The time-of-day clock provides an accurate means of time stamping and measuring on all Models of System/370. Support of the time-of-day clock is optional; during system generation you must specify TOD=YES in the FOPT macro instruction to include this support in your supervisor.

Note: Installations that do not wish the date to increment at 24.00 p.m. can force the date-change to take place at any given time by specifying an unrealistic zone value at system generation time.

The time-of-day clock has more extensive capabilities than are provided by the current interval timer at location 80.

Highlights of TOD clock support are:

- An accurate time-of-day indication with a consistent operation.
- Automatic update of system, Greenwich, and job dates.
- Zone value setting when there is a difference between local time and GMT.
- IPL-to-IPL carry over of the clock and date setting.

What is the Impact?

The optional time-of-day clock support has caused changes in System Generation, System Control and Service, Supervisor and I/O Macros, Operating Guide, and Messages. The information on the messages pertaining to TOD clock support is contained in DOS Version 4 Messages, GC33-5009.

System Generation. A number of additions have been made to the system generation FOPT macro:

- TOD=YES/NO can be specified. Use this parameter to specify whether TOD clock support is part of the system.

- If you have a system that contains TOD support, use the ZONE parameter to specify the difference in time between your location and Greenwich.

For more detailed information about the changes made to the system generation procedure, see DOS Version 4 System Generation, GC33-5008.

System Control and Service. The following changes have been made to the control program for installations that have TOD clock support as part of their system:

- The print formats of the // JOB and /& statements have been changed; both the date and the time-of-day are printed on SYSLST and/or SYSLOG.

- The job control SET command has been changed because the date and clock cannot be set after IPL time. If no TOD clock support is present, the DATE parameter may be specified. The format of the SET command is now:

```
SET [UPSI=n1][,LINECNT=n2][,RCLST=n3]
    [,RCPCH=n4][,RF=n5][,DATE=n6]
```

- The ZONE statement has been added to job control. This statement allows you to reset the value of the time-of-day temporarily. The format of this statement is:

```
// ZONE {EAST}/hh/mm
        {WEST}
```

- The SET statement used at IPL time has been changed; the zone can also be specified. The new format of the SET statement is:

```
SET [DATE=value1[,CLOCK=value2]]
    [,ZONE={EAST}/hh/mm]
           {WEST}
```

Supervisor and I/O Macros. Because the time-of-day clock is intended to allow you to keep track of elapsed time, it is possible to obtain the correct time at any given moment. For this purpose you can use the GETIME macro instruction. This instruction causes the updated time-of-day to be placed in general register 1. Thus the time used by any program or program routine can be accurately calculated.

Operating Guide. The IPL procedure has been changed considerably for systems that include TOD clock support. The "Operating Guide" section contains a full description for the IPL procedure from both card readers and consoles for systems that include or do not include TOD clock support.

RECOVERY MANAGEMENT SUPPORT RECORDER (RMSR)

The Recovery Management Support Recorder writes environmental data on the recorder file (SYSREC). You or the CE can establish the areas that require service by analyzing the environmental records thus obtained.

The records created by RMSR include hardware information and pertinent statistics. Selected intermittent errors can also be recorded.

The types of recording that RMSR performs are:

- MCAR (Machine Check Analysis and Recording). A record is written containing reliability data about the system hardware.

- CCH (Channel Check Handler). When a channel check occurs, channel check information is logged and an interrupt is generated.

- Counter Overflow. A record is written on SYSREC whenever a statistical counter (which accumulates the number of I/O errors per device) in the PUB2 table fills up. The PUB2 table is a logical extension of the PUB table; it provides a main storage area to accumulate statistical data.

- Unit Check. A record is written if, after a certain number of retries, device ERPs (Error Recovery Procedures) cannot correct an error. The information required for the record is in the PUB2 table.

- TES (Tape Error Statistics). When a new tape is opened, a Volume Dismount Record, containing statistical data for the previous volume, is written on SYSREC.

- IPL/EOD. I/O error logging includes RDE (Reliability Data Extractor). If ERRLOG=RDE is specified at system generation, RMSR writes the following records on SYSREC;

  1. An IPL record, which gives the reason for loading the supervisor.

  2. An EOD (End-of-Day) record, which is written when the ROD command is given.

- Miscellaneous Data Recorder (MDR). Recordings are made on the SYSREC file for errors occurring on the 2715 Transmission Control Unit, 3211 Printer Buffer, and 3330 Disk Storage.

Environmental Recording, Editing, and Printing Program (EREP)

The EREP program edits and prints the error statistics that RMSR has stored on SYSREC.

Any of the following options can be performed:

- Edit/print the entire SYSREC file.
- Create/update the history/RDE tapes.
- Selectively retrieve records from SYSREC or the history/RDE tapes for editing and printing.
- Summarize SYSREC.
- Create/update the TES history tape.
- Edit/print tape data on SYSREC.
- Summarize tape error data from SYSREC or the TES history tape.
- Clear SYSREC.
- Summarize RDE data from the RDE tape.

What is the Impact?

For the new Recovery Management Support Recorder functions changes have been made to System Generation, System Control and Service, Operating Guide, and Messages. Detailed information about the messages that have been changed, added, and deleted can be found in DOS Version 4 Messages, GC33-5009.

System Generation. A number of changes have been made to the macros that must be specified during system generation.

- The MCRR parameter of the SUPVR macro is no longer required. This parameter must not be specified.
- The format of the SUPVR ERRLOG parameter has been changed; the new format is:

  ERRLOG=YES/RDE

- The TEB parameter of the FOPT macro is now applicable only to the IBM 2495 Tape Cartridge Reader; the format of the parameter has not changed.
- The format of the TEBV parameter of FOPT is now:

  TEBV=IR/CR/NO

- The n is no longer specified in the EVA parameter of the FCPT macro. The new format of this macro is:

  EVA=NO/(r,w)

- A parameter has been added to the IOTAB macro: Dxxxx=0/n, in which xxxx can be 2311, 2314, 2321, 3330, 2400, 3410, or 3420. This parameter is used to reserve PUB2 table space for devices that require more than the normal value of 12 bytes per device for each PUB2 table entry.

For more detailed information about the changes that have been made to the system generation procedure, see DOS Version 4 System Generation, GC33-5008.

System Control and Service. The following changes have been made to the information in System Control and Service:

- The Tape Error Recovery Procedures no longer use the TEBV.
- The section "System Availability Aids", with its subsections, has been deleted and replaced by the section "Recovery Management Support Recorder".
- The section "DOS Volume Statistics", with its subsections, has been deleted and replaced by the section "Tape Error Statistics".
- Some new operands have been added to the MODE command for further support of the RMSR feature. The new format of the MODE command is:

```
MODE { IR
       CR
       CE,cuu[,I[,xx,y]]
             [,D[,xx,y]]
             [,N]
       R
       STATUS
       HIR[,{M}]{[,{R }]}[,E=eeee][,T=tttt]
       ECC[,{C}]{[,{Q }]}                    }
             {[,{TH}]}
```

- The section "Environmental Recording, Editing, and Printing Program (EREP)", with its subsections, has been deleted and replaced by the section "Environmental Recording, Editing, and Printing (EREP) Program".
- The section "Error Statistics by Tape Volume Utility Program" has been deleted and replaced by the section "Environmental Recording, Editing, and Printing (EREP) Program".

Module 1. System Control and Service

Module Outline

What has been Changed in System Control and Service?

The operating capabilities provided by DOS Version 4 require a minimum main storage area of 28K. DOS Version 4 is intended for IBM System/370 configurations that include one or more IBM 2311 Disk Storage Drives, IBM 2314 Direct Access Storage Facilities, IBM 2319s (if attached to a 2314 or if used with the optional Integrated File Adapter feature of the Model 135 and 145) or IBM 3330 Disk Storage. The system is disk resident. Depending on the requirements of the particular location, the system can be expanded to include all processing programs that perform the various jobs of a particular installation, or it can be tailored to a minimum system to control a single program.

Note: All references to CEAIDS have been deleted and replaced by PDAIDS; therefore all references to CEAREA and CE should be changed to PDAREA and PD. The CE parameter of the MODE command does not fall under this category and is therefore not changed.

What Parts of the Base Manual have been Changed?

Changes have been made to the following sections:

Supervisor

- The Tape Error Recovery Procedures (Tape ERPs) no longer use the TEBV.
- The section "System Availability Aids", with its subsections, has been deleted and replaced by information in the section "Recovery Management Support Recorder (RMSR)".
- The section "DOS Volume Statistics", with its subsections, has been deleted and replaced by the section "Tape Error Statistics".

Job Control

- Label information for the 3330 may not be supplied through // DLAB, // VOL, and // XTENT statements.
- Some new operands have been added to the MODE command to extend the support of the RMSR feature.
- The DSE (data security erase) operand has been added to the MTC command; this operand can be used only for 3400-series tapes.
- For systems with TOD clock support, the print formats of the JOB and /& statements have been changed.
- Changes have been made to the SET command to support the TOD clock; the ZONE command has been added for the same reason.

Initial Program Loader

- A new format of the SET command has been introduced for systems that include TOD clock support.
- The IPL procedure from both a card reader and a console has been changed.
- In the list of device type codes required for the ADD and DEL commands, the new devices have been added.

Librarian

- The calculations of the storage space required for libraries and directories on a 3330 Disk Storage have been added.

Problem Determination

- The section "Environmental Recording, Editing, and Printing (EREP)", with its subsections, has been deleted and replaced by RMSR information.
- The section "Error Statistics by Tape Volume Utility Programs" has been deleted and replaced by RMSR information.

Main Storage Organization

I/O UNITS CONTROL TABLES

The Tape Error Block by Volume (TEBV) is no longer available. Tape error data is now gathered by means of the Tape Error Statistics (TES) function of RMSR. This function uses a TES history tape, the recorder file (SYSREC), and the new PUB2 table. Therefore, the information that was placed in a TEBV can now be gathered from these locations.

Device Error Recovery

The following sections, "Recovery Management Support Recorder (RMSR)" and "Tape Error Statistics (TES)", now contain the material formerly contained in the sections "Device Error Recovery", "System Availability Aids", and "DOS Volume Statistics", with their respective subsections.

Recovery Management Support Recorder (RMSR)

The DOS Recovery Management Support Recorder is a comprehensive error recovery and error logging facility. RMSR controls attempts at recovery from hardware errors and produces three basic types of hardware error recordings: recordings of CPU errors (MCAR records), recordings of channel errors (CCH records), and recordings of device errors (Unit Check records). In addition, RMSR records certain environmental and statistical data, including IPL and EOD records, Counter Overflow records for temporary errors, and magnetic tape statistics by volume.

Records written by RMSR on the recorder file (SYSREC) can be printed and summarized in a number of formats by the Environmental Recording, Editing, and Printing (EREP) function. By analyzing EREP output, the CE can plan maintenance activities that increase system availability, and can more quickly isolate the cause of failure if a condition arises that requires unplanned maintenance. You can use certain EREP options to extract certain pertinent environmental and statistical information from the recorder file. For example, one of the several EREP TES (Tape Error Statistics) options can be used to assess the condition of the volumes in the magnetic tape library.

System Generation Requirements

RMSR is included in the minimum DOS supervisor and supports all devices supported by the system. At system generation time, you must reserve space for a PUB2 table entry for each device attached to the system. The PUB2 table is a logical extension of the PUB table; it provides an area to accumulate statistical data on the operation of the devices. The PUB2 table entries vary in length; because disk and tape devices require an area larger than the standard 12-byte field, you must specify the number of each type of disk and tape device in the ICTAB macro to ensure that sufficient PUB2 table space is reserved for them. If this number is not specified, space is reserved for two 2311 disks. Figure II.1 shows the length of the PUB2 entry for each device.

Device Type	Length, in bytes, of PUB2 entry for each device
2311	24
2314/2319	24
3330	32
2321	24
2400	52
3410	60
3420	60
All others	12

Figure II.1. Space requirements for the PUB2 table.

If there is not enough PUB2 table space at IPL time to contain an area for each device attached to the system, the message

```
0I29I  INSUFFICIENT PUB2 SPACE
       AVAILABLE, RE-IPL
```

appears on the console printer-keyboard and the IPL program is canceled. You must IPL again, deleting devices until the PUB2 space allocated at system generation time can accommodate the devices remaining.

A DOS supervisor generated for any DOS supported System/370 model can be used on any other DOS supported System/370 model; this feature is called SYSRES portability. The size of the extended logout area (used for recovery from machine checks and channel checks) differs from model to model. In order to prevent overlaying part of the supervisor by the extended logout area when a supervisor generated for one CPU is used on a larger model CPU, RMSR masks off extended logout on a Model 155 CPU. To prevent data loss when running a supervisor generated for a Model 145 on a Model 155, specify MODEL=145 and PORT=155 in the CONFG macro at system generation time; this option reserves sufficient storage for the Model 155 extended logout area.

Figure II.2 illustrates the portability support for machine checks and channel checks on the CPUs supported by DOS Version 4. It shows under what circumstances full recovery, incomplete recovery, and invalid recovery is performed.

CONFG	MACHINE CHECK			CHANNEL CHECK		
	135	145	155	135	145	155
MODEL=135 PORT=NO	A	B,C	B,C	A	B,D	B
MODEL=145 PORT=NO	A	A	B,C	A	A	A
MODEL=145 PORT=155	A	A	A	A	A	A
MODEL=155 PORT=NO	A	A	A	A	A	A

A = Recovery and Recording
B = Recovery
C = Incomplete Recovery
D = Invalid Recovery.

Figure II.2. Portability of the different CPUs.

RECORDER FILE

You must create the RMSR recorder file using the file definition statements of the system. This file is identified as the system logical unit SYSREC. The filename operand (in the DLBL statement) is IJSYSRC; this name must be defined as a disk extent on either the system resident disk or any IBM 2311, 2314/2319, or 3330 disk. The file definition statements must be preceded by the // OPTION STDLABEL statement to ensure that they are retained on the standard label cylinder of SYSRES.

The recorder file is not CPU or SYSRES dependent. Thus it can contain records from more than one DOS system.

Once the file is created, no further operator intervention is required. On subsequent IPLs the system opens the recorder file and continues to update it.

To create a recorder file, do the following:

- Assign SYSREC after IPL but before execution of the first job.
- Assign SYSREC to a permanently online disk device such as the system resident disk.
- Add the necessary file definition statements to the standard label deck and build the standard label portion of the label cylinder. The recorder file must be defined as an extent on an IBM 2311, 2314/2319, or 3330 disk device. Split cylinders cannot be used. The recorder file requires a minimum of ten tracks.
- Instruct the system to create the recorder file (SET RF=CREATE).
- Do not include a JOB or /& card until all information applicable to SYSREC has been supplied. (The recorder file is opened when the first JOB or /& card is encountered.)

Whenever the system is shut down, the operator must issue the Record on Demand (ROD) command to ensure that statistical data in main storage is recorded on the recorder file. The ROD command has no operand. BTAM and QTAM use their own separate methods of updating the disk counters during closedown or cancel.

Recording on the recorder file is suppressed during execution of the EREP program.

Figure II.3 shows an example of recorder file creation. The recorder file begins at cylinder 170 and is 43 tracks long. The recorder file is created when the JOB card is processed.

```
ADD
 .
 .                                          If not in system generation
 .
SET    [DATE=value1,[CLOCK=value2]] [ZONE={EAST}/hh/mm]
                                          {WEST}
ASSGN
 .
 .                                          If not in system generation
 .
ASSGN  SYSREC,X'190'
SET    RF=CREATE
// OPTION STDLABEL                         Submit with the
// DLBL IJSYSRC,'DOS.SYSTEM.RMSR.FILE'     rest of the
// EXTENT SYSREC,,,,1700,43                STDLABEL statements
// JOB name
 .
 .      Continue with normal job stream
 .
```

Figure II.3. Example of recorder file creation.

RMSR RECORD TYPES

SYSREC contains variable-length records with a maximum size of 200 bytes (including a standard 24-bytes header). The types of recording that RMSR performs are:

- MCAR recordings
- CCH recordings
- Unit check recordings
- Counter overflow recordings
- Tape volume statistics recordings
- IPL/EOD recordings
- Miscellaneous Data Recorder (MDR) recordings.

Machine Check Analysis and Recording (MCAR)

Two hardware error recovery features, Hardware Instruction Retry (HIR) and Error Correction Code (ECC), perform hardware correction for machine malfunctions. RMSR interfaces with the error correction hardware through Machine Check Analysis and Recording (MCAR). When the CPU is in the 'recording mode', MCAR is informed that a machine malfunction has occurred and has been corrected by means of a 'soft' (or recovered) Machine Check Interrupt (MCI). When the CPU is in 'quiet mode', the hardware correction routines do not generate a soft MCI if the malfunction is corrected. If the hardware correction routines cannot correct the malfunction, a 'hard' (or unrecoverable) MCI is generated regardless of the mode setting.

When a soft MCI occurs, RMSR writes a record on the recorder file containing identification information and the contents of the machine-independent logout area and the machine-dependent logout area (if available). The operator is notified that a soft MCI occurred, control is returned to the interrupted code, and system operation continues.

When a hard MCI occurs, the MCAR routine attempts to isolate the failure to a partition in order to cancel the damaged task and, if possible, continue system operation. If the system cannot continue because failure occurred in an area critical to system operation, recording is attempted, after which the system enters an unrecoverable wait state.

When a hard MCI is caused by an unrepairable main storage position within a problem program area, MCAR dynamically reallocates storage to remove the 2K byte area containing the unrepairable position from the affected partition. If the failure occurred in the upper half of a foreground partition or in a background partition, the partition's ending address is lowered to the highest 2K boundary below the address of the failure. If the failure occurred in the lower half of a foreground partition, the partition's starting address is raised to the lowest 2K boundary above the address of the failure. If partition reduction causes the size of a partition running in SPI mode to be less than 2K bytes or the size of a partition running in batched mode to be less than 14K bytes, the

partition is not usable. When the size of the partition is successfully reduced, appropriate supervisor tables are updated to reflect the change, and the operator is notified.

Note: Programs that exceed the size of the reduced partition cannot be excuted in that partition. If a foreground partition's starting address is changed, programs to be executed in that partition must be self-relocating or must be link-edited at the new starting address.

MCAR Modes of Operating: An Error Frequency Limit (EFL) algorithm prevents SYSREC from filling up too quickly if a large number of intermittent failures (soft MCI) occur. The initial IBM-supplied EFL threshold values are eight soft HIR MCIs, and either eight (Model 155) or sixteen (Model 145; eight for control storage and eight for processor storage) soft ECC MCIs within an eight-hour period. These values are set at system generation time and can be changed by the MODE command. A message is issued on the first occurrence of a soft MCI on a System/370 Model 135 and all recoverable machine checks are disabled. The MODE command must be issued to re-enable reporting of soft machine checks. MCAR supports EFL for two hardware facilities:

- Hardware Instruction Retry (HIR)
- Error Correction Code (ECC).

EFL Threshold Values: At IPL time, the EFL threshold values are established so that the EFL algorithm controls the number of soft MCIs recorded. These values are:

- The number of soft MCIs
- A specific time period.

When these EFL values are reached, a change in mode of operation occurs. Until the EFL threshold values are reached the system operates in recording mode. This is the normal mode of operation in which an MCI occurs for all machine check conditions. After the EFL threshold values are reached, ECC (or ECC and HIR) is placed in quiet mode. In quiet mode no MCIs occur for recovered errors; therefore, the number of corrected errors is unknown.

Hardware Instruction Retry (HIR) Modes: The two HIR modes are:

- Recording; a soft MCI occurs for every hardware instruction correction.
- Quiet; no soft MCI occurs for hardware instruction correction.

Error Correction Code (ECC) Modes: The ECC modes are:

- Recording; a soft MCI occurs for every main or control storage correction.
- Quiet; no soft MCI occurs for main or control storage correction.
- Threshold (Model 145 only); a soft MCI occurs after a predetermined number of unrecorded control storage errors have occurred within a given time period. Threshold mode is a hardware function and is not affected by EFL threshold values.

If HIR is in quiet mode, ECC is also in quiet mode. When ECC is in quiet mode, HIR can still be in recording mode.

At IPL time the system assumes the IBM-supplied EFL threshold values; these values can be changed by the MODE command. When IPL is completed:

- For the Model 145, recording mode is entered for HIR, quiet mode is entered for main storage ECC, and threshold mode is entered for control storage ECC.
- For the Model 155, full recording mode is entered for both HIR and ECC.

Channel Check Handler (CCH)

When a channel check occurs, channel error information is logged and an interrupt is generated. The CCH resident program (the Channel Severity Detect Routine) analyzes the severity of the malfunction. If the severity is such that system operation need not be immediately terminated, the CCH resident program:

- Builds the Error Recovery Program Interface Bytes (ERPIB) containing error information for use by the appropriate CCH/ERP.
- Records the error information on the recorder file.
- Attempts to isolate the error to a device.

If the error cannot be isolated to a device, CCH cancels all problem programs that use the malfunctioning channel.

If the error can be isolated to a device and the device is supported by a CCH/ERP, the appropriate CCH/ERP is loaded into the Recovery Transient Area (RTA). Then ERP

examines the ERPIB supplied by CCH and determines the severity of the error. Whenever possible, the failing channel command is retried. If the failure cannot be retried, or if retry fails, a message is written on SYSLOG and all problem programs using the failing device are canceled. If recovery is successful, a message is also written on SYSLOG, unless SYSLOG was the failing device. Certain retry conditions require manual operator intervention to enable proper retry.

Note: If the 'accept unrecoverable error' bit in the CCB is on, the error is posted and control is returned to the problem program.

If no CCH/ERP is available for an error isolated to a device, all problem programs using that device are canceled.

Error recovery after channel detected errors is supported for the following IBM I/O devices:

- 1403 Printer
- 1443 Printer Model N1
- 3211 Printer
- 1442 Card Read Punch
- 2540 Card Read Punch
- 2501 Card Reader
- 3505 Card Reader
- 3525 Card Punch
- 3210 Console Printer-Keyboard Model 1
- 3215 Console Printer-Keyboard
- 2311 Disk Storage Drive
- 2314 Direct Access Storage Facility
- 2319 Disk Storage
- 3330 Disk Storage
- 2321 Data Cell Drive
- 2400-series Magnetic Tape Units
- 3400-series Magnetic Tape Units.

Device Error Recovery

Each I/O device or class of I/O devices has a unique device error recovery routine. The appropriate routine is entered from the channel scheduler upon detection of an error. The function of the error recovery procedures (ERP) is to attempt recovery from the error either through programmed recovery or by operator intervention. If recovery is not possible, the following choices are available, where applicable:

1. The error can be ignored.
2. The task can be terminated.
3. The problem program can take action (exit to a user routine).
4. The record in error can be bypassed.

Depending on the type of error, the type of device, and whether Logical IOCS is used, some or all of these options are available. Choices 3 and 4 are availble through LIOCS only. In the absence of any other options, only choice 2 is available.

At the time the error is first detected, before ERP is called to attempt recovery, RMSR accumulates certain information relating to the status of the device in the PUB2 for the device. The device ERP then gets control and tries to correct the error. If the ERP cannot recover, RMSR builds and writes the Unit Check record, containing the statistical data from the PUB2 and the status and sense information at the time the ERP determined the error was unrecoverable. If the ERP recovers, the statistical data in the PUB2 is not cleared. This information is recorded at the next permanent error for that device, at the next statistical counter overflow for that device, or at End-of-Day when the operator issues the ROD command.

Besides the Unit Check record (written for every permanent error) and the Counter Overflow record (written when a statistical counter becomes full or when the operator issues the ROD command), RMSR also writes Tape Volume Dismount records. The data recorder in the Tape Volume Dismount records corresponds to the data formerly accumulated in the TEBV table; the EREP TES (Tape Error Statistics) options are used to format and summarize this data.

UNIT CHECK RECORD: Device ERPs attempt recovery from an error, usually by retrying the failing channel command. If the error is not corrected after a certain number of retries, RMSR writes a Unit Check record which contains hardware information (sense data), statistical data, and identification data. All information relevant to the status of the device at the time the failure is determined to be permanent is contained in this record. One Unit Check record is written for each permanent error.

RMSR resets the statistical counters in the PUB2 table at the same time.

COUNTER OVERFLOW RECORD: Whenever a statistical counter in the PUB2 table fills up, a Counter Overflow record is written on SYSREC. The Counter Overflow record is also written for each device that has unrecorded statistics when the operator issues the ROD command. The statistical counters in the PUB2 table for the device are cleared at the same time.

TAPE VOLUME DISMOUNT RECORD: When processing standard labeled tapes using LIOCS, RMSR makes a recording on SYSREC each time a new volume serial number is detected. When the tape is opened, the number of the current tape is compared with the serial number in the PUB2 for that tape drive. If the serial numbers are different, a Volume Dismount record, containing volume usage and Tape ERP recovery statistics, is written on SYSREC. The statistical counters in the PUB2 relating to usage and error recovery action are cleared and the serial number is updated. Processing continues and statistical data for the new tape is accumulated in the PUB2 table.

IPL/EOD: I/O error logging includes RDE (Reliability Data Extractor). If ERRLOG=RDE is specified at system generation, RMSR gathers hardware reliability data that IBM personnel use to evaluate hardware performance.

Two types of RDE records are written on SYSREC:

1. IPL records. These records specify the reason for excuting IPL.

2. EOD (End-of-Day) records. RMSR writes these records when the operator issues the ROD command. The ROD command must be issued before the system is shut down to avoid losing statistics not yet recorded.

MISCELLANEOUS DATA RECORDER (MDR): RMSR makes recordings on the SYSREC file for the 3211 Printer Buffer errors and the 3330 Disk Storage errors.

Tape Error Statistics

One of the major factors affecting the quality of an operating system is the condition of storage media such as magnetic tape. These media can easily be damaged by dust, foreign materials, fingerprints, and particles of oxide coating.

The influence of these environmental factors makes it desirable to record the number of read and write errors occurring on each tape volume. By monitoring this error rate, you can assess the condition of each volume in your tape library.

Read and write errors per volume and tape unit for 2400- and 3400-series magnetic tape units are recorded by RMSR in Tape Volume Dismount records. You can print and summarize this data using the TES options of EREP.

Volume statistics are automatically accumulated for all labeled tapes opened through the use of Logical IOCS. RMSR compares the current volume serial number to the number contained in the PUB2, and writes a Volume Dismount record if the two serial numbers are different.

Statistics of nonstandard labeled and unlabeled tapes can be gathered by:

- Individual Recording (IR), or
- Combined Recording (CR).

IR is used if the tape statistics are to be recorded and reset at each tape OPEN. CR is used if all the statistics of nonstandard labeled and unlabeled tapes mounted on the same unit are to be accumulated. These statistics are recorded at end-of-job or when the first standard labeled tape is opened on the tape unit.

The recording mode for nonstandard labeled and unlabeled tapes is specified at system generation time in the TEPV parameter of the FOPT macro (see DOS Version 4 System Generation, GC33-5008).

The mode of recording for nonstandard labeled and unlabeled tapes can be changed with the tape options of the operator's MODE command.

ERROR VOLUME ANALYSIS (EVA)

If EVA is specified at system generation time in the FOPT macro, a message is sent to the console printer-keyboard every time a predetermined number of temporary read or write errors is exceeded on a currently accessed tape volume. EVA is used for both labeled and unlabeled tape files.

The information message sent to SYSLOG contains the number of temporary read or write errors, SIO instructions, physical unit, and, if standard labeled tape is used, the volume serial number. If nonstandard labeled or unlabeled tape is

used, the system operator should note the volume identification of the volume that is in use when the message is received; this allows him to monitor the message. The message format is:

```
4E10I  xxxxxx cuu TR=nnn TW=nnn SIC=nnnnn
```

where

xxxxxx	Serial number of standard labeled volume (blank when nonstandard labeled or unlabeled volume is being used).
cuu	Channel/unit address (physical unit).
TR=nnn	Number of temporary read errors.
TW=nnn	Number of temporary write errors.
SIO=nnnnn	Number of SIC instructions.

Either the TR=nnn or TW=nnn field contains one more than the predetermined error threshold specified in the FCPT macro instruction.

Job Control

JOB CONTROL FUNCTIONS

JOB ACCOUNTING INTERFACE

The high core address in the communications region contains zeros for link edit phases and phases of which the name start with a $ sign.

Note that there may be a difference of one second between the job duration as printed at EOJ and the time calculated by deducting the job start time from the job end time; this is due to the fact that fractions of seconds are truncated.

When $JOBACCT is called into main storage, no skipping to a new page on the printer is performed.

The difference between start and stop times does not necessarily equal the sum of CPU, All Bound, and Overhead times. An additional reason for this is that all processing performed between the end-of-job of one job and the execution of the second job step in the next job is charged to the first job step of that job. The user phase is called again when the next EXEC statement or a /& statement is read. Thus the time required to initiate a job or job step is charged to the previous job step. (The initiation time for the first job step is charged to the control program.) When the system is in the wait state after IPL or in between two jobs, the time used is charged to the All Bound time of the first step of the next job; the start time of that job is set after the JOB statement has been read.

If a job has to be canceled or is terminated in reply to a job control message, the cancel code in the Job Accounting table is zero (Job Control keeps control and continues processing).

Commands and Statements

ALLOC

One of the reasons why storage is not allocated is that a job control allocation would reduce the background area (or foreground area(s) while operating in the batched foreground mode) to less than 14K bytes.

ASSGN

The specification of the IGN option with ASSGN is not valid for SYSRDR, SYSIPT, SYSIN, SYSREC, and SYSCLB, nor for PL/I (D) or COBOL programs.

If the ASSGN command or statement is specified with the ALT parameter, a reassignment that has been made for the original assignment must also be made for the alternate assignment.

The specification of the TEMP operand is not valid for SYSCLB.

CANCEL

The CANCEL command should not be given while processing the first statement after IPL. The job can be canceled when the message RECORDER FILE xx% FULL has been issued.

DLAB

The combination of this statement with VOL and XTENT should not be used to provide the extent and label information for a 3330.

DLBL

Together with the EXTENT statement, only DLBL should be used to supply extent and label information for the 3330.

For output files the current date is used as the creation date and DOS Version 4 is used as the system code.

EXTENT

Together with the DLBL statement, only EXTENT should be used to supply extent and label information for the 3330.

Note: The EXTENT cards should be checked carefully because an invalid field in the card causes the default options or the

values entered by the previous EXTENT card to be overwritten by the valid entries of the flagged statement.

JOB

The print format of this statement is changed if time-of-day clock support is provided.

If the JOB statement is printed on SYSLST, the date and time-of-day are printed on the same line in columns 73-100. If the JOB statement is printed on SYSLOG, this information in printed on the next line. In both cases the format is:

```
DATE mm/dd/yy,CLOCK hh/mm/ss
  or
DATE dd/mm/yy,CLOCK hh/mm/ss
```

Notes:

1. If the JOB card is omitted from the job stream, no duration and/or date is printed at end-of-job (when the /& card is read).
2. The start time that the job accounting routines store in byte 36 of the Job Accounting Table is calculated from the values in main storage locations 80 and 84.

MAP

Field 3 of the main storage map produced when the MAP command is processed in the attention routine contains blanks for a partition with a 0K bytes allocation.

MODE

Note: The following information replaces the MODE command information in the base publication.

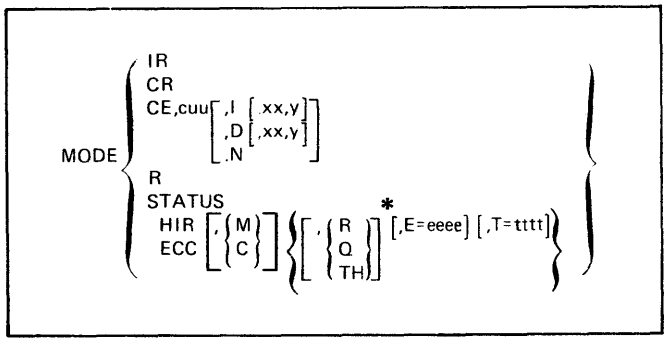
The MODE command provides the following options for controlling recoverable machine check interrupts (MCI):

- The mode of recording for unlabeled and nonstandard labeled tape can be reset.
- The recording mode for a particular device other than a teleprocessing device can be set to intensive or diagnostic, or no recording mode can be specified.
- The mode that the system is operating in (the status of the system) can be requested.
- An EFI threshold value can be specified to override the IBM-supplied value.
- The MODE command can also be used to place the Model 145 control storage ECC in threshold mode.

The MODE command is a notational command. Operands of the MODE can be entered in any order and must be continuous (that is, no blanks are allowed between or within operands). The STATUS operand cannot have any other operands before or after it.

The total length of the MODE command must not exceed 30 characters.

JCC Format



*Note: When either HIR or ECC is specified, at least one of the optional operands within these braces must be selected. TH is only valid for the Model 145 when ECC,C is specified with the MODE command.

The meanings of the operands are:

Operand Meaning

IR
CR
Recording mode for nonstandard labeled and unlabeled tape. Specify Individual Recording (IR) if you wish to record and then reset the tape error statistics at each tape OPEN. Specify Combined Recording (CR) to accumulate all the statistics from nonstandard labeled and unlabeled tape on a specific tape unit until a standard labeled tape is opened. Then one recording of the statistics from all the nonstandard labeled and unlabeled tapes is made on SYSREC, and the statistical counters are reset in the PUB2 table.

CE
The recording mode for a device at physical location X'cuu' may be reset. The possible recording modes are:

b Normal. The default, normal, is assumed.

I Intensive. Normal recording continues. In addition, the next seven errors of a particular type (xx,y) or the next seven errors of any type (if xx,y is not specified) are recorded. The number of I/O retries required for success is not recorded.

D Diagnostic. Normal recording continues. In addition, the next seven errors of a particular type (xx,y) or the next seven errors of any type (if xx,y is not specified) are recorded. The number of I/O retries required for success is also recorded.

N No recording.

When the recording mode parameter is the last parameter of the MODE command, a check is made to see if all errors are recorded. When in intensive or diagnostic mode, it is possible to check for only one type of error. Indicate the bit to be examined with:

(xx,y) where y is the bit (0-7) and xx the byte (0-31) of sense data to be checked.

STATUS
On SYSLOG a report is printed which indicates:

- The type of facility used (HIR,ECC).
- System mode of operation.
- Current error count.
- Error count threshold.
- Current elapsed time.
- Time threshold.
- Number of buffer pages deleted.

A buffer page is a 32-byte work area in control storage that is used by the Model 135 hardware program.

The status report formats are:

HIR,{R|Q},aaaa/eeee,bbbb/tttt

For the Model 135

ECC,{R|Q}

For the Model 145

ECC,{R|Q},{M|C},aaaa/eeee,bbbb/tttt

For the Model 155

ECC,{R|Q},aaaa/eeee,bbbb/tttt

BUF DLT=xxx

where:
aaaa = Current error count
eeee = Error count threshold
bbbb = Current elapsed time
tttt = Time threshold
xxx = Total number of inoperable buffer pages deleted.

HIR — Hardware Instruction Retry. This operand changes the mode of the HIR facility to R or Q and/or modifies the error count threshold and/or time threshold.

Note: When HIR is placed in quiet mode, ECC also goes into quiet mode.

ECC — Error Correction Code. This operand changes the mode of the ECC facility to R or Q, and/or modifies the error count threshold and/or time threshold. ECC,R and ECC,Q are the only valid modes of diagnosis for the Model 135. If ECC is specified for a Model 145, M or C must also be specified. ECC can also place the Model 145 control storage in threshold mode.

Note: Use of the Error Correction Code (ECC) in full recording mode may cause severe system degradation. Thus, the [ECC,M/C,R] operand combination of the MODE command should only be used by the customer engineer or at his request.

R — Recording Mode

MODE R - places both HIR and ECC in recording mode.

MODE HIR,R - places HIR in recording mode.

MODE ECC,R (Model 155) - if HIR is already in recording mode, it places ECC in recording mode.

MODE ECC,M,R (Model 145) - if HIR is already in recording mode, main storage is placed in recording mode.

MODE ECC,C,R (Model 145) - if HIR is already in recording mode, control storage is placed in recording mode.

Q — Quiet Mode

MODE HIR,Q - places both HIR and ECC in quiet mode.

MODE ECC,Q (Model 135 and 155) - places ECC in quiet mode.

MODE ECC,M,Q (Model 145) - places main storage in quiet mode.

MODE ECC,C,Q (Model 145) - places control storage in quiet mode.

M or C — Main or control storage: M or C is only valid for the Model 145. M or C must be specified when ECC is specified for the Model 145. M indicates main storage and C control storage.

TH — Threshold Mode: on the next occurence of an ECC control storage error, control storage is placed in quiet mode. TH is only valid for the Model 145 if ECC,C is specified. TH places the Model 145 control storage ECC in threshold mode.

E=eeee
T=tttt — Values entered for E and T must be within the following decimal ranges:

E - 8 (initial value) through 9999
T - 8 (initial value) through 9999

The IBM-supplied value is 8.

Note: Whenever HIR is in quiet mode, ECC mode must not be changed.

For the Model 135, the only valid mode commands are:

```
MODE CE,...
MODE STATUS
MODE ECC,Q
MODE ECC,R
```

MTC

The DSE (data security erase) operand has been added to the MTC command for 3400-series Magnetic Tape Units.

JCS Format

```
// MTC DSE,SYSnnn
```

JCC Format

```
MTC DSE,{X'cuu'}
        {SYSnnn}
```

DSE Data security erase (3400-series only). This command erases a tape from the point at which the operation is initiated up to the end-of-tape reflective marker. If data is written after the end-of-tape reflective marker, you must erase that data with [//] MTC ERG,SYSnnn.

To ensure that a DSE failure is detected quickly, rewind or rewind-unload should be performed with an MTC rather than manually.

If the DSE command is issued when the tape is at load point, the contents of the tape, including the volume label, are erased completely. In such a case the tape must be reinitialized or a tapemark must be written on it before it can be used again.

The partition that issued the [//] MTC DSE command is placed in the wait state until the end-of-tape reflective marker is reached.

SYSnnn Represents any logical unit.

X'cuu' Represents the channel and unit in hexadecimal, where c is the channel number (0-6) and uu the unit number, 00-FE (0-254).

SET

The SET command initializes the UPSI configuration, specifies the number of lines to be printed on SYSLST, specifies the remaining disk capacity when SYSLST or SYSPCH is assigned to disk, and defines to the system the status of the recorder file on SYSREC used by the Recovery Management Support Recorder (RMSR) feature. The SET card must precede the JOB card in job control sequence.

JCC Format

```
SET [UPSI=n1][,LINECNT=n2][,RCLST=n3]
    [,RCPCH=n4][,RF=n5][,DATE=n6]
```

The time-of-day clock can only be set during IPL. Therefore the CLOCK parameter of the job control SET command is no longer supported. The DATE parameter may only be specified if the TOD clock is not supported in the system or if the clock is not operational.

RF=n5 Defines to the system the status of the recorder file (IJSYSRC) on SYSREC used by the RMSR routines. n5 can be:

YES An active recorder file exists on the system and can be opened as an input file.

CREATE Instructs the system to create a recorder file when the first JOB card is encountered.

VOL

The VOL command, in combination with the DLAB and XTENT commands, should not be used to supply label and extent information for the 3330.

XTENT

The XTENT command, in combination with the DLAB and VOL command, should not be used to supply label and extent information for the 3330.

ZONE

This is a new statement. It initializes the value of the job zone field in the communications region (bytes 143 and 144). If no ZONE statement is supplied, job control supplies the zone given in the system zone field in the communications region extension (bytes 68 and 69). If no DATE statement is supplied, the job date is updated by means of the values given in the system date field and in the ZONE statement.

Locations that are on Greenwich Mean Time need not specify the ZONE statement or can specify

```
// ZONE EAST/00/00 or
// ZONE WEST/00/00.
```

JCS Format

```
// ZONE {EAST}/hh/mm
        {WEST}
```

EAST A geographical position east of Greenwich.

WEST A geographical position west of Greenwich.

hh/mm A decimal value which indicates the difference in hours and minutes between local time and Greenwich Mean Time. hh may be in the range 0-12, mm in the range 0-59.

This statement is only accepted if time-of-day clock support is included in the system. Otherwise, the message 1S0nD INVALID STATEMENT is printed on SYSLOG and SYSLST.

/& -- END OF JOB

If time-of-day clock support is provided, the end-of-job statement is printed on SYSLST in the following format: columns 1-3 contain EOJ, columns 5-12 the job name, columns 14-72 blanks or any user comments, and columns 73-118 the date, time-of-day, and job duration in the following format:

DATE mm/dd/yy,CLOCK hh/mm/ss,
DURATION hh/mm/ss

or

DATE dd/mm/yy,CLOCK hh/mm/ss,
DURATION hh/mm/ss

On SYSLOG, the date, time of day, and job duration (the amount of time elapsed between the start and the end of a job) are printed in the same format, occupying 46 positions, on the line following the end-of-job statement.

If time-of-day clock support is part of your system, the zone and date values are reset every time this statement is encountered.

Note: The stop time that the Job Accounting routines store in byte 40 of the Job Accounting Table is calculated from the values in main storage locations 80 and 84.

Note: The following information replaces the information about the SET statement in the base publication.

The only communication required at IPL time is the SET statement. If any ADD or DEL statements are required, they must precede the SET statement. The SET statement is entered via the communications device (3210, 3215, or a card reader) and is in the following format:

Operation	Operand
SET	[DATE=value1[,CLOCK=value2]] [,ZONE={EAST/hh/mm / WEST}]

value1 - Specifies the year, month, and day of the month in one of the following formats:

mm/dd/yy
dd/mm/yy

value2 - Specifies the local time-of-day in the format hh/mm/ss.

EAST - Specifies that the installation is located at a geographical position east of Greenwich.

WEST - Specifies that the installation is located at a geographical position west of Greenwich.

The parameters that have to be specified with the SET statement depend upon the type of system and the type of communications device used. The following groups can be distinguished:

1. 3210/3215; system without TOD clock support and without Job Accounting and QTAM. The statement must be given in the form SET DATE=value1. CLOCK and ZONE may be specified but are ignored (message 0I31A is printed).

2. 3210/3215; system without TOD clock support but with Job Accounting and QTAM. The statement must be given in the form SET DATE=value1,CLOCK=value2. ZONE may be specified but is ignored (message 0I31A is printed).

3. 3210/3215; system with TOD clock support. If the TOD clock is in the set state (message CI30I is printed), the statement may be given in one of the four possible forms, depending on whether the clock values are satisfactory. If the TOD clock is in the not-set state (message CI31A is printed), the statement must be given in either of two forms:
SET DATE=value1,CLOCK=value2 or
SET with all three parameters. If the TOD clock is inoperative (0I32I is printed), the same procedure must be followed that is required for systems that have no TOD clock support (either 1 or 2 above).

4. Card Reader; system without TOD clock support and without Job Accounting and QTAM. The command must be given in the form SET DATE=value1.

5. Card Reader; system without TOD clock support but with Job Accounting and QTAM. The command must be given in the form
SET DATE=value1,CLOCK=value2.

6. Card Reader; system with TOD clock support. The SET command may be given without parameters. However, if the clock is in the 'not set' or 'error' state (the system enters a hard wait state and message code CI31A is in low main storage), the IPL procedure must be repeated and the SET command must be given with DATE and CLOCK or with all three parameters. If the clock is not operational (the system enters a hard wait state and message code CI32A is placed in low main storage), the IPL procedure cannot be performed from a card reader. In such a case the system must be loaded using a 3210 or 3215.

Notes:

1. The date and time-of-day supplied in the SET command for systems that have TOD clock support must be realistic values; the time-of-day clock must always contain the exact time (that is the time that has elapsed since January 1, 1900, 00.00 a.m.).

2. If the SET statement contains the DATE and CLOCK parameters and the system contains TOD clock support, the operator must depress the TOD clock switch on the system control panel to the ENABLE SET position at the exact time he has specified in the CLOCK parameter. The system loops until this switch is depressed.

DEVICES

Figure II.4 lists the device types available with DOS Version 4. This figure shows the card code and device type; you must use the card code in ADD statements when adding a device to your system.

Card Code	Actual IBM Device	Device Type X'nn'	Device Type
2400T9	9-track Magnetic Tape Units (2400-series)	50	Magnetic Tape Devices
2400T7	7-track Magnetic Tape Units (2400-series)	50	
3410T9	9-track Magnetic Tape Units (3400-series)	53	
3410T7	7-track Magnetic Tape Units (3400-series)	53	
3420T9	9-track Magnetic Tape Units (3400-series)	52	
3420T7	7-track Magnetic Tape Units (3400-series)	52	
2495TC	2495 Tape Cartridge Reader	51	Tape Cartridge Reader
1442N1	1442N1 Card Read Punch	30	Card Read Punches
2520B1	2520B1 Card Read Punch	31	
2596	2596 Card Read Punch	30	
3525RP	3525 Card Punch (with optional read feature)	23	
2501	2501 Card Reader	10	Card Readers
2540R	2540 Card Reader	11	
3505	3505 Card Reader	12	
2540P	2540 Card Punch	21	Card Punches
2520B2	2520B2 Card Punch	20	
1442N2	1442N2 Card Punch	22	
2520B3	2520B3 Card Punch	20	
3525P	3525 Card Punch	23	
1403	1403 Printer	40	Printers
1403U	1403 Printer with UCS feature	42	
1443	1443 Printer	41	
3211	3211 Printer	43	
3525P	3525 Card Punch (with optional print feature)	23	
1050A	3210, 3215 Console Printer-Keyboards	00	Printer-Keyboards
UNSP	Unsupported Device	FF	No burst mode on multiplexor channel
UNSPB	Unsupported Device	FF	Burst mode on multiplexor channel
2311	2311 Disk Drive	60	DASD
2314	2314 Direct Access Storage Facility	62	
2314	2319 Disk Storage Facility	62	
3330	3330 Disk Storage	63	
2321	2321 Data Cell Drive	61	
1419	1255 Magnetic Character Reader	72	MICR - Magnetic Ink Character Recognition Devices
1419	1259 Magnetic Character Reader	72	
1419	1419 Magnetic Character Reader	72	
1419P	1419 Dual Address Adapter Primary Control Unit	73	
1419S	1419 Dual Address Adapter Secondary Control Unit	74	
2701	2701 Line Adapter Unit	D0	Teleprocessing Lines
2702	2702 Transmission Control Unit	D1	
2703	2703 Transmission Control Unit	D2	
2955	2953 Data Adapter Unit	D7	Data Link for RETAIN
1017	1017 Paper Tape Reader with 2826 Control Unit Model 1	78	Paper Tape Readers
1017TP	1017 Paper Tape Reader with 2826 Control Unit Model 2	D5	
2671	2671 Paper Tape Reader	70	
1018	1018 Paper Tape Punch with 2826 Control Unit Model 1	79	Paper Tape Punches
1018TP	1018 Paper Tape Punch with 2826 Control Unit Model 2	D6	
1419	1270 Optical Reader Sorter	72	Optical Readers
1419P	1275 Optical Reader Sorter	73	
1287	1287 Optical Reader	77	
1288	1288 Optical Page Reader	77	
2260	2260 Display Station or 1053 Printer	C0	Display Station
3277	3277 Display Station or Printer	B0	
3277B	3277 Display Station or Printer running in burst mode on the MPX channel	B0	
7770	7770 Audio Response Unit	D3	Audio Response Units

Figure II.4. Device type codes; use these codes in ADD and DEL statements.

Disk Storage Space Required for Libraries and Directories

You must determine the amount of space allocated to each of the libraries and directories. Each library consists of one or more complete disk tracks. Each directory occupies the first track(s) of the first cylinder allocated to its respective library.

In each of the formulas contained in this section, the formula to the left applies to the 2311, the one to the right to the 3330. If the formula applies equally to the 2311, 2314/2319, 3330, it is given only once.

DIRECTORY SIZES

Figure II.5 summarizes the track requirements for the core image, relocatable, and source statement directories.

	Directory		
	Core Image	Relocatable	Source Statement
NUMBER OF ENTRIES:			
2311 first track	144 phase entries	175 module entries	155 book entries
2311 other tracks	144	180	160
2311 last track	143	179	159
2314/2319 first track	270 phase entries	335 module entries	265 book entries
2314/2319 other tracks	270	340	270
2314/2319 last track	269	339	269
3330 first track	468 Phase entries	555 module entries	435 book entries
3330 other tracks	468	560	440
3330 last track	467	559	439
NUMBER OF TRACKS:			
2311	$TCD = \frac{p+1}{144}$	$TRD = \frac{m+6}{180}$	$TSD = \frac{b+6}{160}$
2314/2319	$TCD = \frac{p+1}{270}$	$TRD = \frac{m+6}{340}$	$TSD = \frac{b+6}{270}$
3330	$TCD = \frac{p+1}{468}$	$TRD = \frac{m+6}{560}$	$TSD = \frac{b+6}{440}$

p = Total number of phases in the core image library.
m = Total number of modules in the relocatable library.
b = Total number of books in the source statement library.

Note: The value TxD is rounded to the next higher integer if a remainder results.

Figure II.5. Calculation of the tracks required for directories.

Core Image Library Size

Each track allocated to the core image library contains 2 fixed-length blocks on 2311 (or 4 fixed-length blocks on the 2314-2319 or 8 fixed-length blocks on the 3330). Each block contains a maximum of 1728 (or 1688 or 1504) bytes of instructions or data. The core image library contains exactly the same information as is loaded into main storage for execution. Each phase is written beginning in a new block. The number of tracks required for the core image library can be calculated as follows:

1. Determine the number of blocks (B) required for a phase:

$$B = \frac{L}{1728} \qquad B = \frac{L}{1688} \qquad B = \frac{L}{1504}$$

   where L is the total number of bytes in the phase. The value B is rounded to the next higher integer if a remainder results.

2. Determine the total number of blocks (Bt) required for all phases in the core image library:

$$Bt = B1 + B2 + B3 + \ldots + Bn$$

3. Determine the number of tracks (TCL) required to hold all phases in the core image library

$$TCL = \frac{Bt}{2} \qquad TCL = \frac{Bt}{4} \qquad TCL = \frac{Bt}{8}$$

4. Determine the number of cylinders (CCL) required to hold the core image library and core image directory:

$$CCL = \frac{TCD+TCL}{10} \qquad CCL = \frac{TCD+TCL}{20} \qquad CCL = \frac{TCD+TCL}{19}$$

   The value of CCL is rounded to the next higher integer if a remainder results.

Relocatable Library Size

Each track allocated to the relocatable library contains 9 fixed-length blocks for the 2311 (or 16 fixed-length blocks for the 2314/2319 or 28 fixed-length blocks for the 3330). Each block is 322 bytes long. A number of factors affects the packing of information in these blocks. The factors include the following variables:

1. The number of separate control sections.

2. The use of DS (define storage) statements, which reserve storage that may or may not be utilized for data constants defined in the program.

3. Alternation of the location counter during assembly (use of ORG statements).

The following calculations approximate fairly accurately the library area required for typical programs.

1. Determine the number of blocks (Bc) required for all cards or statements except the actual program text. Assume a separate block for each card of the following types:

   a. PHASE

   b. INCLUDE

   c. REP

   d. END

   e. SYM

   f. ENTRY

   Let Bc equal the total number of cards of the above types.

2. Determine the number of blocks (Be) required for ESD and RLD cards. Assume a separate block for every two ESD or RLD cards.

3. Determine the number of blocks (Bi) required for the actual instructions or data in the TXT cards. Assume an average of 200 bytes of text in each block. (A maximum per block, for continuously assigned text, is 264 bytes per block.) Thus,

$$Bi = \frac{\text{total bytes of text in TXT cards}}{200}$$

4. Determine the total number of blocks (Bn) required for a module in the relocatable library:

$$Bn = Bc + Bi + Be$$

5. Determine the total number of blocks (Bt) required to hold all of the modules in the library:

$$Bt = B1 + B2 + B3 + \ldots\ldots + Bn$$

6. Determine the number of tracks (TRL) required for the relocatable library:

$$TRL = \frac{Bt}{9} \qquad TRL = \frac{Bt}{16} \qquad TRL = \frac{Et}{26}$$

The value TRL is rounded to the next higher integer if a remainder results.

7. Determine the number of cylinders (CRL) required to hold the relocatable library and directory:

$$CRL = \frac{TRD+TRL}{10} \qquad CRL = \frac{TRD+TRL}{20} \qquad CRL = \frac{TRD+TRL}{19}$$

The value CRL is rounded to the next higher integer if a remainder results.

Source Statement Library Size

Each track allocated to the source statement library contains 16 fixed-length blocks for the 2311 (or 27 fixed-length blocks for the 2314/2319 or 44 fixed-length blocks for the 3330). Each block contains a maximum of 160 bytes of source statement information. The source statements are compressed before they are written out on the source statement library. This compression is performed by eliminating all blanks in each source statement. Several count bytes indicating the number of blanks eliminated are added to each statement before writing it in the source statement library. The number of tracks required for the source statement library can be calculated as follows:

1. Determine the number of statements (N) used to define a book.

2. Determine the average compressed statement length (Ls) in the book. The compressed statement length approximately equals:

   $Ls = (I1+1) + ... + (In+1) + 3$

   where each In is the number of bytes in each word of the source statement.

3. Determine the number of blocks (Bn) needed to hold the book:

   $$Bn = \frac{N(Ls)}{160}$$

   The value Bn is rounded to the next higher integer if a remainder results.

4. Determine the total number of blocks (Bt) required to hold all books in the library:

   $Bt = B1 + B2 + B3 + ... + Bn$

5. Determine the number of tracks (TSL) required to hold all of the books in the source statement library:

   $$TSL = \frac{Bt}{16} \qquad TSL = \frac{Et}{27} \qquad TSL = \frac{Et}{44}$$

   The value TSL is rounded to the next higher integer if a remainder results.

6. Determine the number of cylinders (CSL) required to hold the source statement library and source statement directory:

   $$CSL = \frac{TSL+TSD}{10} \qquad CSL = \frac{TSL+TSD}{20} \qquad CSL = \frac{TSL+TSD}{19}$$

   The value CSL is rounded to the next higher integer if a remainder results.

LIBRARIAN FUNCTIONS

MAINTENANCE FUNCTIONS

Note that, when a private library is assigned during a condense function, the directories of the private and system libraries are displayed on SYSLST when the /* statement is processed.

COPY FUNCTION

Note that if the ALLOC copy control statement does not have any operands, comments and sequence numbers are not allowed because the first non-blank character in the ALLOC statement is considered an operand.

COPY, IPL

The COPYI control statement is used to transfer the IPL Retrieval Program ($$A$IPL2) from SYSRES to SYS002 (RES and NRS) and back. The control statement has the following format:

```
                    COPY    $$A$IPL2
```

MERGE FUNCTION

The operand entry field to indicates, when PRV is specified, a private relocatable library on SYSRLB and/cr private scurce statement library on SYSSLB and/or private core image library on SYSCLB.

```
// EXEC CORGZ
  NEWVCL FL=10(2),SL=10(1),CL=15(1)
  MERGE PRV,PRV
  COPYR ALL
  CCPYS AII
/*
/&
```

PRIVATE LIBRARIES

CREATION OF PRIVATE LIBRARIES

To define and create a private library from an existing private library, the MERGE statement must be used between the NEWVOL and the COPYR or COPYS statements (nct applicable tc COPYC). Following is an example of the sequence of steps.

MAINTENANCE AND SERVICE CF PRIVATE LIBRARIES

Whereas it is not possible tc delete the system ccre image library, it is pcssible tc dc sc with a private ccre image library through the use of the DELETC ALL statement.

Environmental Recording, Editing, and Printing (EREP) Program

This section is new. Together with its subsections it replaces the information currently contained in sections "Environmental Recording, Editing, and Printing Program (EREP)" and "Error Statistics by Tape Volume Utility Programs" in the base publication.

The EREP program edits and prints error statistics records that have been stored on the recorder file (SYSREC) by RMSR.

A request to run the EREP program is made for any of the following conditions:

- When the first record on the last track of the recorder file is reached, run EREP to avoid the risk of losing statistics.
- When an unrecoverable I/O error on the recorder file occurs while the record indicated is being accessed, the record is ignored and processing continues. If this error persists, run EREP to retrieve the information from the file and re-create the file using different disk extents.
- When SYSREC becomes full, no further recording occurs until the file is purged. To avoid the risk of losing statistics, run EREP. No recycling of the file occurs.
- For system termination situations (for example a machine check was unrecoverable, the channel caused system reset, or two channels are damaged) encountered by MCAR/CCH, recording is attempted. Depending on the success of recording, the execution of EREP is requested. An attempt is made to write a message to the operator. If the attempt is unsuccessful, the message code is in low main storage.
- If the recorder file is more than 90% full at IPL time, the operator is requested to run EREP to prevent the loss of pertinent error data.

EREP can perform any combination of the following options:

- Edit/print the entire SYSREC file.
- Create or update the history/RDE tapes.
- Selectively retrieve records from the SYSREC file or history/RDE tapes for editing and printing.
- Summarize the SYSREC file.
- Create or update a TES history tape.
- Edit/print TES data from the SYSREC file.
- Summarize TES data from the SYSREC file or history tape.
- Clear the SYSREC file.

EREP HISTORY TAPE

There are two EREP history tapes: the history/RDE tape and the TES history tape. The history/RDE tape is created and updated from the SYSREC file and contains all record types found on SYSREC. The TES history tape is also created from the SYSREC file but it contains tape error records only. If your installation contains a history/RDE tape and a TES history tape, both these tapes should be created or updated on the same run. If this procedure is not followed, the TES history tape may contain redundant data or may have data missing.

Retain the history/RDE and TES history tapes for problem determination. The history/RDE tape can be used as input to certain on-line test programs of CITEP. The TES history tape can be printed with the ESTVUT utility program. The history/RDE tape should also be retained for use by the CE.

Figure II.6 summarizes the logical units used by EREP. Figures II.7 and II.8 show the use of the history options.

History/RDE Tapes

The history/RDE tape is created and updated using the EREP history option. This tape contains RDE data only if ERRLOG=RDE is specified at system generation. A magnetic tape unit assigned to SYS007 must be used for this function. EREPNEW must be the filename that is used when a tape is created, and EREPUP when a tape is updated (both TLBL cards must be included for UPNEW). When the tape becomes full or when a second tape must be mounted, the operator is notified via SYSLOG.

Note: If EREP is link-edited as a self-relocating program, an LBLTYP card is needed when EREP builds a history/RDE tape.

LOGICAL UNIT	COMMENTS
SYSIPT	Optional
SYSLOG	Required, must be assigned to a 3210 or 3215
SYSREC	Required
SYS007 SYS008	Optional; must be assigned to a magnetic tape unit when a TES option is specified.
SYS009	Optional; must be assigned to a magnetic tape unit for history/RDE options.

Figure II.6. These are the logical units that EREP uses.

TES History Tape

The TES history tape is created and updated using the EREP TES options. A magnetic tape unit assigned to SYS007 must be used for this function. The filename of the tape file must be TAPEIN when the file is created and TESUP when the file is updated.

```
// JOB EXAMPLE1
// TLBL EREPNEW
// TLBL TAPEIN
// ASSGN SYS007,X'cuu'
// ASSGN SYS009,X'cuu'
// LBLTYP TAPE
// EXEC EREP
 OPTION HIST,NEW
 OPTION TES,TAPE,NEW
/*
/&
// JOB EXAMPLE2
// TLBL TESUP
// TLBL EREPUP
// ASSGN SYS007,X'cuu'
// ASSGN SYS009,X'cuu'
// LBLTYP TAPE
// EXEC EREP
 OPTION EDIT
 OPTION TES,TAPE
 OPTION HIST
/*
/&
```

EREPNEW and EREPUP must be the filenames for new history file(s) or for updating. TAPEIN and TESUP must be the filenames for a new TES history tape or an updated TES history tape.

Figure II.7. Examples of job control required for EREP processing.

OPTION	COMMENTS
OPTION EDIT	Edits and prints SYSREC onto SYSLST.
OPTION CLEAR	1. Edits and prints SYSREC onto SYSLST 2. Clears SYSREC.
OPTION SUM GROUP= { DISK / TAPE / MICR/OCR / UNITREC / TP / CPU / 2715 / ALL } CPU=xxxxxx,yyyy	Prints the summarization of SYSREC onto SYSLST. The file is summarized by the hardware group(s) listed in the GROUP parameter. If records from multiple CPUs appear on the SYSREC file, specify the serial number (*xxxxxx*) and model number (*yyyy*) of the CPU whose records you wish to have summarized. If CPU data is not supplied, records from all CPUs appearing on the SYSREC file are summed together.
OPTION HIST,NEW[,2]	1. Creates the history/RDE tape on SYS009 2. Clears SYSREC.
OPTION HIST[,2]	1. Updates the history /RDE tape on SYS009 2. Clears SYSREC.
OPTION EDIT followed by OPTION HIST,NEW or OPTION HIST	1. Edits and prints SYSREC onto SYSLST 2. Creates or updates the history/RDE tape on SYS009 3. Clears SYSREC.
OPTION TES,NEW	Creates a TES history tape on SYS007.
OPTION TES	Updates a TES history tape on SYS007.
OPTION TES,NOTAPE,PRINT	Edits and prints tape error data from SYSREC onto SYSLST. The data is printed in the detail tape unit format.
OPTION TES,PRINT,NEW	1. Creates a TES history tape on SYS007 2. Edits and prints tape error data from SYSREC onto SYSLST in the detail tape unit format.
OPTION TES,PRINT	1. Updates the TES history tape on SYS007 2. Edits and prints tape error data from SYSREC onto SYSLST in the detail tape unit format.
OPTION TES,NOTAPE,SUM	Prints the summarized tape data from SYSREC onto SYSLST in the detail tape unit format.
OPTION TES,NOTAPE,PRINT,SUM	1. Edits and prints the tape error data from SYSREC onto SYSLST in the detail tape unit format. 2. Prints the summarization of the tape data from SYSREC onto SYSLST in the summarized tape unit format.
OPTION TES,SUM,VOL	1. Updates the TES history tape on SYS007 2. Summarizes the tape error data on SYSREC by volume serial number.
OPTION TES,PRINT,VOL	1. Updates the TES history tape on SYS007 2. Edits and prints the tape error data from SYSREC onto SYSLST in the detail volume serial number. format.
OPTION TES,PRINT,SUM,SUMTAPE,VOL	1. Updates the TES history tape on SYS007. 2. Edits and prints the tape error data from SYSREC onto SYSLST in the detail volume serial number format 3. Summarizes the tape error data on the history tape and prints it on SYSLST in the summarized volume serial number format.
OPTION TES,NOTAPE,SUM,SUMTAPE	Summarizes the tape error data on the history file and prints it on SYSLST in the summarized tape unit format.
OPTION SELECT (see note[1])	Selectively prints records from SYSREC onto SYSLST.
OPTION SELECT,TAPE (see note[1])	Selectively prints records from the history/RDE tape onto SYSLST.
OPTION RDESUM	Summarizes the IPL, EOD, MCAR, CCH, and Unit Check records for a specified period of from one to 30 days. These records are on the history/RDE tape (see note 2).
(none).	Edits and prints SYSREC onto SYSLST.

Note[1]. Records are selected by specifying select parameters See Figure II.10 for the possible select parameters.

Note[2]. RDESUM does not summarize across multiple volumes. If EOF is encountered before the entire requested reporting period has been covered (this can be checked through the end date printed on the RDESUM listing), rerun RDESUM using the next volume in the multiple volume history/RDE file and the same reporting period you specified during the first RDESUM execution. A listing with the remainder of the requested information is thus generated.

Figure II.8. These are the EREP options.

Job stream required to catalog the EREP program into the core image library.

```
// JOB CATALOG
// OPTION CATAL
 PHASE EREP,S+80      (for background execution)      }
 PHASE EREP,+0        (for self-relocating execution) }   choose one
 INCLUDE IJBECALA     (EREP monitor)
// EXEC LNKEDT
 INCLUDE IJBECALB     (EREP edit/select retrieval)
// EXEC LNKEDT
 INCLUDE IJBECALC     (EREP summary)
// EXEC LNKEDT
 INCLUDE IJBECALD     (EREP TES)
// EXEC LNKEDT
 INCLUDE IJBECALE     (RDE summary*)
// EXEC LNKEDT
/*
/&
```

* The RDE summary function only supplies meaningful information if ERRLOG=RDE has been specified at system generation time.

The EREP program is a modular, self-relocating program. However, if the supervisor is batched-job only, EREP must be link-edited to the end-of-supervisor address. It can run in a 14K byte partition using standard job control statements. When the environmental data is needed or the SYSREC file becomes full, EREP can be executed from SYSLOG or SYSRDR by specifying:

```
// EXEC EREP
```

EREP then issues a message to the operator via SYSLOG requesting the logical unit, either SYSLOG or SYSIPT, that is to be used for entering the EREP options:

```
3E11D ENTER OPTION SOURCE, C=CARD,
      S=CONSOLE, N=NONE
```

A response of N or END results in the SYSREC file being edited and printed (this is also the default). If the operator responds C or S followed by END, the system waits for option data from SYSLOG or SYSIPT. If the job has to be canceled at this time, the operator must type in CANCEL. Any response other than C, S, N, CANCEL, or END results in the message

```
3E25I INVALID RESPONSE
```

being printed followed by message 3E11D.

When the EREP options are entered via SYSIPT, only one option per card is allowed (for example, HIST UPNEW, 2 is considered one option). Each option may only be entered once for each execution of the EREP program.

When the EREP options are entered via SYSLOG, the entry must not exceed 80 positions. The parameters, if any, should follow the OPTION statement on subsequent line(s).

Repeat this procedure for each option; when all the options have been specified, press END to continue processing.

Embedded blanks within the operation, option, or parameter statements are not allowed for input from both SYSLOG and SYSIPT. Misspelled words, syntax errors, duplicate option statements, and unsupported options are invalid. When input is from SYSIPT, these errors cause 40 bytes of the card to be printed on SYSLOG, followed by the message

```
3E04I INVALID PARAMETER
```

or

```
3E12D INVALID OPTION
```

At this time, you may place a corrected card in SYSIPT and press END to process the desired option. If you do not want to process the card in error, only press END; the program will then ignore that option card. Enter CANCEL and press END to cancel the EREP program. EREP allows multiple options. See Figure II.9 for a summary of the EREP options.

The EREP options are:

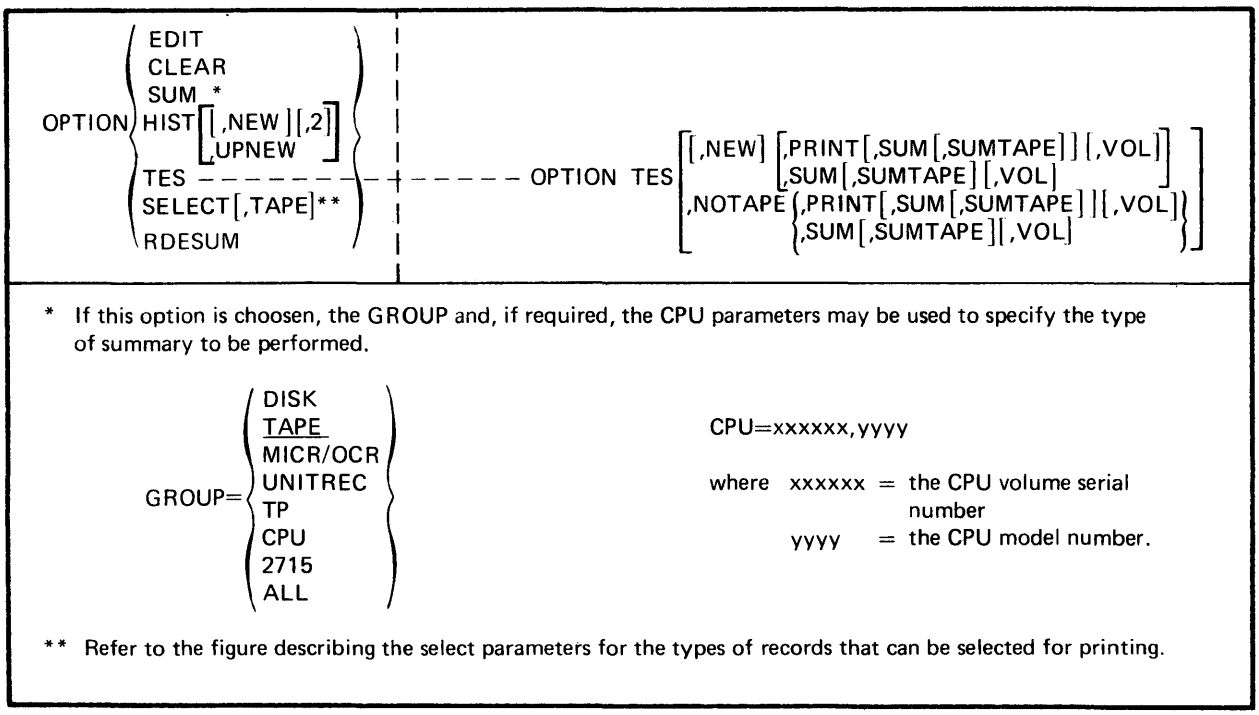


Figure II.9. The EREP options and the summary parameters.

When the EREP options are entered via SYSLOG, it is possible to execute the SUM and SELECT options more than once during an EREP run. After the SUM or SELECT function has executed, the message

3E03A ENTER SELECT PARAMETERS

or

3E05A ENTER SUMMARY PARAMETERS

is printed on SYSLOG. You may execute the SUM or SELECT function again by entering parameters at this time. If you wish to terminate the SUM or SELECT option, press END.

EDIT: The EDIT option causes EREP to edit and print the contents of the IJSYSRC file on SYSLST. The Unit Check records are displayed first; they are grouped by channel and unit address (CUA) within each device group (unsupported, tape, disk, TP, unit record, MICR/OCR). After the Unit Check records the channel check, machine check, 2715, and IPL/EOD records are displayed. Retain these printouts for problem determination.

EREP displays IBM 2715 error records from the SYSREC file in the order:

1. Disk adapters
2. 2790 loop adapter
3. MPX adapters
4. 2740 adapters
5. BSC adapters.

The special codes records are grouped for editing and printing by area station address, CUA, and special code. All area station records on SYSREC are summarized by device address, area station, ID, and CUA during editing and printing.

EREP EDIT can execute in a 14K byte partition, but performance may be improved by allocating more than 14K byte (up to 42K) to the EREP partition. Storage allocation should be increased in blocks of 4K because the tables that EREP EDIT uses are each 3.5K in size.

SELECT PARAMETER	COMMENTS
CPU=xxxxxx	All error records associated with a CPU may be selected for printing by entering the six-digit CPU serial number.
TYPE { MCAR / CCH / IPL / EOD / TP / UNIT / 1275 }	A specific type of error record may be selected for printing. Any number of different types may be selected for each search.
DATE { yyddd,yyddd / yyddd }	All recordings made within a time span (measured in days) may be selected for printing. If two dates, separated by a comma, are specified, all recordings made in that time span are selected. If only one date is specified, all recordings made on that day are selected for printing.
TIME hhmm,hhmm	All recordings made within a time span (measured in hours and minutes) may be selected for printing.
JOB=xxxxxxxx	All recordings made during the execution of a specific job may be selected for printing by specifying the eight-byte jobname from the job statement.
VOL xxxxxx	The error records for a specific volume may be selected for printing by entering the six-byte volume serial number.
TERM xxxxxxxx	The error records for a terminal may be selected by entering the eight-byte terminal name.
CUA=xxxx	Records may be selected for printing by entering the channel and unit address (in hexadecimal) or the line number for TP.
DEVICE=xxxxxx	The records associated with a specific type of device may be selected by entering the device type code (for example, 1403, 1442N1).
FORMAT TES	Whenever a tape (2400- or 3400-series) error record is encountered, it is printed in the detail TES format by volume serial number. If FORMAT TES is not specified, all tape error records are printed in the unit check format.
SEL2715 { AREA / ADAPTER / SPECIAL }	The 2715 records are printed in area station format if the SEL2715 parameter is not specified. If printing by area, adapter, or special is required, however, the SEL2715 parameter must be specified.

Figure II.10. The select parameters.

CLEAR: The CLEAR option causes EREP to clear (reset) the entire SYSREC file for RMSR recording. If the CLEAR option is specified by itself, the EDIT option is forced. CLEAR always is the last EREP function performed. CLEAR is forced if HIST, or HIST with optional parameters, is specified.

SUM: The SUM option allows hardware groups on the IJSYSRC file to be summarized. This function can:

- Accumulate certain bits and bytes in CPU logouts within MCAR/CCH records.
- Accumulate statistical and sense byte data from Unit Check records.
- Accumulate area station data in 2715 error records by device address, area station, 2715, ID, and channel and unit address.

The SYSREC file may be summarized, or one or more hardware groups may be summarized. The GROUP parameter should immediately follow OPTION SUM.

GROUP= { DISK / TAPE / MICR/OCR / UNITREC / TP / CPU / 2715 / ALL }

These entries may be made in any order with commas separating them, following OPTION SUM. If the GROUP parameter does not follow OPTION SUM or if it contains an

error which the operator does not correct, the EREP program summarizes the SYSREC file for the tape hardware group.

If the SYSREC file contains records of multiple CPUs, the CPU whose records are to be summarized must be defined by entering

CPU=xxxxxx,yyyy

in which xxxxxx = the CPU serial number

yyyy = the CPU model number.

If no CPU is provided, records from all CPUs appearing in the SYSREC file are summed together.

You can execute the SUM option more than once during an EREP run if you enter the option and parameter control statements via SYSLOG. After the summary is performed with one set of parameters, the message

3E05A ENTER SUMMARY PARAMETERS

is printed on SYSLOG. You may enter the parameters for another summary at this time or end execution of the SUM function.

If GROUP=ALL is specified, EREP does not ask for additional parameters because a summary of all records is made. When the summary has been completed, EREP processes the next option, if any.

It is possible to improve the processing time for the SUM function by allocating more main storage (in blocks of 8K bytes) to the partition in which EREP is to run. The root phase requires 2K bytes, each transient 8K bytes. The disk, tape, and unit record groups use two transients, all other hardware groups require only one transient. When 2715 is specified in the GROUP parameter, the 2715 records are summarized before any other hardware group. The 2715 group uses 10K bytes of storage, even if more storage is available. If not all the 2715 records can be processed in the 10K bytes partition, those that can be are processed, after which the transient is reloaded and the next 2715 records are processed. This is done until all 2715 records are processed.

In the 8K bytes partition, the TP group can process records for up to 60 distinct terminal names at one time. If more than 60 terminals are to be summarized, the file must be read more than once. If more than one hardware group is specified in a 10K bytes partition, the transients overlay each other and the file must be read as many times as there are transients.

Example 1: The job control statements required for a summary of the SYSREC file by disk, tape, unit record, and TP groups are:

```
// EXEC EREP
 OPTION SUM
 GROUP=DISK,TAPE,UNITREC,TP
/*
```

If the preceding EREP option is to be executed in a 10K bytes partition, the SYSREC file must be read seven times because only one table phase can be in storage at a time; the disk, tape, and unit record groups each require two 8K bytes table phases and the TP group requires one 8K bytes table phase. In a 34K bytes partition four table phases can be loaded; in that case the SYSREC file is only read twice to process all seven table phases. If the partition is allocated 42K or 50K bytes, the SYSREC file must still be read twice. However, when 58K bytes is allocated to the partition, all seven table phases and the root phase fit in storage at the same time and the SYSREC file has to be read only once.

OPTION	PARTITION SIZE	NUMBER OF TIMES SYSREC MUST BE READ
OPTION SUM GROUP=DISK, TAPE,UNITREC, TP	10K	7
	18K	4
	26K	3
	34K	2
	42K	2
	50K	2
	58K	1

Figure II.11. Partition sizes and number of SYSREC reads.

Example 2: The control statements required for a summary of the SYSREC file by MICR/OCR, CPU, and 2715 hardware groups are:

```
// EXEC EREP
 OPTION SUM
 GROUP=MICR/OCR,CPU,2715
/*
```

The 2715 group is summarized first; it uses 10K bytes only. If all records cannot be processed at the same time, the transient is reloaded as many times as necessary to process all records. After the 2715 records have been processed, it may be wise to utilize all main storage available to improve processing time for

MICR/OCR and CPU groups. A partition of 18K bytes allows both record types to be summarized on one single reading of the SYSREC file.

SELECT: By means of the specified search parameters, EREP selects records to be printed. The SELECT option initiates the search for these records on SYSREC; SELECT,TAPE causes a search of the history tape to be performed.

The parameters of the SELECT option are called select parameters; they are checked for validity but not for logical relationship. For example, although an MCAR record has no VOL field, the parameters

```
TYPE=MCAR
VOL=123456
```

are considered valid.

The possible select parameters are listed in Figure II.10.

Any combination of parameters may be entered; the EREP program assumes that you will only enter select parameters that apply to the records you want. If no select parameters are specified with the SELECT option, the MCAR records are selected and printed.

The SELECT option can be executed more than once during an EREP run if the option and parameter control statements are entered via SYSLOG. After selective retrieval, when one set of select parameters has been completed, the message

```
3E03A ENTER SELECT PARAMETERS
```

is printed on SYSLOG. At this time, you may enter a new set of select parameters to execute the selective retrieval, or you may end selective retrieval.

RDESUM: The RDESUM option provides a summary of information about system operation during a specified 1 to 30 day period. This summary is created by searching the history/RDE tape, mounted on SYS009, for IPL, EOD, MCAR, CCH, and Unit Check records, after which these records are edited and printed onto SYSLST. The information provided by the RDESUM option includes:

- The starting and ending date of the report.
- The date, time, reason, and subsystem responsibility for each IPL.
- The average run time between IPL and EOD (or between two consecutive IPLs if the ROD command was not issued to create an EOD record) for the specified interval. If specified, the number of IPL records that occur in the cluster interval.*
- The subsystem responsibility and number of times a subsystem caused a System Recovery Incident (a recoverable error that may cause system degradation) or a System Incident (an unrecoverable error that caused system failure).

When RDESUM is used to retrieve IPL/ECD data, the starting date of the retrieval period may not have a date before 1960.

RDESUM does not summarize across multiple volumes of a history/RDE file. If EOF is encountered on the input tape, RDESUM goes to EOJ and the report printed reflects the information available from the start date to the last record on the tape. There may be some inaccuracy in the average run time per IPL (because RDESUM does not know when the EOD or next IPL record will occur, it uses the time of the last error record to compute the IPL period), but no other information is lost. RDESUM can be executed again for the next volume in the history/RDE file to obtain the remainder of the information for the desired reporting period. The previously specified period may be used on the subsequent volume because RDESUM starts with the first record on the tape if the specified start date is earlier than the date of the first record.

The following rules govern the method for summarizing RDE information:

- If the history/RDE tape does not contain information for a portion of the required time period, only those dates on the tape that fall within the time period are processed. The actual dates processed are reflected on the summary listing.
- If the starting date is defaulted, the first record on the tape is used to start the report. The report is stopped with the specified end date or, if that date is more than thirty days from the date of the first record processed, the thirtieth day processed.
- If the end date is defaulted, the report is stopped with the last date on the tape or, if that date is more than 30 days from the starting date, on the thirtieth day processed.

---

* Clustering is the process of searching for multiple IPL records that have occurred within a specified number of minutes. Clustering can be used to detect multiple false starts that may distort other information provided by RDESUM.

- If the history/RDE tape contains no records within the specified dates, an error message is printed and the report is terminated.
- IPL records are not counted in the reports of subsystems SI (System Incidents) or SRI (System Recovery Incidents).
- If an IPL record with a reason code of UN, IE, IM, ME or DF is immediately preceeded on the tape by an SRI that occurred within 30 minutes of the IPL, the SRI may be reclassified as an SI. The SRI is reclassified if (1) the subsystem ID specified for the IPL is the same as the device type of the SRI, or (2) if the subsystem ID is unknown (00).
- Multiple SRIs on the same device are counted as a single SRI until there is a ten minute interval without an incident or an IPL record.
- If an SI occurs within ten minutes of the IPL record following an SI, the SI is counted as a multiple occurrence of the first SI regardless of the subsystem involved. Intervening SRIs are ignored.
- If 16 sequence errors occur on the history/RDE tape, RDESUM is terminated; if fewer than 16 sequence errors occur, the out-of-sequence records are ignored.

RDESUM is executed when the appropriate option card is encountered. The control information, including the start date for the report, the end date, the clustering interval if clustering is desired, and the company name, is entered once the EREPRDE phase is in main storage. The control information is entered in response to prompter messages.

HIST OR HIST WITH ANY OPTIONAL OPERANDS

This option copies the data on the SYSREC file to the history/RDE tape. All records on the tape(s) appear in chronological order. If an unrecoverable I/O error occurs while a record is being read from the SYSREC file, the record is ignored and processing continues with the next sequential record. If the data fills the complete tape, the message

3E15A TAPE FULL, MOUNT NEW TAPE

is printed on SYSLOG. The operator must mount a new tape and press END to continue processing, or he may respond CANCEL and press END to cancel the HIST option.

The tape must be mounted on SYS009. SYS009 must be assigned to a tape drive before EREP is executed. The tape contains standard labels that are checked before the history/RDE tape is written. If the wrong tape is mounted, the message

3E31A WRONG TAPE, MOUNT CORRECT TAPE

is printed on SYSLOG. Mount the correct tape and press END to continue processing, or respond CANCEL END to cancel the HIST option. When the HIST option is specified, the CLEAR option is forced. The SYSREC file is cleared after the history/RDE tape has been created or updated, thus preventing redundant data to be transferred to the history/RDE tape the next time the HIST option is executed.

HIST,NEW[,2]: This option causes EREP to create a history file on the tape unit assigned to SYS009. If 2 is also specified, a second history file is created on the same tape unit for RDE data. The data contained on both tapes is identical. The tape(s) contain the contents of the SYSREC file. The SYSREC file is cleared after all options have been executed.

HIST,UPNEW: This option causes the tape file mounted on SYS009 (either history or RDE) to be updated, after which a new tape file is created. If UPNEW is specified, TLBL information for creation and updating must be included in the job stream. The SYSREC file is cleared when all options have been executed.

TES OR TES WITH ANY OPTIONAL OPERANDS

The TES options provide for the editing and printing of the tape error records on SYSREC and the summarizing of tape data found on either SYSREC or the history file.

This option can also select tape error data from the SYSREC file and create a TES history tape with the same format as the previously supported ESTV tape file. All records on the tape appear in chronological order. If an unrecoverable I/O error occurs while reading a record from the SYSREC file, the record is ignored and processing continues with the next sequential record. If the data fills the complete tape, the message

3E15A TAPE FULL, MOUNT NEW TAPE

is printed on SYSLOG. The operator must mount a new tape and press END, or he may

OPTION CARD	COMMENTS
OPTION TES,NEW	Creates a TES history tape.
OPTION TES	Updates a TES history tape.
OPTION TES,PRINT	Updates the TES history tape and then edits and prints the tape error data from SYSREC onto SYSLST in the detail tape unit format.
OPTION TES,NOTAPE,PRINT,VOL	Edits and prints the tape error data from SYSREC onto SYSLST in the detail volume serial number format.
OPTION TES,NOTAPE,PRINT	Edits and prints the tape error data from SYSREC onto SYSLST in the detail tape unit format.
OPTION TES,PRINT,NEW,VOL	Creates a new TES history tape and then edits and prints the tape error data from SYSREC onto SYSLST in the detail volume serial number format.
OPTION TES,PRINT,VOL	Updates the TES history tape and then edits and prints the tape error data from SYSREC onto SYSLST in the detail volume serial number format.
OPTION TES,PRINT,SUM,VOL	Updates the TES history tape and then edits and prints the tape error records from SYSREC onto SYSLST in the detail volume serial number format. Finally, the tape error records on SYSREC are summarized by volume serial number.
OPTION TES,PRINT,SUM,SUMTAPE,VOL	Updates the TES history tape and then edits and prints the tape error records from SYSREC onto SYSLST in the detail volume serial number format. Finally, the tape error data on the history tape is summarized and printed on SYSLST in the summarized volume serial number format.
OPTION TES,NOTAPE,SUM	Edits and prints the tape error data from SYSREC onto SYSLST in the summarized tape unit format.
OPTION TES,NOTAPE,SUM,SUMTAPE	Summarizes and prints the tape error data from the history tape onto SYSLST in the summarized tape unit format.

Figure II.12. EREP options for tape statistics.

The tape must be mounted on SYS009. SYS009 must be assigned to a tape drive before EREP is executed. The tape contains standard labels that are checked before the history/RDE tape is written. If the wrong tape is mounted, the message

3E31A WRONG TAPE, MOUNT CORRECT TAPE

is printed on SYSLOG. Mount the correct tape and press END to continue processing, or respond CANCEL END to cancel the TES option. The history/RDE tapes and the TES history tape should be created or updated during the same EREP run. If the HIST option is specified without the TES option, the SYSREC file is cleared after HIST has been executed and the TES data is lost. If you wish to maintain both these history tapes and the TES and HIST options are not specified together in one EREP run, the data on the TES history file may be redundant or lost.

TES,NEW: This causes EREP to create a TES history file on the tape unit assigned to SYS007. The tape file contains tape error data from the SYSREC file. The tape error data on the tape has the same record format as the previously supported ESTV tape file. Use the ESTVUT utility program to print this tape file.

TES: EREP updates the TES history tape on SYS007.

TES,NOTAPE,PRINT: Causes the tape data on SYSREC to be edited and printed onto SYSLST. Data is printed in the detail tape unit format.

TES,PRINT,NEW: A new TES history tape is created on SYS007 after which the tape error data on SYSREC is edited and printed onto SYSLST. The data is printed in the detail tape unit format.

TES,PRINT: The TES history tape, which is mounted on SYS007, is updated. The tape error data on SYSREC is then edited and printed onto SYSLST in the detail tape unit format.

TES,NOTAPE,SUM: The tape error data on SYSREC is summarized by tape drive.

TES,NOTAPE,PRINT,SUM: The tape error data on SYSREC is edited and printed onto SYSLST in the detail tape unit format. Then the tape error data on SYSREC is summarized by channel and unit and printed onto SYSLST.

TES,SUM,VOL: The TES history tape on SYS007 is updated. Afterwards the tape error data found on SYSREC is summarized by volume serial number.

TES,PRINT,VOL: The TES history tape mounted on SYS007 is updated. The tape error data on SYSREC is edited and printed onto SYSLST in the detail volume serial number format. SYS007 is used as a work tape and the detail records are printed in sequence by volume serial number.

PROCESSING THE TAPE ERROR STATISTICS WITH EREP

The EREP (Environmental Recording, Editing, and Printing) program provides processing options for the tape error statistics records on SYSREC.

Tape records can be edited and printed, or summarized, together with the other records on SYSREC; you may also choose to have only the tape error records of the file selected or summarized. If the SYSREC file has been used to create a history/RDE tape, the records on that tape contain the same information as the SYSREC file contained. In this case the tape error statistics records can be selected or summarized from the history/RDE tape file.

The SYSREC file may also be used to create a TES history tape. This tape contains tape error statistics records only. These records have the same format as the records of the former ESTV disk file; thus only part of the information recorded on the SYSREC file for tape error statistics is written on the TES history file. The information written on the TES history file consists of:

- Date the record was collected.
- Physical address of the device on which the tape volume was mounted.
- Number of temporary read errors.
- Number of temporary write errors.
- Number of permanent read errors.
- Number of permanent write errors.
- Number of error gaps encountered.
- Number of noise blocks encountered.
- Number of cleaner actions taken.
- Number of SIO instructions issued.
- The volume serial number, if the tape was a standard labeled volume.
- Block length if the volume contained fixed-length blocked records.

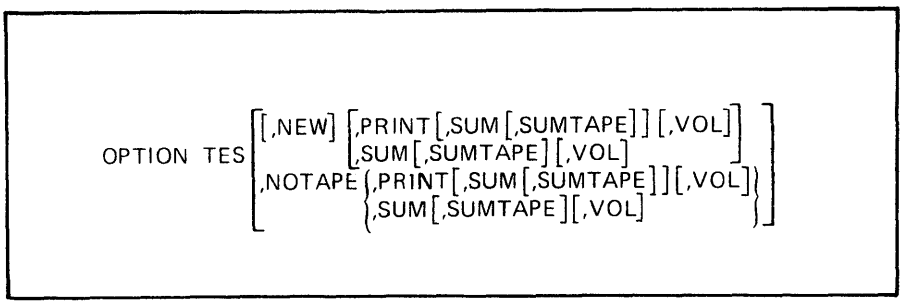


Figure II.13. The EREP tape options.

- Tape density of the tape volume.

The history/RDE tape and the TES history tape must always be updated on the same run. Failure to update both these tapes on the same run may result in redundant or lost data on the TES history tape. When PRINT is specified the detail records on SYSREC are printed on SYSLST. When SUM is specified, the tape error statistics are summarized on either the history tape or SYSREC. It is possible to print or summarize tape error statistics by volume serial number or by tape drive address.

When tape error statistics are summarized by volume serial number, it may be possible to improve processing time by allocating more main storage to the EREP partition. Approximately 90 distinct volumes can be summarized in a 10K byte partition. When the SYSREC file contains recordings for more than 90 distinct volumes and EREP is run in a 10K byte partition, the SYSREC file is read and 90 volumes are summarized; then the SYSREC file is processed again and the remaining (or next 90) volumes are summarized.

If you want to improve your processing time when there are more than 90 volumes, therefore, you must allocate enough main storage, thus allowing all volumes to be summarized on only one read through of the SYSREC file. Approximately 12 additional volumes can be processed for each 1K bytes added to the partition. To calculate the number of volumes that can be summarized in a particular partition, use the following formula:

$$N = \frac{P - \left(\begin{array}{l}80 \text{ bytes} \\ \text{if tape is} \\ \text{assigned}\end{array}\right) - 2740}{82}$$

EXAMPLES OF PROCESSING TAPE STATISTICS RECORDS

You can cause detailed or summarized tape statistics to be printed through the use of the various combinations of EREP options shown in Figure II.12. The summarized format combines the individual recordings (for example, Unit Check, Volume Dismount, and End-of-Day records) either by volume serial number or by tape unit and prints the summarized statistics. The detail format prints each recording in either volume serial number format or tape unit format. Whenever detail or summarized data is printed in volume serial number format, the data is printed in sequence by volume serial number.

Example 1: Print detail tape error statistics from SYSREC. The information is printed in the format of record 4 of Figure II.14. Enter the following job control statements:

```
// EXEC EREP
 OPTION TES,NOTAPE,PRINT
/*
```

Example 2: Print the summarized tape error statistics from SYSREC only. The data is printed in the format of record 3 of Figure II.14. Enter the following job control statements:

```
// EXEC EREP
 OPTION TES,NOTAPE,SUM
/*
```

Example 3: Print the detail tape error records and then print their summary by volume serial number. The data is printed in the format of records 1 and 3 of

Figure II.14. The following job control statements:

```
// EXEC EREP
 OPTION TES,NOTAPE,PRINT,SUM,SUMTAPE,VOL
/*
```

A work tape is required because the VOL option is specified. The work tape will contain a sequential list of all volume serial numbers along with a 5-byte disk address for each of these numbers. The message

3E08A MOUNT SCRATCH TAPE ON SYS008

is printed on SYSLOG. After the scratch tape is mounted the operator should respond END. If the operator chooses not to mount a work tape, he should respond CANCEL END. This causes the SUM and PRINT TES options to be canceled. Any other response results in the messages

3E25I INVALID RESPONSE
3E08A MOUNT SCRATCH TAPE ON SYS008

being printed on SYSLOG.

Example 4: Update the TES history tape on SYS007. Then a scratch tape is mounted on SYS008. The error records are edited and printed from SYSRES onto SYSLST in the detail volume serial number format (record 2 of Figure II.14). The tape error records on the history tape are then summarized and printed on SYSLST in the summarized volume serial number format (record 1 of Figure II.14). Enter the following job control statements:

```
// LBLTYP TAPE
// TLBL EREPNEW
// EXEC EREP
 OPTION HIST
 OPTION TES,PRINT,SUM,SUMTAPE,VOL
/*
```

First the TES history tape is updated: the message

3E09A MOUNT TES HISTORY TAPE ON SYS007

is printed on SYSLOG. After the TES history tape has been updated, the tape error data on SYSREC is edited. The message

3E08A MOUNT SCRATCH TAPE ON SYS008

is printed on SYSLOG. The tape data is printed on SYSLOG and then the message

3E18A MOUNT HISTORY/RDE TAPE

is printed on SYSLOG. The history tape is read and the tape error data is summarized by volume serial number. Finally, the history tape is updated and the SYSREC file is cleared.

PROCESSING THE TES HISTORY TAPE WITH THE ESTVUT UTILITY PROGRAM

When a TES history tape is created from the data on SYSREC, ESTVUT, the ESTV Dump File Program, is used to process the data on the TES history tape. This utility program, dumps the TES history file on SYSLST.

Control Cards necessary to run ESTVUT. ESTVUT can be executed either from a card reader or from SYSLOG. An example of the job control statements required for ESTVUT is:

```
// JOB ESTVDUMP
// ASSGN SYS005,X'181'
// ASSGN SYSLST,X'00E'
// TLBL TAPEIN
// LBLTYP TAPE
// EXEC ESTVUT
/*
/&
```

Symbolic Unit Assignments: Every symbolic unit required for execution of the ESTVUT program must be assigned, either temporarily for one job or permanently.

- SYS005 must be assigned to the magnetic tape unit on which the TES history file is mounted.
- SYSLOG must be assigned to a 3210 or 3215 for all executions of ESTVUT in order to log inquiries and accept replies.

```
RECORD#1              SUMMARY   MAGNETIC TAPE ERROR STATISTICS          XX/XXX

VOLUME        PERM  PERM  TEMP  TEMP   SIO   NRZI        CPU   MOD  ERASE  CLEANER
SERIAL  DATE  READ  WRT   RD    WRT    COUNT NOISE  ID SERIAL NO   GAP    ACTION



RECORD#2              DETAIL   MAGNETIC TAPE ERROR STATISTICS BY VOLUME    DATE XX/XXX

VOLUME         TIME          TU    RD/  PERM  PERM  TEMP  TEMP   SIO   BLOCK   PROGRAM  CPU  MOD  DENSITY
SERIAL  DATE   OF DAY  CUA  SERIAL  WRT  READ  WRT   RD    WRT    COUNT LENGTH     ID     ID   NO



RECORD#3              SUMMARY   MAGNETIC TAPE ERROR STATISTICS          XX/XXX

       JU          SIO   TEMP  TEMP  PERM  PERM  NRZI   EQUIP  OVDR  EARLY  WR TM  IBG   FEED  VEL   PART  SLOW  EXC
CUA  SERIAL  DATE COUNT   RD    WRT   RD    WRT   NOISE  CK     RUN   END    CHECK  DROP  THRU  RTRY  REC   BOR   PAMB



RECORD#4              DETAIL   MAGNETIC TAPE ERROR STATISTICS BY TAPE UNIT   DATE XX/XXX

       TU          VOLUME   TIME   TEMP  TEMP   SIO   DENSITY  NRZI  R/W  WR TG  LRC  CRC  ECC  SKEW  ERLY  VEL
CUA  SERIAL  DATE  SERIAL  OF DAY  RD    WRT    COUNT         NOISE VRC  VRC    MTE  EDC  ENV  ERR   BOR   CHG   TIE
```

Figure II.14. The EREP TES print formats.

VOLUME SERIAL	DATE	TIME OF DAY	CHANNEL /UNIT	TEMP READ	TEMP WRITE	PERM READ
xxxxxx	yr/day	hr.mn.sc.	cuu	nnn	nnn	nnn
PERM WRITE	NOISE BLOCKS	ERASE GAPS	CLEANER ACTIONS	SIOS USAGE	TAPE DENSITY	BLOCK LENGTH
nnn	nnn	nnn	nnn	nnnnn	nnn	nnnnn

Figure II.15. ESTVUT print format.

Label Information: Label information must be available to the system whenever the devices are used in the execution of ESTVUT.

- The first operand of the TLBL statement for the input tape must be TAPEIN.
- A LBLTYP for tape is required if the program uses tape and has been cataloged as a self-relocating program (+0 on the PHASE card). This statement reserves space for processing standard label information.

Contents and Format of Printed Output: When the operator specifies a printer as output device, the collected error statistics are formatted and printed as shown in Figure II.15. Each printed page contains 50 lines of data. The last printed page contains a message after the last line of data. This message is:

```
ESTV TAPE FILE DUMPED
```

Cataloging ESTVUT: ESTVUT consists of one module that has to be cataloged in the core image library. The module name to be used in the INCLUDE statement for this routine is:

```
IJBTESUT
```

Following is an example of the job control required to catalog the module in the core image library.

```
// JOB CATALOG
// OPTION CATAL
 PHASE ESTVUT, {+0}
               { S}
 INCLUDE IJBTESUT
// EXEC LINKEDT
/&
```

- +0 is used for a multiprogramming system.
- S is used for a non-multiprogramming (batched-job) system.

Index

Module 2. Data Management Concepts

Module Outline

What has been Changed in Data Management?

Data Management now includes support for the IBM 3330 Disk Storage, the 3400-series Magnetic Tape Units, the 2596 Card Read Punch, the 3505 Card Reader, and the 3525 Card Punch. No changes are required in Data Management for the 3400-series tape drives and the new 96-column Card Read Punch, the 2596.

3330

The changes and additions that have been made for the 3330 are:

- ISFMS. Storage space formulas for the two disk devices have been added.
- DAM. The capacity record figure has been updated to include 3330.
- DASD. A description of the new disk device and its record and storage capacities has been added.

3505/3525

Some appendix information has been added for the 3505 and 3525 card devices. This information logically fits in the base publication as Appendix J. The 3505 and 3525 can both be used in normal mode, Optical Mark Read (OMR) mode, and Read Column Eliminate (RCE) mode. To explain these modes, the new information contains:

- Descriptions of the RCE and OMR format descriptor cards.
- How to code an input card for OMR.
- A description of the format of OMR data records.

Requirements

INDEXED SEQUENTIAL DISK STORAGE SPACE FORMULAS FOR THE IBM 3330

Three formulas are used to compute IBM 3330 Disk Storage requirements for an indexed sequential file. The known quantities for the computation given are:

D = data length
K = key length
c = constant
  = 0 if K = 0
  = 56 if K ≠ 0
B = block length (data length x number of records)
X = number of prime data tracks per cylinder
L = number of bytes (10) for overflow link information.

1. To calculate the number of prime data records per cylinder (Npr)

   let:

   A = number of prime data records on a shared track
   C = number of records on a non-shared track.

   Notes:

   1. These values must be whole numbers. A shared track is one on which prime data records occupy unused space on a track index.

   2. The last track of the prime data area is never used for prime data records. If the file is completely filled, the last track contains an EOF record only.

   Then:

   a. Determine the size of the track index in bytes (T1),

      $$T1=(2X+1)(135+c+K)$$

   b. Determine the number of bytes remaining on the track for prime records (T2),

      $$T2=13,165-T1$$

   c. Determine the number of prime data records on a shared track (A),

      if T2 is negative, set A=0,
      if T2 is zero, set A=1,
      if T2 is positive, set

      $$A=1+\frac{T2}{135+c+K+B}$$

   d. Determine the number of records on a non-shared track (C),

      $$C=1+\frac{13,165-(K+B)}{135+c+K+B}$$

   Compute the number of prime records per cylinder (Npr) by substituting for A, C, and X in

   $$Npr=A+C(X-1)$$

2. To determine the number of overflow records per track (Nor)

   compute: $$Nor=1+\frac{13,165-(K+D+L)}{135+c+K+D+L}$$

3. To determine the number of cylinders or master index records per track (Nir)

   compute: $$Nir=1+\frac{13,165-(K+10)}{135+c+(K+10)}$$

   Note: Allow for a dummy record.

Direct Access Method

Capacity Record

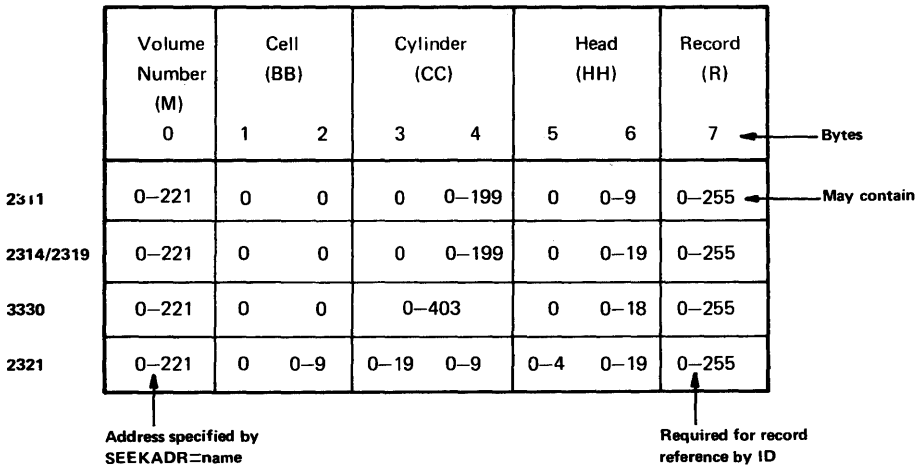


Figure III.1. DASD address format.

IBM 3330 Disk Storage

Version 4 of the Disk Operating System supports the IBM 3330 Disk Storage in selector mode and 2314/2319 mode. This unit consists of a 3830 Control Unit and one to four IBM 3330 Disk Storage modules, attached to a block multiplexer channel or integrated channel with block multiplexing capability. Each 3330 module contains two independent disk drives.

Each disk drive has two access mechanisms consisting of nineteen read/write heads; each access mechanism is individually addressable. The heads read or write data stored on an IBM 3336 Disk Pack. These disk packs are mounted in powered drawers; they are easily removeable and interchangeable. Thus large offline storage capacity can be obtained as well as programming flexibility.

STORAGE AND RECORD CAPACITY

Each disk record contains some nondata areas (such as count fields and gaps); therefore, the net data storage capacity of tracks varies with the number of records. If only one record is written, each track has a data capacity of 13,030 bytes.

Minute particles can sometimes contaminate the disk surface; therefore the 3330 has seven alternate cylinders, each of which can be used if one of the 404 main cylinders is defective. In that way a total capacity of 100,000,000 bytes (based on 404 cylinders) is maintained on the disk pack.

Record capacities for the 3330 are listed for records with keys and without keys in Figure III.2; the storage capacity of the 3330 is shown in Figure III.3. Further information on the 3330 is available in Reference Manual for IBM 3830 Storage Control and IBM 3330 Disk Storage, GA26-1592.

Storage Device	Track capacity in bytes when R_0 is used as specified by IBM Programming Systems	Bytes per data record			
		Data records (except for last record)		Last record	
		Without key	With key	Without key	With key
3330	13030	$135 + D_L$	$191 + D_L + K_L$	D_L	$56 + K_L + D_L$

Record R_0 used as specified by IBM Programming Systems. No application data; K_L=0; D_L=8	Number of equal length records that can be stored on a 3330 track																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Bytes per record without key	13030	6447	4253	3156	2498	2059	1745	1510	1327	1181	1061	962	877	805	742	687	639	596	557	523
Bytes per record with key	12974	6391	4197	3100	2442	2003	1689	1454	1271	1125	1005	906	821	749	686	631	583	540	501	467

R_0 = Record 0 (track descriptor record)
D_L = Data length
K_L = Key length

Figure III.2. Record capacities for the 3330.

	Per Track	Per Cylinder	Per Disk Storage Drive	Per IBM 3330
Disk Storage Drives				8
Cylinders			404	3,232
Tracks		19	7,676	61,408
Bytes (Alphameric Characters)	13,030	247,570	100,018,280	800,146,240
Packed Decimal Digits (Numeric Only)	26,060	495,140	200,036,560	1,600,292,480

Figure III.3. IBM 3330 storage capacities.

OMR and RCE Modes and the Format Descriptor Card

This is a new section. It contains appendix information; it should be placed in the base publication after Appendix I.

The RCE (Read Column Eliminate) mode is supported by the IBM 3505 Card Reader and 3525 Card Punch. The OMR (Optical Mark Read) mode is supported by the IBM 3505 Card Reader. OMR is the ability to read up to 40 columns of penciled or preprinted marked data per input card. These 40 columns can be located anywhere on the card, but each mark must be separated from the next by at least one blank. RCE is the ability to ignore data in selected columns of a card.

OMR and RCE modes are specified in the MODE parameter of the DTFCD macro instruction (see the "Supervisor and I/O Macros" module). A format descriptor card specifies the columns to be read in OMR mode or the columns to be eliminated in RCE mode. This descriptor card must be the first card in the file. When this descriptor card is found, an 80-byte record is built which relates to the specified format on a column-by-column basis. If the format descriptor card is not found, a message is issued to the operator and the job is terminated.

RCE Format Descriptor Card

For RCE the format descriptor card is written as follows:

```
FORMAT (N1,N2),....
```

N1 Indicates the first column which is not to be read. N1 must at least be 1 and not greater than N2.

N2 Indicates the last column which is not to be read. N2 must be less than 81 and not smaller than N1.

If the format descriptor card is written FORMAT (N1,N2),(N3,N4),... N2 must be smaller than N3.

The information in the format descriptor card must begin in column 2 and continue no further than column 71; if more information is required, a continuation code must be inserted in column 72 and coding on the next card must begin in column 16.

Example: The following format descriptor card specifies that columns 20 through 30 and 52 through 76 are not to be read:

```
FORMAT (20,30),(52,76)
```

OMR Format Descriptor Record

For OMR the format descriptor card must be written as follows:

```
FORMAT (N1,N2),....
```

N1 Indicates the first column to be read in OMR mode. N1 must at least be 1 and not greater than 80 or N2.

N2 Indicates the last column to be read in OMR mode. N2 must be less than 81 and not smaller than 1 or N1.

Only every other column is read in OMR mode; therefore N1 and N2 must both be even or both be odd.

If the format descriptor card is written FORMAT (N1,N2),(N3,N4),... N3 must be at least N2+2. A maximum of 40 columns of OMR data can be defined for each card.

Example: The following format descriptor card specifies that columns 1, 3, 5, 7, 9, 70, 72, 74, 76, 78, and 80 are to be read in OMR mode:

```
FORMAT (1,9),(70,80)
```

CODING AN INPUT CARD FOR OMR

The following rules apply to the coding of an input card to be read in OMR mode.

- Mark characters on a card (characters to be read optically) must be separated by at least one column that contains neither marks nor punches.

  MbMbMbbM

- Mark characters and punched hole columns must be separated by at least one column containing neither marks nor punches.

  MbPbPPP

- Mark characters in odd columns and mark characters in even columns must be separated by at least two columns containing neither marks nor punches.

  MbMbMbbM

OMR DATA RECORDS

Although OMR data is physically located in alternating columns, the data in the I/O buffer is compressed into contiguous bytes. The relationship of data in card columns to the location of the data in storage is as follows:

1. If column n does not contain OMR data, the content of column n+1 represents the contiguous byte in main storage which follows the column n data byte.

2. If column n contains OMR data, the data content of column n+2 represents the contiguous byte in main storage which follows the column n data byte. The data content of column n+1 is not placed in main storage.

3. The data content of column 1 always represents the first data byte in main storage.

Figure III.4 shows how these rules apply to the data card to be read in OMR mode, the format descriptor card defined for the data card, and the record that results from reading the card.

When a marginal mark, weak mark, or poor erasure is detected by the 3505, the data in that column is replaced with X'3F' in EBCDIC mode or with X'3F3F' in card image mode. It is your responsibility to check for this condition.

If X'3F' is placed in the data, a X'3F' is also placed in byte 80 of the I/O buffer in EBCDIC mode and in byte 160 of the I/O buffer in card image mode to indicate that an OMR error occurred.

If the I/O buffer length is less than 80 (or 160) bytes, the X'3F' is not placed in main storage. In that case it is your responsibility that each OMR data byte is checked for a X'3F' to indicate a read error. To determine if a read error occurred in a card, you must check if there is a X'3F' in either column 80 or 160.

Card Column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Card Data	p_1	p_2	b	M_4	b	M_6	b	b	M_9	b	M_{11}	b	p_{13}	p_{14}	p_{15}	p_{16}	p_{17}	p_{18}	p_{19}	p_{20}
Format Data	b	b	b	F_4	–	F_6	–	b	F_9	–	F_{11}	–	b	b	b	b	b	b	b	b
	Switch from punch to mark					Switch from even to odd marks					Switch from mark to punch									
Format Descriptor Card		F	O	R	M	A	T		(	4	,	6	)	,	(	9	,	1	1	)
Channel Data	p_1	p_2	b	M_4	M_6	b	M_9	M_{11}	p_{13}	p_{14}	p_{15}	p_{16}	p_{17}	p_{18}	p_{19}	p_{20}				

b = Must have neither hole nor mark data
b = Hexadecimal 40
– = May be character or blank
p_x = Punched data in column x
M_x = Mark data in column x
F_x = Format data for column x

Figure III.4. Relationship between format descriptor card and data card.

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Module 3. Supervisor and I/O Macros

Module Outline

What has been Changed in Supervisor and I/O Macros

The inclusion of the 2596, 3505, and 3525 card readers/punches as well as the 3400-series tape drives and the 3330 disk has caused a number of alterations to supervisor and I/O macros. The supervisor-communications macro GETIME now includes a number of new parameters in order to allow you to obtain the local time-of-day via this macro if your system includes TOD clock support.

SAM

Changes have been made to the DTFCD, CDMOD, DTFPR, PRMOD, and DTFSD declarative macro instructions. The DTFDI and DIMOD macros can be used for all new devices except the 2596 the same way they are used for old devices. The 3400-series magnetic tape units can be processed by means of the DTFMT and MTMOD macros; these macros need **not** be changed.

DTFCD/CDMOD. The following changes and new restrictions have been included for the DTFCD.

- BLKSIZE has a new default of 96 for the 2596 and of 160 for the 3505 and 3525 in column binary mode.
- CONTROL is not valid for a 3525 associated input file.
- Only DEVADDR=SYSnnn is valid for the 2596.
- 2596, 3505, and 3525 can be specified in DEVICE.
- IOAREA2 is not valid for 3525 associated files.
- Only RECFORM=FIXUNB is allowed if FUNC=I is specified.
- The ASOCFLE, ERROPT, FUNC, and MODE operands base been added.

Likewise the CONTROL, DEVICE, ICAREA2, and RECFORM operands of CDMOD have been changed and the FUNC operand has been added. This also results in an increased number of possible module names for CDMOD.

DTFPR/PRMOD. The print feature of the IBM 3525 Card Punch can be invoked by means of the DTFPR. Therefore the following operands have been changed:

- The BLKSIZE default for the 3525 is 64.
- When CTLCHR=ASA is specified, the + character may not be used for the 3525.
- Only DEVADDR=SYSnnn is valid for 3525.
- 3525 can be specified in the DEVICE operand.
- For the 3525 ERROPT=IGNORE can be specified.
- The ASOCFLE and FUNC operand have been added to the DTFPR.

For the PRMOD similar changes have been made to the CTLCHR, DEVICE, and ERROPT operands; the FUNC operand has been added. An increased number of possible PRMOD names also results from these changes.

DTFSD. Due to the addition of the IBM 3330 Disk Storage, the following operands have been modified:

- The largest BLKSIZE specification allowed is now 13,030.
- 3330 can be specified in the DEVICE operand.
- The ICAREA1 operand should be no larger than 13,030 for spanned record processing.

Imperative Macros. OPEN(R) has been changed to verify the 3505 and 3525 format descriptor card. A number of new considerations have been included for the PUT macro when processing a 3525 print file. The updating function for a 3525 file which is performed through the use of an associated file, and the new card control codes for the 2596, 3505, and 3525 have been added. Special considerations exist for the PRTOV macro when it is used with a 3525; for CLOSE(R) some new functions have been added for 3505 and 3525 files. CLOSE(R) resets these devices to normal mode after RCE or CMR processing.

Sequential Processing Macros. Small changes have been made to the NOTE, POINTR, and POINTW macro instructions to make it possible the handle the extended 3330 disk address.

DAM

The types of track reference fields have been extended to include the 3330. For the same device the specification 3330 has been added to the DEVICE operand of the DTFDA macro instruction.

ISAM

Some small changes have been made to the DTFIS. The maximum specification for the 3330 in the CYLOFL operand is 17. The DEVICE and HINDEX operands allow the specification of 3330.

PIOCS

3330 can now be specified in the DEVICE operand of the DTFPH macro instruction; the specification of TAPE applies to any 2400 or 3400-series magnetic tape unit.

Sequential Access Method

Declarative Macro Instructions

CARD FILE (DTFCD)

The DTFCD macro instruction defines sequential processing for a file ccntained on a card device.

Figure IV.2 lists the keyword operands contained in the operand field. Only the following operands have been changed for DOS Version 4.

```
┌──────────────────────────────────────┐
|  ASOCFLE=filename                    |
└──────────────────────────────────────┘
```

This is a new operand. It specifies the filename or address of associated read, punch, and print files. It thus enables macro sequence checking by the logic module of each associated file. ASOCFLE must be used with the FUNC operand to define associated files. One filename or address is required per DTF for associated files. Figure IV.1 defines the filename specified by the ASOCFLE parameter for each DTF file type.

Examples:

- If FUNC=PW is specified, you must specify the filename of the print file in the ASOCFLE operand of the punch DTF; you must also specify the filename of the punch file in the print DTF.

- If FUNC=RPW is specified, you must specify the filename of the punch file in the ASOCFLE operand of the read DTF. You must also specify the filename of the print file in the ASOCFLE operand of the punch DTF and the filename of the read file in the ASOCFLE operand of the print DTF.

FUNC=	DTF TYPE		
	READ(R)	PUNCH(P)	PRINT(W)
RP	Punch file	Read file	
RW	Print file		Read file
PW		Print file	Punch file
RPW	Punch file	Print file	Read file

Figure IV.1. Relationship of associated files.

```
┌──────────────────────────────────────┐
|  BLKSIZE={nnn|80|96|160}             |
└──────────────────────────────────────┘
```

If this operand is omitted, the length is assumed to be 80 for EBCDIC mode. For 2596 the length is assumed to be 96; for 3505 and 3525 column binary mode, it is assumed to be 160.

```
┌──────────────────────────────────────┐
|  CONTROL=YES                         |
└──────────────────────────────────────┘
```

This operand is not valid for an input file used in association with a punch file on a 3525 Card Punch (FUNC=RP or RPW).

```
┌──────────────────────────────────────┐
|  DEVADDR={SYSIPT|SYSPCH|SYSRDR|SYSnnn}  |
└──────────────────────────────────────┘
```

This operand specifies the symbolic unit to be associated with a file. SYSIPT, SYSPCH, and SYSRDR are not valid for a 2596.

```
┌──────────────────────────────────────┐
|  DEVICE={1442|2501|2520|2540|2596|3505| |
|          3525}                       |
└──────────────────────────────────────┘
```

This operand specifies the I/O device associated with the logical file. If this operand is omitted, 2540 is assumed.

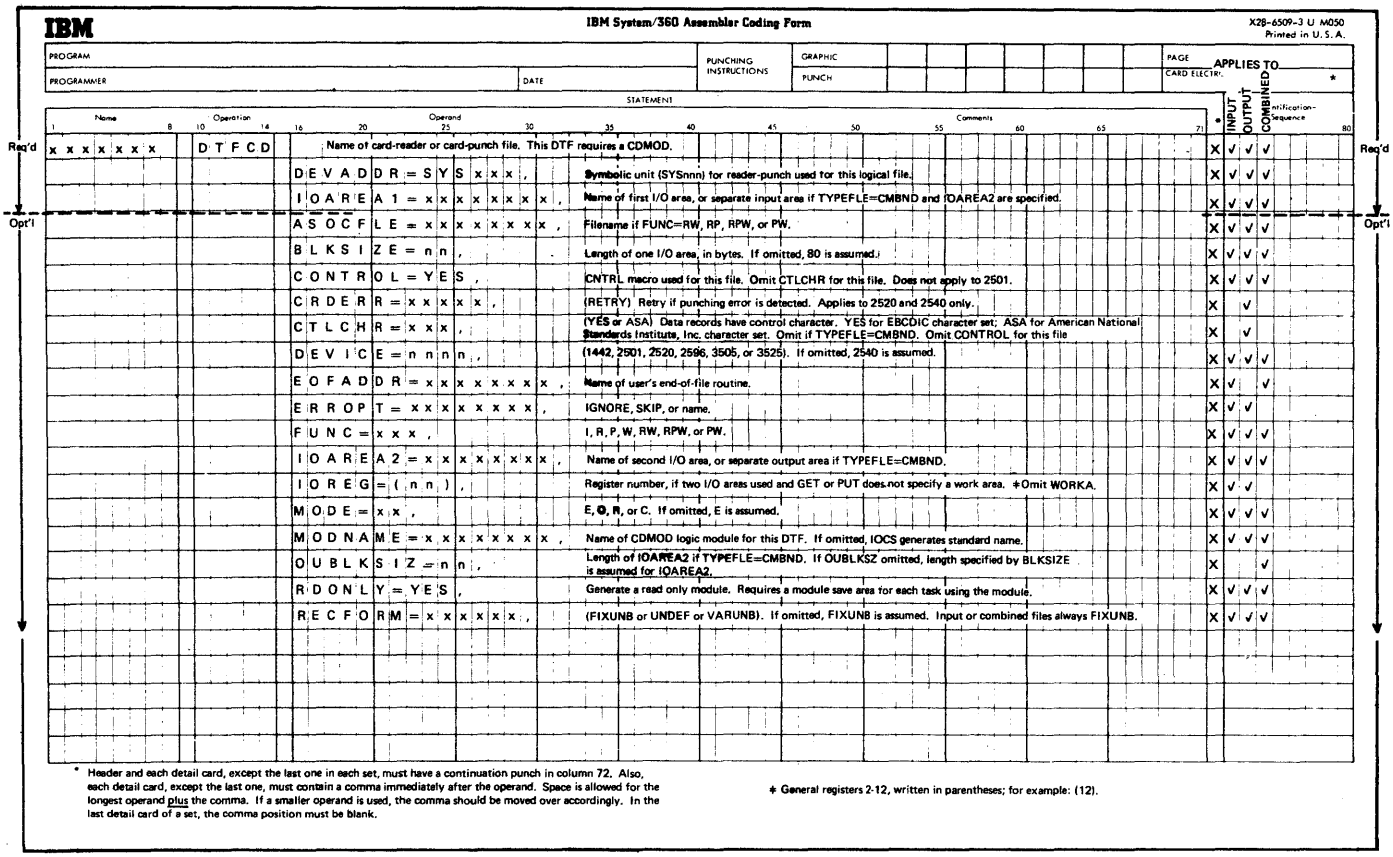


Figure IV.2. DTFCD macro (Part 1 of 2).

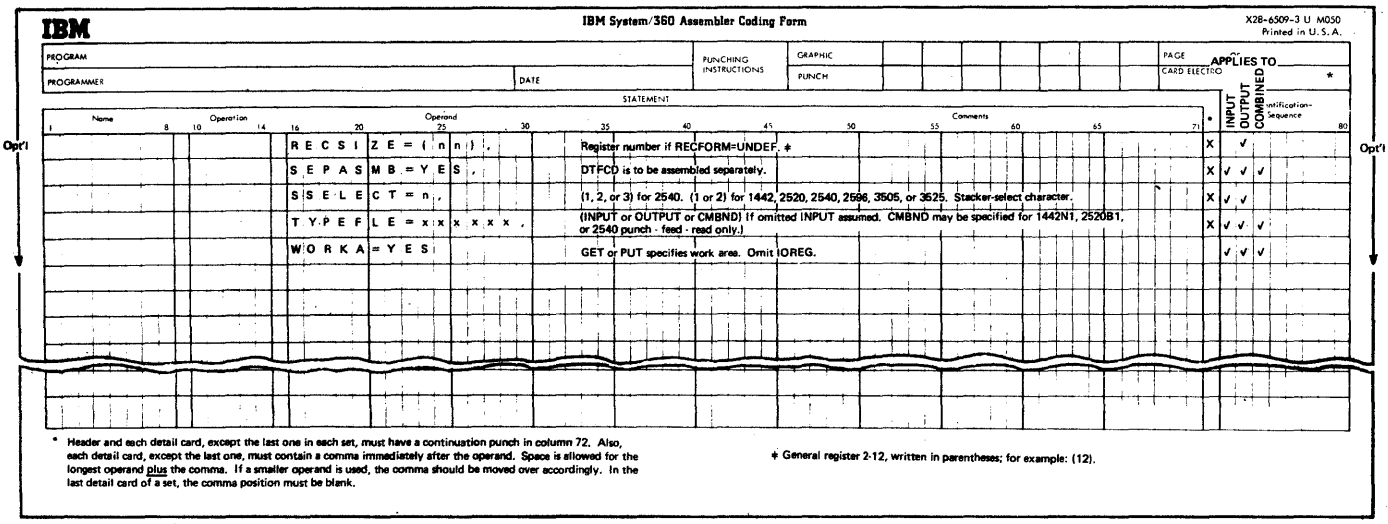


Figure IV.2. DTFCD macro (Part 2 of 2).

```
ERROPT= {IGNORE|SKIP|name}
```

This is a new operand. It specifies the error exit option used for an input or output file on a 3505 or 3525. IGNORE, SKIP, or the symbolic name of an error routine can be specified for input files. For output files only IGNORE can be specified.

IGNORE — Whenever an error condition occurs, the error is ignored. The address of the error record is placed in register 1, and a bit in the CCB is set on. You can retrieve the record address from register 1 for further error processing. You can also check the CCB bit and take the action required to recover from the error. ERROPT=IGNORE is not valid for output files using the operands IOAREA2 and/or WORKA.

SKIP — No records in the error block are made available for processing. The record following the record in error is read and processing continues.

name — IOCS branches to the routine with this name, in which you perform whatever functions you desire to process or note the error conditions. Register 1 contains the address of the record in error; register 14 contains the return address.

A read operation in an error routine may not be performed by means of a GET macro instruction. Register 14 should be saved if any other IOCS macro instructions are used in the error routine. When RDONLY=YES is specified, register 13 must also be saved. To continue normal processing at the end of the error routine, you must return to the IOCS routine by branching to the address in register 14.

```
FUNC={I|R|P|RP|RW|RPW|PW}
```

This is a new operand. It specifies the type of file to be processed by the 3525. The valid entries are I (interpret), R (read), P (punch), RP (read/punch), RW (read/print), RPW (read/punch/print), and PW (punch/print). RP, RW, RPW, and PW are used, with the ASOCFLE operand, to specify associated files. When RP, RW, RPW, or PW is specified for an input or output associated file, it must also be specified for a corresponding output or input associated file in another DTFCD or in a DTFPR. RP, RW, RPW, and PW associated files can have one I/O area only. SYSIN and SYSPCH are invalid for associated files.

Note: Associated files allow you to perform more than one operation on cards during the execution of a job. Each operation requires a separate DTF.

```
IOAREA2=xxxxxxxx
```

This operand is not valid when associated files (FUNC=RP,RPW,RW,PW) are specified for the 3525 Card Punch.

```
MODE={[E] [O]}
     {[C] [R]}
```

This is a new operand. It specifies the mode used to process an input or output file for a 3505 or 3525.

E = normal punch mode
C = column binary mode
O = optical mark read mode
R = read column eliminate mode.

Valid entries are E, C, O, R, ER, EO, CO, and CR. O can be specified for the 3505 only; O,R, and C are not supported for SYSIN. O and R cannot be specified for output files. If the MODE operand is omitted, E is assumed; if only O or R is specified, EO or ER is assumed.

If O or R is specified, a format descriptor card defining the card column to be read or eliminated must be provided. This descriptor card must be the first card in the data file. An 80-byte record which relates column-by-column to the specified format is built when this descriptor record is found. If no format descriptor record is found, a message is issued to the operator and the job is terminated.

```
RECFORM={FIXUNB|VARUNB|UNDEF}
```

If TYPEFLE=COMBND or FUNC=I, this operand must be FIXUNB.

```
SSELECT=n
```

When this operand is used with a device other than a 1442 or 2596, the program ignores CONTROL=YES with input files.

CARD MODULE (CDMOD)

Following is a summary of the operands that have been changed for DOS Version 4.

```
┌-----------------------------------------┐
|  CONTROL=YES                            |
└-----------------------------------------┘
```

This operand is not valid for input files that are used with RP or RPW associated files.

```
┌-----------------------------------------┐
|  DEVICE={1442|2501|2520|2540|2596|3505| |
|         3525}                           |
└-----------------------------------------┘
```

Include this operand to specify the I/O device used by the module.

```
┌-----------------------------------------┐
|  FUNC={I|R|P|RP|RW|RPW|PW}               |
└-----------------------------------------┘
```

This is a new operand. It specifies the type of file to be processed by the 3525.

```
┌-----------------------------------------┐
|  IOAREA2=YES                            |
└-----------------------------------------┘
```

Include this operand if a second I/O area is used. This operand is not valid for associated files.

```
┌-----------------------------------------┐
|  RECFORM={FIXUNB|VARUNB|UNDEF}          |
└-----------------------------------------┘
```

Specifies the record format. For INPUT, COMBND, and PUNCH INTERPRET files, only FIXUNB should be specified.

Recommended Module Names for CDMOD

This section replaces the "Recommended Module Names for CDMOD" section in the base publication.

Each name begins with a 3-character prefix (IJC) and consists of a 5-character field corresponding to the options permitted in the generation of the module.

CDMOD name = IJCabcde

a = F RECFORM=FIXUNB (always for INPUT, CMBND, and PUNCH INTERPRET files)
  = V RECFORM=VARUNB
  = U RECFORM=UNDEF

b = A CTLCHR=ASA (not specified if CMBND)
  = Y CTLCHR=YES
  = C CONTROL=YES
  = Z CTLCHR or CONTROL not specified

c = B RDONLY=YES and TYPEFLE=CMBND
  = C TYPEFLE=CMBND
  = H RDONLY=YES and TYPEFLE=INPUT
  = I TYPEFLE=INPUT
  = N RDONLY=YES and TYPEFLE=OUTPUT
  = O TYPEFLE=OUTPUT

d = Z WORKA and IOAREA2 not specified
  = W WORKA=YES
  = I IOAREA2=YES
  = B WORKA and IOAREA2
  = Z WORKA=YES not specified (CMBND files only)

e = 0 DEVICE=2540
  = 1 DEVICE=1442 or 2596
  = 2 DEVICE=2520
  = 3 DEVICE=2501
  = 4 DEVICE=2540 and CRDERR
  = 5 DEVICE=2520 and CRDERR
  = 6 DEVICE=3505
  = 7 DEVICE=3525 and FUNC=R, FUNC=P, or FUNC omitted
  = A DEVICE=3525 and FUNC=RP
  = B DEVICE=3525 and FUNC=RW
  = C DEVICE=3525 and FUNC=PW
  = D DEVICE=3525 and FUNC=I
  = E DEVICE=3525 and FUNC=RPW

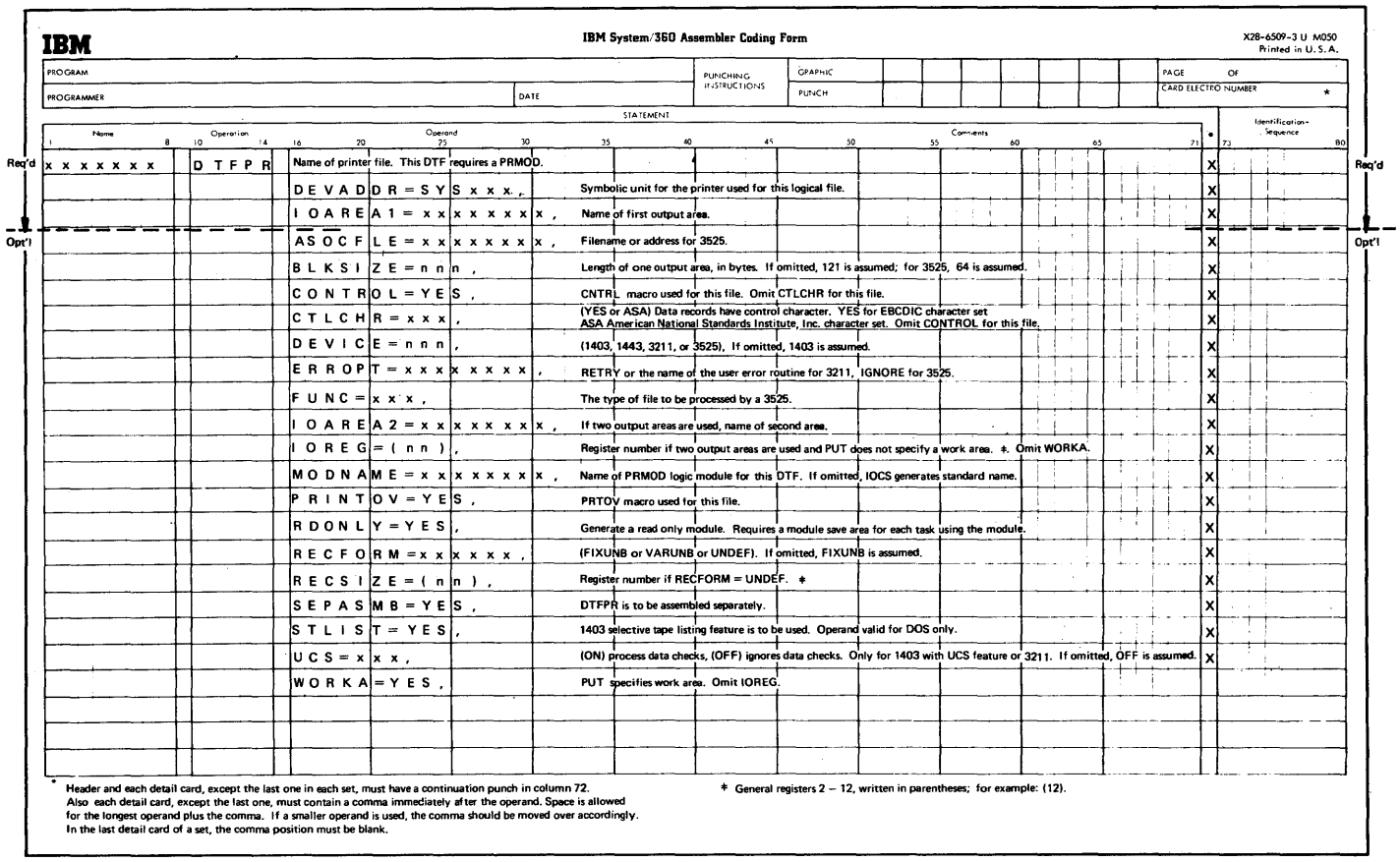
Subset/Superset CDMOD Names

The following figure replaces the equivalent figure in the base publication. It shows the subsetting and supersetting allowed for CDMOD names.

			*	*	*	*	*	
I	J	C	F	A	B	B	0	
			V	Y	C	I	1	
			U	+	H	W	2	
				C	I	Z	3	
				Z	N		4	
					O		5	
							6	
							7	
							A	
							B	
							C	
							D	
							E	

\+ Subsetting/supersetting permitted
* No subsetting/supersetting permitted

Figure IV.3. These are the subset/superset names for CDMOD.



IBM System/360 Assembler Coding Form

X28-6509-3 U M050
Printed in U.S.A.

PROGRAM | PUNCHING INSTRUCTIONS | GRAPHIC | PUNCH | PAGE OF | CARD ELECTRO NUMBER *

PROGRAMMER | DATE

STATEMENT

	Name (1–8)	Operation (10–14)	Operand (16–71)	Comments	* (71)	Identification-Sequence (73–80)
Req'd	x x x x x x x	D T F P R	Name of printer file. This DTF requires a PRMOD.		X	Req'd
		D E V A D D R = S Y S x x x ,		Symbolic unit for the printer used for this logical file.	X	
		I O A R E A 1 = x x x x x x x ,		Name of first output area.	X	
Opt'l		A S O C F L E = x x x x x x x ,		Filename or address for 3525.	X	Opt'l
		B L K S I Z E = n n n ,		Length of one output area, in bytes. If omitted, 121 is assumed; for 3525, 64 is assumed.	X	
		C O N T R O L = Y E S ,		CNTRL macro used for this file. Omit CTLCHR for this file.	X	
		C T L C H R = x x x ,		(YES or ASA) Data records have control character. YES for EBCDIC character set ASA American National Standards Institute, Inc. character set. Omit CONTROL for this file.	X	
		D E V I C E = n n n ,		(1403, 1443, 3211, or 3525). If omitted, 1403 is assumed.	X	
		E R R O P T = x x x x x x x x ,		RETRY or the name of the user error routine for 3211, IGNORE for 3525.	X	
		F U N C = x x x ,		The type of file to be processed by a 3525.	X	
		I O A R E A 2 = x x x x x x x x ,		If two output areas are used, name of second area.	X	
		I O R E G = (n n) ,		Register number if two output areas are used and PUT does not specify a work area. *. Omit WORKA.	X	
		M O D N A M E = x x x x x x x x ,		Name of PRMOD logic module for this DTF. If omitted, IOCS generates standard name.	X	
		P R I N T O V = Y E S ,		PRTOV macro used for this file.	X	
		R D O N L Y = Y E S ,		Generate a read only module. Requires a module save area for each task using the module.	X	
		R E C F O R M = x x x x x x ,		(FIXUNB or VARUNB or UNDEF). If omitted, FIXUNB is assumed.	X	
		R E C S I Z E = (n n) ,		Register number if RECFORM = UNDEF. *	X	
		S E P A S M B = Y E S ,		DTFPR is to be assembled separately.	X	
		S T L I S T = Y E S ,		1403 selective tape listing feature is to be used. Operand valid for DOS only.	X	
		U C S = x x x ,		(ON) process data checks, (OFF) ignores data checks. Only for 1403 with UCS feature or 3211. If omitted, OFF is assumed.	X	
		W O R K A = Y E S ,		PUT specifies work area. Omit IOREG.		

* Header and each detail card, except the last one in each set, must have a continuation punch in column 72. Also each detail card, except the last one, must contain a comma immediately after the operand. Space is allowed for the longest operand plus the comma. If a smaller operand is used, the comma should be moved over accordingly. In the last detail card of a set, the comma position must be blank.

* General registers 2 – 12, written in parentheses; for example: (12).

Figure IV.4. DTFPR macro.

PRINTER FILE (DTFPR)

The DTFPR macro instruction defines sequential processing for files whose output is a printer device.

Figure IV.4 lists all the keyword operands that are contained in the operand field. The following discussion addresses only those operands that have been changed or added for DOS Version 4.

```
┌──────────────────────────────────────────┐
│ ASOCFLE=filename                         │
└──────────────────────────────────────────┘
```

This is a new operand. It specifies the filename or address of associated read, punch, and print files. It thus enables macro sequence checking by the logic module of each associated file. ASOCFLE must be used with the FUNC operand to define associated files. One filename or address is required per DTF for associated files. Figure IV.5 defines the filename specified by the ASOCFLE parameter for each DTF file type.

FUNC=	DTF TYPE		
	READ(R)	PUNCH(P)	PRINT(W)
RP	Punch file	Read file	
RW	Print file		Read file
PW		Print file	Punch file
RPW	Punch file	Print file	Read file

Figure IV.5. Relationship of associated files.

```
BLKSIZE={nnn|64|121}
```

This operand specifies the length of IOAREA1. If this entry is omitted, 121 is assumed for all devices except 3525. For the 3525, 64 is assumed.

```
CTLCHR={YES|ASA}
```

If CTLCHR=ASA is specified for the 3525, the + character is not allowed as first character control. For 3525 print-only files using CTLCHR=ASA, you must issue either a space 1 or skip to channel 1 command to print on the first line of a card. For 3525 print associated files, you must issue a space 1 command to print on the first line of a card. A skip to channel 1 is diagnosed for associated print files.

```
DEVADDR={SYSLOG|SYSLST|SYSnnn}
```

This operand specifies the symbolic unit to be associated with the printer. SYSLST and SYSLOG are not valid for the 3525.

```
DEVICE={1403|1404|1443|1445|3211|3525}
```

This operand specifies the device that is used for the file.

```
ERROPT={RETRY|IGNORE|name}
```

If RETRY is specified and an equipment check with command retry is encountered, the command is retried once. If retry is unsuccessful, an information message is issued and the job is canceled.

If you have specified the name of your own error routine and an equipment check with command retry occurs, the command is retried once. If the retry is unsuccessful, an information message is issued and the job is canceled. When certain other errors are encountered, an information message is issued, error information is posted in the CCB, and control is given to your error routine. If any IOCS macros are used in this routine, the contents of register 14 must be saved and restored, and also the contents of register 13 if RDONLY=YES has been specified in the DTF.

Note: If ERROPT=RETRY or ERROPT=name is specified, then DEVICE=3211 must also be specified; DEVICE=3525 must be specified if ERROPT=IGNORE.

```
FUNC={W[T]|RW[T]|RPW[T]|PW[T]}
```

This is a new operand. It specifies the type of file to be processed using a 3525. The optional parameter T specifies a 2-line printer. RW[T], RPW[T], and PW[T] are used, with the ASOCFLE operand, to specify associated files.

When RP[T], RPW[T], or PW[T] is specified for a printer file, RW, RPW, or PW must also be specified for a corresponding associated file. If the optional T parameter is not specified, multiline printing is assumed. If CTLCHR or CONTROL is specified, the T parameter is ignored.

Note: Associated files allow you to perform more than one operation on cards during the execution of a job. Each individual operation requires a separate DTF.

PRINTER MODULE (PRMOD)

Following is a summary of the operands that have been changed for DOS Version 4.

```
CTLCHR={YES|ASA}
```

Include this operand if first character forms control is used. The + character is not valid for the 3525 when ASA is specified.

```
DEVICE={1403|1404|1443|1445|3211|3525}
```

This operand specifies the device that is used for the file.

```
ERROPT=YES
```

This operand must be specified if ERROPT=name is specified in the DTFPR.

This operand must not be used if ERROPT was not specified or if ERROPT=RETRY or ERROPT=IGNORE was specified in the DTFPR.

```
FUNC={W[T]|RW[T]|RPW[T]|PW[T]}
```

This is a new operand. It specifies the type of file to be processed using a 3525. The optional parameter T specifies a 2-line printer.

Recommended Module Names for DTFPR

This section replaces the "Recommended Module Names for PRMOD" section in the base publication.

Each name consists of a 3-character prefix (IJD) followed by a 5-character field corresponding to the options permitted in the generation of the module.

PRMOD name = IJDabcde

a = F RECFORM=FIXUNB
  = V RECFORM=VARUNB
  = U RECFORM=UNDEF

b = A CTLCHR=ASA
  = Y CTLCHR=YES
  = T DEVICE=3525 and 2-line print support
  = C CONTROL=YES
  = S STLIST=YES
  = Z none of these is specified

c = B ERROPT=YES (ERROPT=name in DTFPR) and PRINTOV=YES
  = P PRINTOV=YES, DEVICE is not a 3525, and ERROPT is not specified (ERROPT=RETRY, ERROPT=IGNORE, or ERROPT is omitted in DTFPR)
  = I PRINTOV=YES, DEVICE=3525, and FUNC=W[T] or FUNC is not specified
  = F PRINTOV=YES, DEVICE=3525, and FUNC=RW[T]
  = C PRINTOV=YES, DEVICE=3525, and FUNC=PW[T]
  = D PRINTOV=YES, DEVICE=3525, and FUNC=RPW[T]
  = Z neither PRINTOV or ERROPT is specified (ERROPT=RETRY, ERROPT=IGNORE, or ERROPT is omitted in DTFPR) and DEVICE is not a 3525
  = O PRINTOV=YES is not specified, DEVICE=3525, and FUNC=W[T] or FUNC is not specified
  = R PRINTOV=YES is not specified, DEVICE=3525, and FUNC=RW[T]
  = S PRINTOV=YES is not specified, DEVICE=3525, and FUNC=PW[T]
  = T PRINTOV=YES is not specified, DEVICE=3525, and FUNC=RPW[T]
  = E ERROPT=YES (ERROPT=name in DTFPR) and PRINTOV=YES is not specified

d = I IOAREA2=YES
  = Z IOAREA2=YES is not specified

e = V RDONLY=YES and WORKA=YES
  = W WORKA=YES
  = Y RDONLY=YES
  = Z neither is specified

Subset/Superset PRMOD Names

Figure IV.6 replaces the corresponding figure in the base publication. It shows the subsetting and supersetting allowed for PRMOD names.

I	J	D	F V U	A Y S T + C Z	P Z + I O + F + C S + D T + B E	I Z	V W Y Z
			*	*	+	*	*

\+ Subsetting/supersetting permitted
* No subsetting/supersetting permitted

Figure IV.6. These are the subset/superset names for PRMOD.

SEQUENTIAL DASD FILES (DTFSD)

The DTFSD macro instruction defines sequential (consecutive) processing for a file contained in a DASD. Only IBM standard label formats are processed. The DTFSD macro instruction can be used with the IBM 2311, 2314/2319, 3330, and 2321.

A DTFSD entry is included for each sequential input or output DASD file that is processed in the program (Figure IV.8). The DTFSD header entry and a series of detail entries describe the file. Symbolic

addresses of routines and areas are specified in the detail entries. Enter the symbolic name of the file in the name field and DTFSD in the operation field. The detail entries can follow in any order. Keyword operands are contained in the operand field.

Following is a description of those operands that have been changed to include the IBM 3330 Disk Storage.

```
BLKSIZE=nnnnn
```

Enter the length nnnnn of the I/O area. If the record format is variable or undefined, enter the length of the I/O area needed for the largest block of records.

When processing spanned records, the length of the define storage statements for the I/O area must be at least as large as the smaller of the values given in Figure IV.7.

Device	Length
2311 Disk Storage Drive	3,625 or BLKSIZE decimal
2314 Direct Access Storage Facility 2319 Disk Storage	7,294 or BLKSIZE decimal
3330 Disk Storage	13,030 or BLKSIZE decimal
2321 Data Cell Drive	2,000 or BLKSIZE decimal
Add 8 for output files decimal	

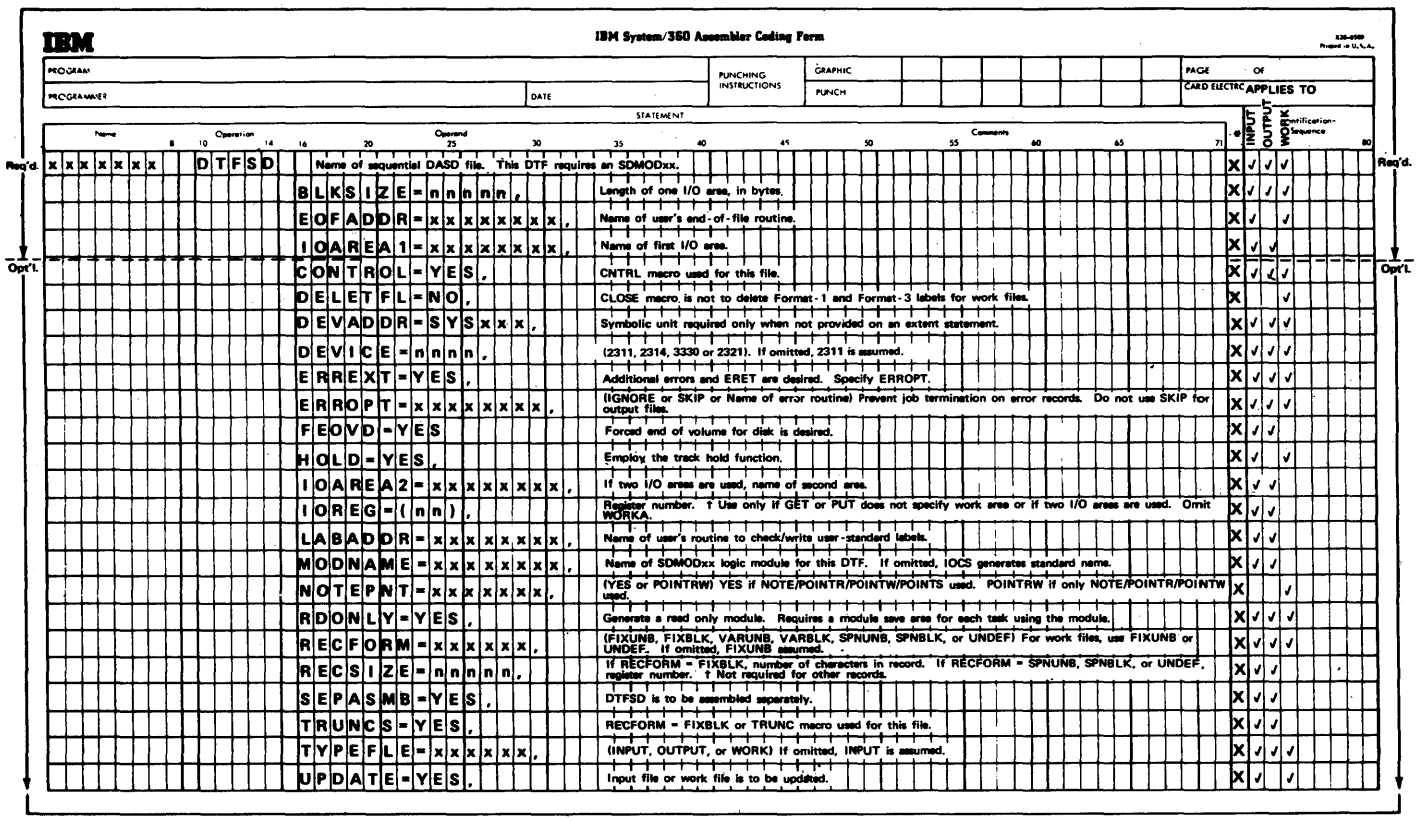
Figure IV.7. Minimum I/O area sizes required for spanned record processing.

```
DEVICE=({2311,2314,3330,2321})
```

This operand is included to specify whether the data file is located on an IBM 2311, 2314/2319, 3330, or 2321. If the location is unspecified, 2311 is assumed.

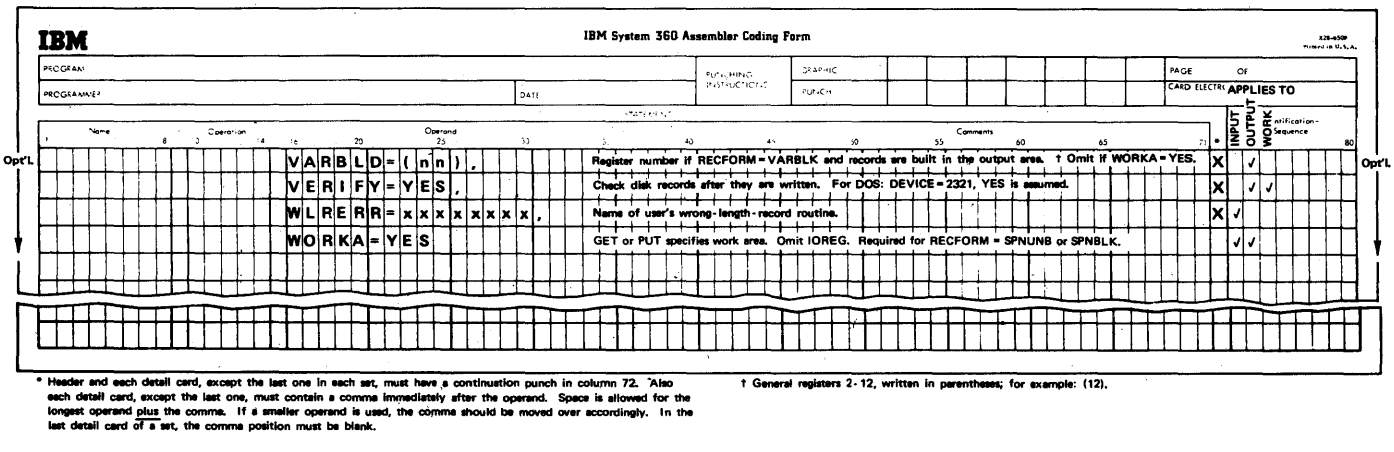
```
IOAREA1=xxxxxxxx
```

This operand specified the symbolic name of the I/O area used by the file. IOCS either reads or writes records using this area. For variable-length and undefined records, this area must be large enough to contain the largest block or record. For output records, the first 8 bytes of IOAREA1 must be allotted for IOCS to construct a count field. When variable-length records are processed, the size of the I/O area must include four bytes for the block size. The I/O area must begin on a halfword boundary.



Name	Operation	Operand	Comments	INPUT	OUTPUT	WORK
Req'd.	xxxxxxx	DTFSD	Name of sequential DASD file. This DTF requires an SDMODxx.	X	✓	✓ ✓
		BLKSIZE=nnnnn,	Length of one I/O area, in bytes.	X	✓	✓ ✓
		EOFADDR=xxxxxxxx,	Name of user's end-of-file routine.	X	✓	✓
		IOAREA1=xxxxxxxx,	Name of first I/O area.	X	✓	✓
Opt'l.		CONTROL=YES,	CNTRL macro used for this file.	X	✓	✓ ✓ Opt'l.
		DELETFL=NO,	CLOSE macro is not to delete Format-1 and Format-3 labels for work files.	X		✓
		DEVADDR=SYSxxx,	Symbolic unit required only when not provided on an extent statement.	X	✓	✓ ✓
		DEVICE=nnnn,	(2311, 2314, 3330 or 2321). If omitted, 2311 is assumed.	X	✓	✓ ✓
		ERREXT=YES,	Additional errors and ERET are desired. Specify ERROPT.	X	✓	✓ ✓
		ERROPT=xxxxxxxx,	(IGNORE or SKIP or Name of error routine) Prevent job termination on error records. Do not use SKIP for output files.	X	✓	✓ ✓
		FEOVD=YES	Forced end of volume for disk is desired.	X	✓	✓
		HOLD=YES,	Employ the track hold function.	X	✓	✓
		IOAREA2=xxxxxxxx,	If two I/O areas are used, name of second area.	X	✓	✓
		IOREG=(nn),	Register number. † Use only if GET or PUT does not specify work area or if two I/O areas are used. Omit WORKA.	X	✓	✓
		LABADDR=xxxxxxxx,	Name of user's routine to check/write user-standard labels.	X	✓	✓
		MODNAME=xxxxxxxx,	Name of SDMODxx logic module for this DTF. If omitted, IOCS generates standard name.	X	✓	✓
		NOTEPNT=xxxxxxx,	(YES or POINTRW) YES if NOTE/POINTR/POINTW/POINTS used. POINTRW if only NOTE/POINTR/POINTW used.	X		✓
		RDONLY=YES,	Generate a read only module. Requires a module save area for each task using the module.	X	✓	✓ ✓
		RECFORM=xxxxxx,	(FIXUNB, FIXBLK, VARUNB, VARBLK, SPNUNB, SPNBLK, or UNDEF) For work files, use FIXUNB or UNDEF. If omitted, FIXUNB assumed.	X	✓	✓ ✓
		RECSIZE=nnnnn,	If RECFORM = FIXBLK, number of characters in record. If RECFORM = SPNUNB, SPNBLK, or UNDEF, register number. † Not required for other records.	X	✓	✓
		SEPASMB=YES,	DTFSD is to be assembled separately.	X	✓	✓
		TRUNCS=YES,	RECFORM = FIXBLK or TRUNC macro used for this file.	X	✓	✓
		TYPEFLE=xxxxxx,	(INPUT, OUTPUT, or WORK) If omitted, INPUT is assumed.	X	✓	✓ ✓
		UPDATE=YES,	Input file or work file is to be updated.	X	✓	✓

Figure IV.8. DTFSD macro (Part 1 of 2).



Name	Operation	Operand	Comments	INPUT	OUTPUT	WORK
Opt'L		VARBLD=(nn),	Register number if RECFORM=VARBLK and records are built in the output area. † Omit if WORKA=YES.	X		✓ Opt'L.
		VERIFY=YES,	Check disk records after they are written. For DOS: DEVICE=2321, YES is assumed.	X		✓ ✓
		WLRERR=xxxxxxxx,	Name of user's wrong-length-record routine.	X	✓	
		WORKA=YES	GET or PUT specifies work area. Omit IOREG. Required for RECFORM = SPNUNB or SPNBLK.		✓	✓

* Header and each detail card, except the last one in each set, must have a continuation punch in column 72. Also each detail card, except the last one, must contain a comma immediately after the operand. Space is allowed for the longest operand plus the comma. If a smaller operand is used, the comma should be moved over accordingly. In the last detail card of a set, the comma position must be blank.

† General registers 2-12, written in parentheses; for example: (12).

Figure IV.8. DTFSD macro (Part 2 of 2).

4.12 DOS Version 4 Supervisor and I/O Macros

Imperative Macro Instructions

INITIALIZATION MACROS

OPEN(R) Macro

The OPENR macro has not been changed for DOS Version 4; the following considerations have been added for the OPEN(R) macro, however.

If the optical mark read mode or read column eliminate mode has been specified for a 3505 Card Reader (MODE=0 or MODE=R), or if MODE=R has been specified for a 3525 Card Punch, OPEN retrieves the data from the first data card and analyzes this data to verify the presence of a format descriptor card. If such a card is found, an 80-byte record corresponding to the format descriptor record is built. If no format descriptor card is found, a message is issued and the job is canceled.

For a 3525 print-only file, OPEN feeds the first card to ensure that a card is in the print station. For 3525 associated files, all files must be open before a GET or PUT is issued.

PUT Macro

The following new considerations apply to the PUT macro as of DOS Version 4.

For a 3525 with a 2-line printer, the output is automatically printed on lines 1 and 3. Automatic line positioning is used for a print-only file on a 2-line printer, the one PUT macro causes line 3 to be printed and the other PUT causes a new card to be fed and the printing of line 1 to be started. When automatic line positioning is used for a 3525 print-only file with a multiline printer, card feeding is caused by the PUT macro that follows the PUT causing the printing of line 25. This PUT macro also starts the printing of line 1 on the next card. If you want to control line positioning, either the CONTROL or the CTLCHR parameter must be specified in the DTF macro instruction. (When a printer file is used with a read or punch file as an associated file, the DTFPR may not contain CONTROL or CTLCHR operands for card feeding.) In such a case you are responsible for all spacing and skipping during printing. If CTLCHR=YES is specified, you are also responsible for card feeding.

The following restrictions apply to user-controlled line positioning:

1. Any attempt to print on lines other than 1 and 3 on a 2-line printer results in a command reject. Otherwise, 2-line printer support is identical to multiline printer support.
2. A print-and-space command for line 25 results in positioning on line 1 of the next card.
3. Any attempt to print and suppress spacing results in a command reject.
4. Any skip command to a channel number smaller than or equal to the present channel position results in a skip to that channel position on the next card.
5. If CONTROL or CTLCHR is specified, FUNC=nnnT is ignored for 2-line printer support.

Updating

A sequential file on 2311, 2314/2319, 3330, or 2321 DASD, a card input file on a 1442, 2520, or 3525, or a card file on the punch feed of a 2540 equipped with the punch-feed-read special feature can be updated. That is, each DASD or card record can be read, processed, and transferred back to the same disk location or card from which it was read. In the case of a card file, the file must be specified as a combined file (CMBND) in the TYPEFLE entry. On a 3525 this function may be performed through the use of associated files.

ASSOCIATED FILES: For a 3525 using RP or RPW associated files, the GET/PUT sequence must be maintained for normal processing. Each GET must be followed by a PUT which punches the card. (If there is no additional information, blanks are punched.) If multiple GET instructions (without intervening PUT instructions) or multiple PUT instructions (without intervening GET instructions) are issued to the punch file, the job is abnormally terminated due to a sequence error in a macro instruction.

If printing is required, a PUT to the printer file must follow a PUT which is used to punch the card. If printing is not required, a GET can be issued following the punch operation.

Note: If CTLCHR=ASA is used for a 3525 print only file, you must issue either a

space 1 or skip to channel 1 command to print on the first line of the card. For a 3525 associated print file, you must issue a space 1 command to print on the first line; a skip to channel 1 command is diagnosed for associated print files.

2596 Card Read Punch Codes for the CNTRL Macro

Cards fed into the 2596 are normally directed to the stacker specified in the SSELECT parameter of the DTF. If SSELECT is omitted, cards are fed into stacker 1 on read and into stacker 3 on punch operations. The CNTRL macro can be used to override the selected pocket temporarily. The possible selections are:

FEED	STACKER	VALUE OF n1 OR SSELECT PARAMETER
Read	1	1
Read	2	2
Punch	3	1
Punch	4	2

Figure IV.9. Valid 2596 CNTRL specifications.

Input File: CNTRL can only be used if one I/O area, with or without a work area, is specified for the file. The CNTRL instruction must be issued after the GET for a card if that card is to be placed in a particular stacker.

Output File: CNTRL can be used with any permissible combination of I/O areas and work areas. The CNTRL instruction must be issued before the PUT to a card if that card is to be placed in a specific stacker.

3505 Card Reader and 3525 Card Punch Codes for the CNTRL Macro

Stacker selection for the 3505 and 3525 can be specified by either the SSELECT or CONTROL=YES parameters of the DTF. For output records on a 3525, the CTLCHR parameter of the DTF can also be used. If no stacker selection is specified, stacker 1 is selected.

If CONTROL=YES is specified in the DTF, either stacker 1 or stacker 2 must be specified in the CNTRL macro instruction. For input files CNTRL can be used only if one I/O area is specified for the file.

3525 Card Printing Codes for the CNTRL Macro

Spacing and skipping to a specific line on a card for the 3525 card print feature can be controlled by the CNTRL macro instruction. The SP parameter is used to direct the 3525 to space one, two, or three lines on a card and the SK parameter is used to skip to a channel (1-12) on a card.

The 3525 print channels are identified with specific rows on a printed card. The channels and their corresponding rows are shown in Figure IV.10.

LINE NUMBER	CHANNEL NUMBER	
1	1	
2		
3	2	
4		
5	3	
6		
7	4	
8		
9	5	
10		
11	6	
12		
13	7	
14		
15	8	
16		
17	9	(overflow)
18		
19	10	
20		
21	11	
22		
23	12	(overflow)
24		
25		

Figure IV.10. 3525 channels.

Note: If CTLCHR=ASA is used for a 3525 print only file, you must issue either a space 1 or skip to channel 1 command to print on the first line of the card. For a 3525 associated print file, you must issue a space 1 command to print on the first line: a skip to channel 1 command is diagnosed for associated print files.

PRTOV Macro

The following new considerations apply to the 3525 Card Punch with print feature.

A channel 9 test on a 3525 indicates print line 17. A channel 12 test indicates print line 23. An overflow condition from either of these channels causes:

1. A transfer of control to the overflow routine specified in the PRTOV macro instruction, or
2. A skip to channel one to begin printing on the next card for print only files.

When the PRTOV macro instructions is used for a 2-line printer, the result of the test is always negative because lines 17 and 23 are not available.

Note: PRTOV without the routine name option is invalid for associated files. A skip to channel one is valid only for print only files. For associated files this command is diagnosed.

CLOSE(R) Macro

The following new considerations apply to the support of the 3505 Card Reader and the 3525 Card Punch.

The 3525 has a print station between the punch station and the stackers. This results in a unique card path. To prevent the loss of data in a batched job environment, the following rules for card movement must be obeyed when a CLOSE(R) macro is issued for a 3525 file.

- All associated files must be closed without intervening I/O operations to any of these files.
- If one of the files is reopened, all associated files must be recovered.
- If an I/O operation is issued and the associated files are not opened, the job is abnormally terminated due to a macro instruction sequence error.
- If programs using RCE are executed as batched jobs, a non-data card must follow the card that causes the program to close files.

Figure IV.11 shows the card movement for 3525 when a CLOSE(R) macro instruction is issued.

FILE TYPE	FEED CAUSED BY CLOSE OF:
Read	Read*
Punch	Punch
Print	Print
Read/Print	Print*
Read/punch/print	Print**
Read/Punch	Punch**
Punch/Print	Print
Punch/Interpret	Punch

* A card feed is executed only if RCE has been specified on the READ file. Problem programs using RCE must detect an end-of-file condition themselves.

** Delimiter cards cannot be punched or printed in these files. CLOSE(R) always issues a feed command.

Figure IV.11. Card movement for the 3525 on a CLOSE(R).

If RCE is specified for the 3505 or 3525, or if OMR is specified for the 3505, the data format specified remains in effect until the CLOSE(R) routine resets the device to normal mode or until a unit exception occurs, in which case the device resets itself to normal mode. If programs using RCE or OMR on the 3505 are executed as batched jobs, a nondata card must follow the card that causes the file to be closed.

Sequential Processing Macros

WORK FILE MACROS FOR TAPE AND DISK

WRITE Macro

Name	Operation	Operand
[name]	WRITE	{filename / (1)}, {SQ / UPDATE}, {area / (0)} [, {length / (r)}]

The function of the WRITE macro has not been changed. However, an end-of-file record is only written if a CLOSE immediately follows a WRITE SQ.

NOTE Macro

Name	Operation	Operand
[name]	NOTE	{filename (1)}

The function of the NOTE macro has not changed. However, to be able to handle the extended address of the 3330, the identification returned in register 1 is in the form cchr,where

- cc = cylinder number,
- h = track number,
- r = record number within the track.

POINTR Macro

Name	Operation	Operand
[name]	POINTR	{filename (1)},{address (0)}

The function of the POINTR macro has not changed. However, the four- or six-byte number must now be supplied in the form cchr or cchrnn, where nn is the length remaining on the track.

POINTW Macro

Name	Operation	Operand
[name]	PCINTW	{filename (1)},{address (0)}

The function of the PCINTW macro has not changed. However, the four- or six-byte number must now be supplied in the form cchr or cchrnn, where nn is the length remaining on the track.

COMPLETION MACROS

FEOVD Macro

Name	Operation	Operand
[name]	FEOVD	{filename (r)}

The function of the FEOVD macro has not changed. Note, however, that when a file is created using the FEOVD macro and has been processed as an input file, FEOVD=YES must be specified, even if the FEOVD macro is not used for the input file.

CLOSE(R) Macro

Operation	Operand
CLOSE(R)	{filename (r1)} [,{filename2 (r2)} ... {, filenamen (rn)}]

Note that the CLOSER macro may only be used to close a file if that file has been opened previously.

The filename address may only be preloaded in registers 2-15 for CLOSER and 0 and 2-15 for CLOSE.

Record Types

REFERENCE METHODS

Track Reference

To provide IOCS with the track reference, you set up a track reference field in main storage, assign a symbolic name in the DTFDA entry SEEKADR, and determine by DTFDA operand specifications which type of addressing system to use. When a READ or WRITE is executed, IOCS refers to this field to select the specific track on the appropriate device.

The format of the track reference field is mbbcchhr. The values that may be specified for the 3330 are, in hexadecimal:

m - 00-FF
bb - 0000
cc - 0000-0193
hh - 0000-0012
r - 00-FF

Direct Access Macros

DIRECT ACCESS FILE (DTFDA)

The DTFDA detail entries that apply to a file when records are processed by the Direct Access Method are shown in Figure IV.12.

Enter the symbolic name of the file in the name field and DTFDA in the operation field of the macro instruction.

Only the following operand has been changed to include the 3330.

```
DEVICE={2311,2314,3330,2321}
```

This operand specifies whether the logical file is on a 2311, 2314/2319, 3330 or 2321. If this entry is omitted, 2311 is assumed.

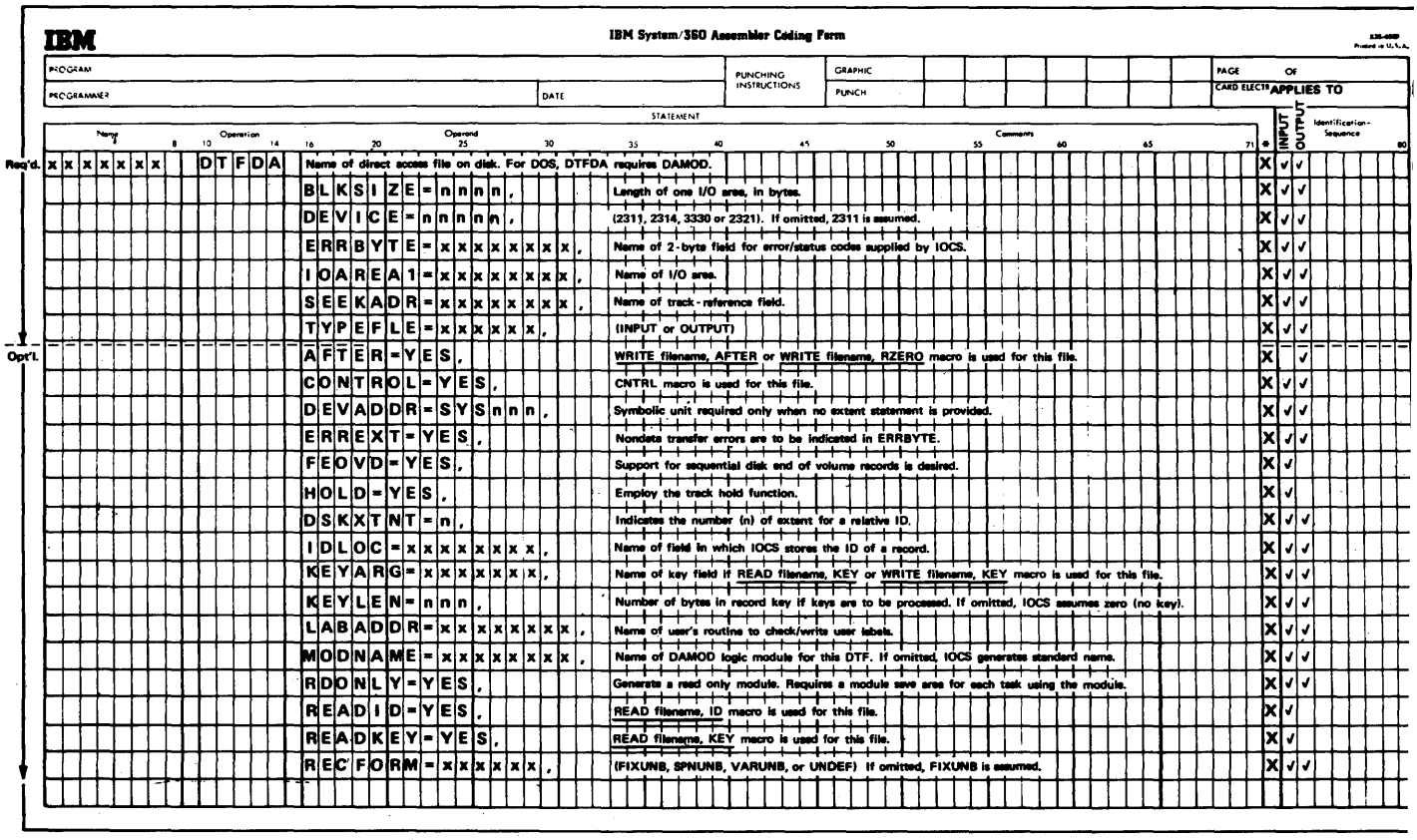
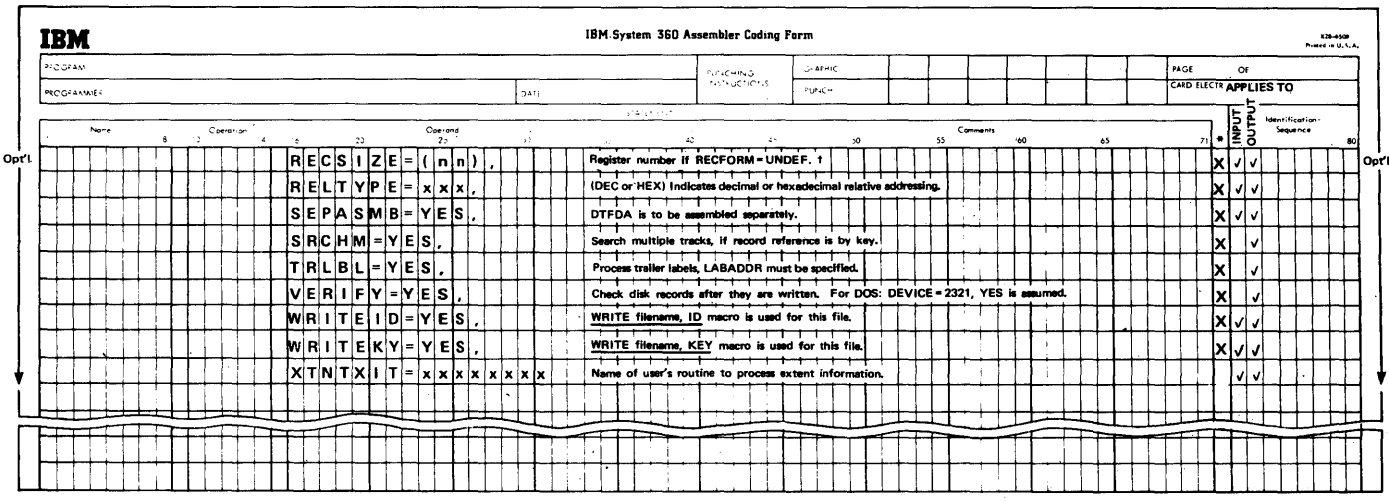


Figure IV.12. DTFDA macro (Part 1 of 2).



* Header and each detail card, except the last one in each set, must have a continuation punch in column 72. Also each detail card, except the last one, must contain a comma immediately after the operand. Space is allowed for the longest operand plus the comma. If a smaller operand is used, the comma should be moved over accordingly. In the last detail card of a set, the comma position must be blank.

† General registers 2-12, written in parentheses; for example: (12).

Figure IV.12. DTFDA macro (Part 2 of 2).

4.18 DOS Version 4 Supervisor and I/O Macros

Indexed Sequential Macros

INDEXED SEQUENTIAL FILE (DTFIS)

Figure IV.13 summarizes the DTFIS detail entries that apply to a file when records are processed by the indexed sequential access method.

Following is a description of those operands that have been changed to include the IBM 3330 Disk Storage.

```
CYLOFL=nn
```

This operand specifies the number nn of tracks to be reserved on each cylinder.

The maximum number of tracks that can be reserved on each cylinder is 8 for 2311, 18 for 2314, and 17 for 3330.

```
DEVICE={2311,2314,3330,2321}
```

This operand specifies the device that contains the prime data or overflow areas for the logical file. If this operand is omitted, 2311 is assumed.

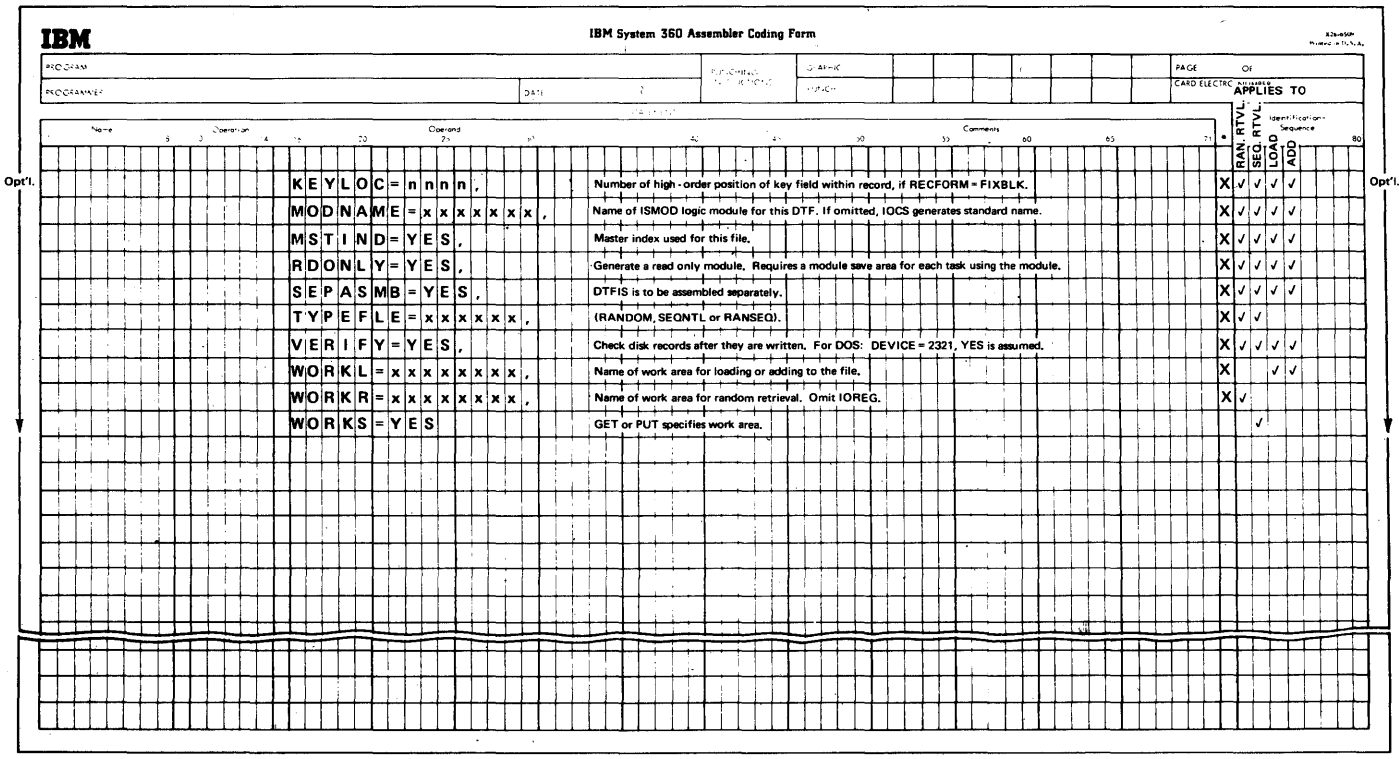
```
HINDEX={2311,2314,3330,2321}
```

This operand specifies the device containing the highest index. If omitted, 2311 is assumed.

IBM System 360 Assembler Coding Form

Name	Operation	Operand	Comments	RAN. RTVL	SEQ. RTVL	LOAD	ADD
q'd. xxxxxxx	DTFIS		Name of indexed sequential file on disk, 7 characters or less. DTFIS requires ISMOD.	X	✓	✓	✓	✓	Req'd.
		DSKXTNT=n,	Maximum number of extents specified for this file.	X	✓	✓	✓	✓	
		IOROUT=xxxxxx,	(LOAD, ADD, RETRVE, or ADDRTR)	X	✓	✓	✓	✓	
		KEYLEN=nnn,	Number of bytes in record key (maximum is 255 for DOS).	X	✓	✓	✓	✓	
		NRECDS=nnn,	Number of records in a block. For DOS, required for blocked records only; if unblocked, 1 is assumed.	X	✓	✓	✓	✓	
		RECFORM=xxxxxx,	(FIXUNB or FIXBLK)	X	✓	✓	✓	✓	
		RECSIZE=nnnnn,	Number of characters in a logical record.	X	✓	✓	✓	✓	
Opt'l.		CYLOFL=nn,	Number of tracks for each cylinder overflow area. Maximum = 8 for 2311, 18 for 2314, 17 for 3330, or 18 for 2321.	X	✓	✓	✓	✓	Opt'l.
		DEVICE=nnnn,	(2311, 2314, 3330, or 2321). If omitted, 2311 is assumed.	X	✓	✓	✓	✓	
		ERREXT=YES,	Nondata transfer error returns and ERET desired.	X	✓	✓	✓	✓	
		HINDEX=nnnn,	(2311, 2314, 3330, or 2321). Unit containing highest level index. If omitted, 2311 is assumed.	X	✓	✓	✓	✓	
		HOLD=YES,	Track hold function is desired.	X	✓	✓		✓	
		INDAREA=xxxxxxxx,	Symbolic name of cylinder index area.	X	✓			✓	
		INDSKIP=YES,	Index skip feature is to be used.	X	✓			✓	
		INDSIZE=nnnnnn,	Number of bytes required for the cylinder index area.	X	✓			✓	
		IOAREAL=xxxxxxxx,	Name of I/O area.	X			✓	✓	
		IOAREAR=xxxxxxxx,		X	✓				
		IOAREAS=xxxxxxxx,		X		✓			
		IOAREA2=xxxxxxxx,	Name of second I/O area.	X		✓	✓		
		IOREG=(nn),	Register number. †Omit if WORKR or WORKS is specified for DOS.	X	✓	✓			
		IOSIZE=nnnnnn,	Bytes alloted to IOAREAL.	X				✓	
		KEYARG=xxxxxxxx,	Name of key field in main storage, for random retrieval or sequential retrieval starting by key.	X	✓	✓			

Figure IV.13. DTFIS macro (Part 1 of 2).



* Header and each detail card, except the last one in each set, must have a continuation punch in column 72. Also, each detail card, except the last one, must contain a comma immediately after the operand. Space is allowed for the longest operand plus the comma. If a smaller operand is used, the comma should be moved over accordingly. In the last detail card of a set, the comma position must be blank.

† General registers 2-12, written in parentheses; for example: (12).

Figure IV.13. DTFIS macro (Part 2 of 2).

INITIALIZATION - OPEN(R) MACRO

Operation	Operand
OPEN(R)	{filename1 / (r1)} [,{filename2 / (r2)} ... {, filenamen / (rn)}]

The functions of the OPEN(R) macro have not been changed. However, when a file is loaded, or when an ADD or ADDRTR operation is performed through the use of indexed sequential output processing, the volumes of the file to be written on are opened as output files. That means that you must make sure that you supply the same file ID in the DLBL statement for ADD and ADDRTR operations as the one supplied when the file was initially loaded. If the file ID is conflicting, the open routines will delete unexpired files through the usual procedure. If the correct file ID is supplied, the Format 1 label for the expired file is updated with a new expiration date or with a seven days' retention period if no new expiration date has been supplied. If the file consists of more than one volume, all the volumes must be on-line and ready when the file is first opened.

Note that the filename address may be preloaded only in registers 2-15 for OPENR and 0 and 2-15 for OPEN.

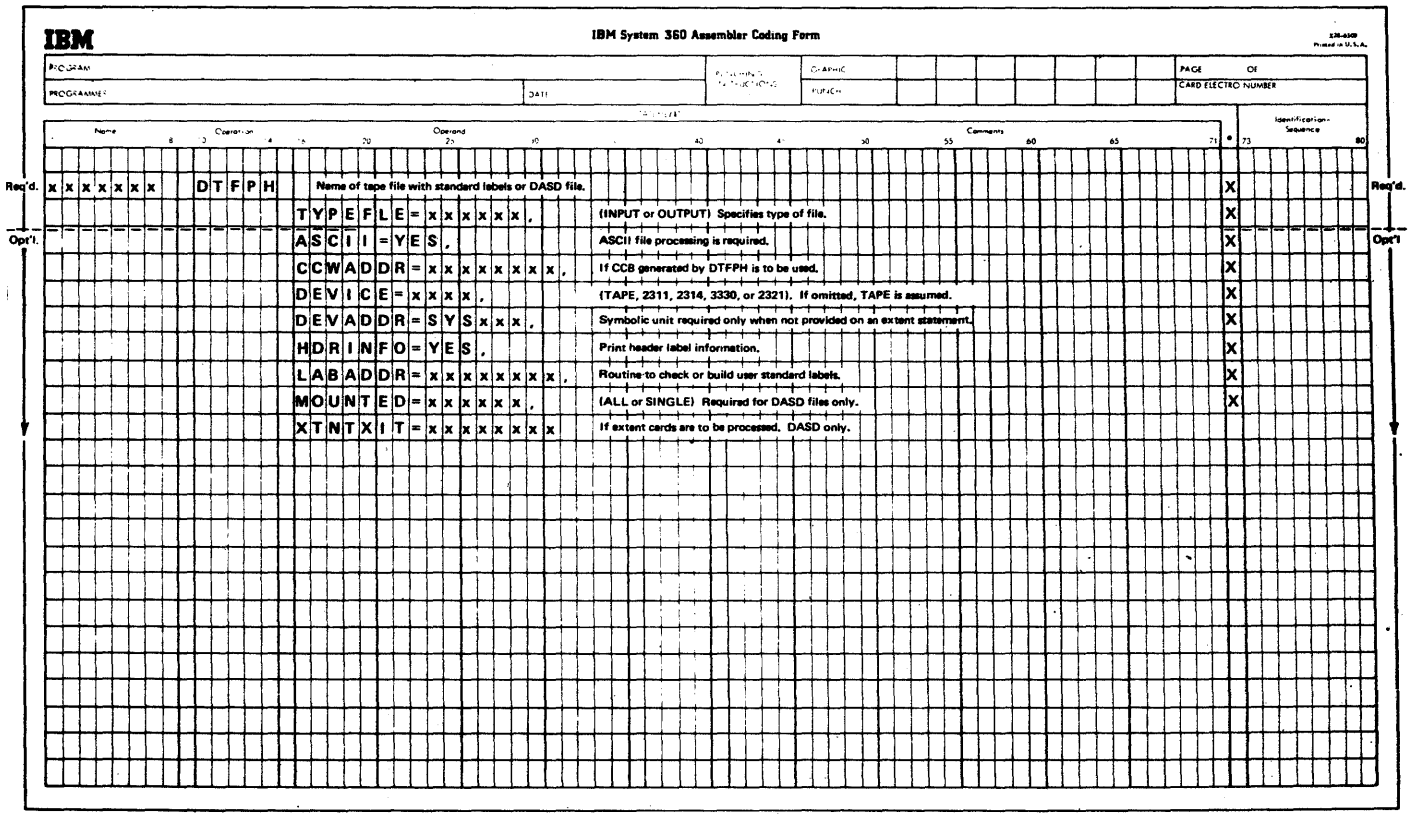
DTFPH Macro

When physical IOCS macro instructions (EXCP, WAIT, etc.) are used in a program, DASD or tape files with standard labels need to be defined by DTFPH entries (DTF for a file handled by physical IOCS). DTFPH must also be used for a checkpoint file on a 2311, 2314/2319, or 3330.

The following operand has been changed to allow for the use of a 3330 Disk Storage.

```
DEVICE={TAPE,2311,2314,3330,2321}
```

If the file is contained on disk or data cell, enter the proper identification: 2311, 2314, 3330, or 2321; TAPE applies to any 2400/3400-series tape unit.



* Header and each detail card, except the last one in each set, must have a continuation punch in column 72. Also, each detail card, except the last one, must contain a comma immediately after the operand. Space is allowed for the longest operand plus the comma. If a smaller operand is used, the comma should be moved over accordingly. In the last detail card of a set, the comma position must be blank.

† General registers 2-12, written in parentheses; for example: (12).

Figure IV.14. DTFPH macro.

Supervisor-communication Macros

Time-of-Day Macro

GETIME -- GET TIME-OF-DAY IN REGISTER 1

Name	Operation	Operand
[name]	GETIME	STANDARD , LOCAL BINARY GMT TU

The GETIME macro instruction obtains the time-of-day at any time during program execution. STANDARD and LOCAL are assumed if no operands are given.

The job date and system date in the communications region, and the Greenwich date in the communications region extension (bytes 70-78), are updated every time GETIME is issued. However, when the job stream contains a // DATE statement, only the system date in the communications region and the Greenwich date in the communication region extension are updated when GETIME is issued; the job date is not changed.

If STANDARD is specified, the time-of-day is placed in register 1 as a packed decimal number with low-order sign: hhmmss where hh is hours, mm is minutes, and ss is seconds. The time-of-day may be stored, unpacked,or edited.

Note: Conversion routines, some of which are lengthy, are generated (in line) each time STANDARD is used. Therefore, this function should be put into a subroutine if it is used frequently.

If BINARY is specified, the time-of-day is returned in register 1 as a binary integer in seconds.

If TU is specified, the time-of-day is returned in register 1 as a binary integer in units of 1/300 seconds.

The time-of-day clock is independent of the interval timer options (SETIME and STXIT). It can be used by any area in a multiprogramming environment, regardless of which area is using the timer.

Checkpointing a Problem Program

CHECKPOINT FILE

Checkpoints on Disk

If checkpoints are written on disk, the following must be observed:

- One continuous area on a single disk must be defined at execution time by the job control cards necessary to define a DASD file.
- The number of tracks required is computed as follows:

$$T = n\left(\frac{1+\frac{x}{30}+\frac{y}{20}}{18} + \frac{c}{z}\right)$$

where

n = the number of sets of checkpoint records to be retained.
c = the number of bytes to be checkpointed.
x = the number of disk extents including nonoverlapping split-cylinder extents.
y = the number of data cell extents including nonoverlapping split-cylinder extents.
z = 3,625 for 2311,
7,294 for 2314/2319, or
13,030 for 3330.

For each division, the remainder is rounded to the next highest whole number before multiplying by n.

- Each program can use a common checkpoint file or define a separate one. If a common file is used, only the last program using the file can be restarted.
- The checkpoint file must be openend before the CHKPT macro can be used.
- A DTFPH macro must be included for use by OPEN and the checkpoint routine.

This section contains appendix information; it is a logical part of Appendix E of the base publication.

CTLCHR=YES

The following list of character codes applies to the IBM 3525 Card Punch with Print Feature.

PRINTER CONTROL FOR 3525 WITH PRINT FEATURE		
HEXADECIMAL CODE	PUNCH COMBINATION	FUNCTION
0D	12,5,8,9	Print on line 1
15	11,5,9	Print on line 2
1D	11,5,8,9	Print on line 3
25	0,5,9	Print on line 4
2D	0,5,8,9	Print on line 5
35	5,9	Print on line 6
3D	5,8,9	Print on line 7
45	12,0,5,9	Print on line 8
4D	12,5,8	Print on line 9
55	12,11,5,9	Print on line 10
5D	11,5,8	Print on line 11
65	11,0,5,9	Print on line 12
6D	0,5,8	Print on line 13
75	12,11,0,5,9	Print on line 14
7D	5,8	Print on line 15
85	12,0,5	Print on line 16
8D	12,0,5,8	Print on line 17
95	12,11,5	Print on line 18
9D	12,5,8,9	Print on line 19
A5	11,0,5	Print on line 20
AD	11,0,5,8	Print on line 21
B5	12,11,0,5	Print on line 22
BD	12,11,0,5,8	Print on line 23
C5	12,5	Print on line 24
CD	12,0,5,8,9	Print on line 25

Figure IV.15. 3525 printer control characters.

Index

Module 4. Operating Guide

Module Outline

In what way have Operating Procedures changed?

Changes have been made to the following sections:

System Concepts

- The ESTV error routine is no longer available for magnetic tape devices.
- Changes have been made to Problem Determination now that this feature is completely handled by RMSR.
- A new section on RMSR has been included.

System Operation

- The IPL procedure from both console and card reader has been changed. The method of loading the supervisor depends on whether an installation has TOD clock support.
- A minor restriction caused by RMSR has been included in the section "Running Batch Jobs".

Problem Determination

- It is not necessary to stop a BTAM application program that is running on a 3270 when OLTEP is executing. For other TP devices this restriction remains in effect.
- The ROD command now causes the PUB2 table counters to be written on SYSREC; some new operands have been added to the MODE command.
- The section "ESTV and EVA - Magnetic Tape Error Recording" has been deleted and replaced by RMSR information.
- The section "ERRLOG/MCRR and RMSR - System Error Recording" has also been replaced by new RMSR information.

Operator Reference Information

- A restriction for label information commands is in effect for the 3330.
- Some new operands have been added to the MODE command for further support of the RMSR feature.
- The DSE operand has been added to the MTC command; this operand can be used for 3400-series tapes.
- Changes have been made to the SET command to support the TOD clock; the ZONE command has been added for the same reason.

DOS Components

SUPERVISOR

Error Logging

This section replaces the existing "Error Logging" section in the base publication.

Failures in the system hardware are of two types: a complete failure that the system programs cannot correct, or a temporary failure that can be corrected by retrying the instruction or operation that failed. DOS records the error in the SYSREC file. The supervisor then attempts to retry the I/O operation (often the error does not recur). All temporary and some permanent errors are recorded on the SYSREC file and SYSREC is listed when the EREP (Environmental Recording, Editing, and Printing) program is executed. If it is necessary to execute the EREP program, save the listing for the customer engineer.

There is an error logging routine for the tape cartridge reader -- Tape Error Block (TEB). This routine lists the errors on SYSLOG at end-of-job, but has no recording option.

Problem Determination

This section, together with the section "Recovery Management Support Recorder (RMSR)" replaces the existing "Problem Determination" section in the base publication.

Problem determination is the process that allows you to determine the cause of an error. Specific procedures you must follow when an error condition occurs are described in DOS Version 4 Messages, GC33-5009.

To help locate and define system problems, diagnostic tools are also available. These tools, which aid in recording the errors and displaying pertinent information, are:

- EREP (Environmental Recording, Editing, and Printing Program). The EREP program edits, prints, and summarizes the data records that have been stored on the recorder file (SYSREC) by the Recovery Management Support Recorder (RMSR) function. It also creates and maintains history/RDE tape(s) and the TES history tape. Records from the recorder file and the history/RDE tape can be selectively printed. Tape Error Statistics (TES) can be selected or summarized from the SYSREC file or history tape.

- ESTVUT (Error Statistics by Tape Volume Utility Program). The tape error statistics that are stored on the TES history tape by volume serial number can be listed by means of the ESTV file program.

- TEB (Tape Error Block). TEB lists the 2495 tape cartridge errors on SYSLOG at end-of-job.

- PDAIDS (Problem Determination Serviceability Aids). PDAIDS provide five functions to trace events within the CPU and between the CPU and I/O devices. These functions are:

  1. Input/Output trace
  2. Fetch/Load trace
  3. Generalized SVC trace
  4. QTAM trace
  5. Transient dump.

- LSERV (Standard Label Cylinder Display). LSERV prints all labels of the standard label cylinder with the exception of the Data Set Secure labels on the device assigned to SYSLST.

- DUMPGEN (Stand-Alone Dump Generator). DUMPGEN generates a system-tailored, stand-alone dump.

- Operator Diagnostic Commands and Statements). Operator commands and statements useful as debugging aids are:

  1. LISTIO or // LISTIO
  2. MAP
  3. ROD
  4. MCDE.

The job control statement OPTION DUMP is also available.

- OLTEP (On-line Test Executive Program). DOS provides a set of online tests (OLTs) to test I/O devices. These tests, together with OLTEP, make up the online test system which checks I/O devices, diagnoses I/O errors, verifies I/O device repairs, and verifies engineering changes.

Recovery Management Support Recorder (RMSR)

RMSR is a feature of the Disk Operating System which retries errors and records error statistics. The types of recording and retry performed by RMSR are:

- MCAR/CCH (Machine Check Analysis and Recording and Channel Check Handler). When a machine check interrupt occurs, the MCAR function records error information on SYSREC and attempts to recover from the interrupt. If error recovery is not possible, MCAR attempts to record error information, terminates the job (or task), and continues system operation if possible. When a channel error occurs and processing can continue, the CCH function either cancels all programs on the channel in error or provides information to attempt retry. If processing cannot continue after a channel error occurs, the system enters a wait state.

- Tape Error Statistics. RMSR provides you with a set of tape error data which includes the time of day the error occurred, the unit on which the volume was mounted, the tape density, the number of retries required for success, and other statistics necessary to evaluate the data.

- Unit Check Recording. When a permanent error occurs, RMSR writes a Unit Check record on SYSREC. This record contains statistical and hardware data, which provides a complete status description at the time the error occurred.

- Counter Overflow. Whenever a statistical counter in the PUB2 table fills up, RMSR writes a statistical record for the device to which the counter belongs on SYSREC and then clears the counter. Processing and the accumulation of error statistics is continued.

- IPL/ECD. When the RDE function of RMSR is active, RMSR writes a record on SYSREC containing the reason for each IPL. Whenever the system is shut down, the error statistics from the PUB2 table are written on SYSREC.

Starting the System (IPL Procedure)

The following three figures (V.1, V.2, and V.3) give a summary of the actions that have to be taken to load the system. Figure V.1 deals with the procedure for card readers, Figures V.2 and V.3 with the procedure for console printer-keyboard on systems with and without TOD clock support, respectively.

If the communications device at IPL time is a card reader, no printed messages occur after the system enters the wait state. Instead, the first five characters of any message are placed in storage bytes 0-4.

The message codes occurring in connection with time-of-day clock support are the following:

0I31A The time-of-day clock is in the 'not set' or 'error' state. The IPL procedure is terminated. Include a SET command with DATE and CLOCK (and, if required, ZONE) parameter in the card deck and restart the IPL procedure.

0I32A The time-of-day clock is not operational. The IPL procedure is terminated. IPL cannot be performed using a card reader if the time-of-day clock is not operational. Restart the IPL procedure from a 3210 or 3215 console printer-keyboard.

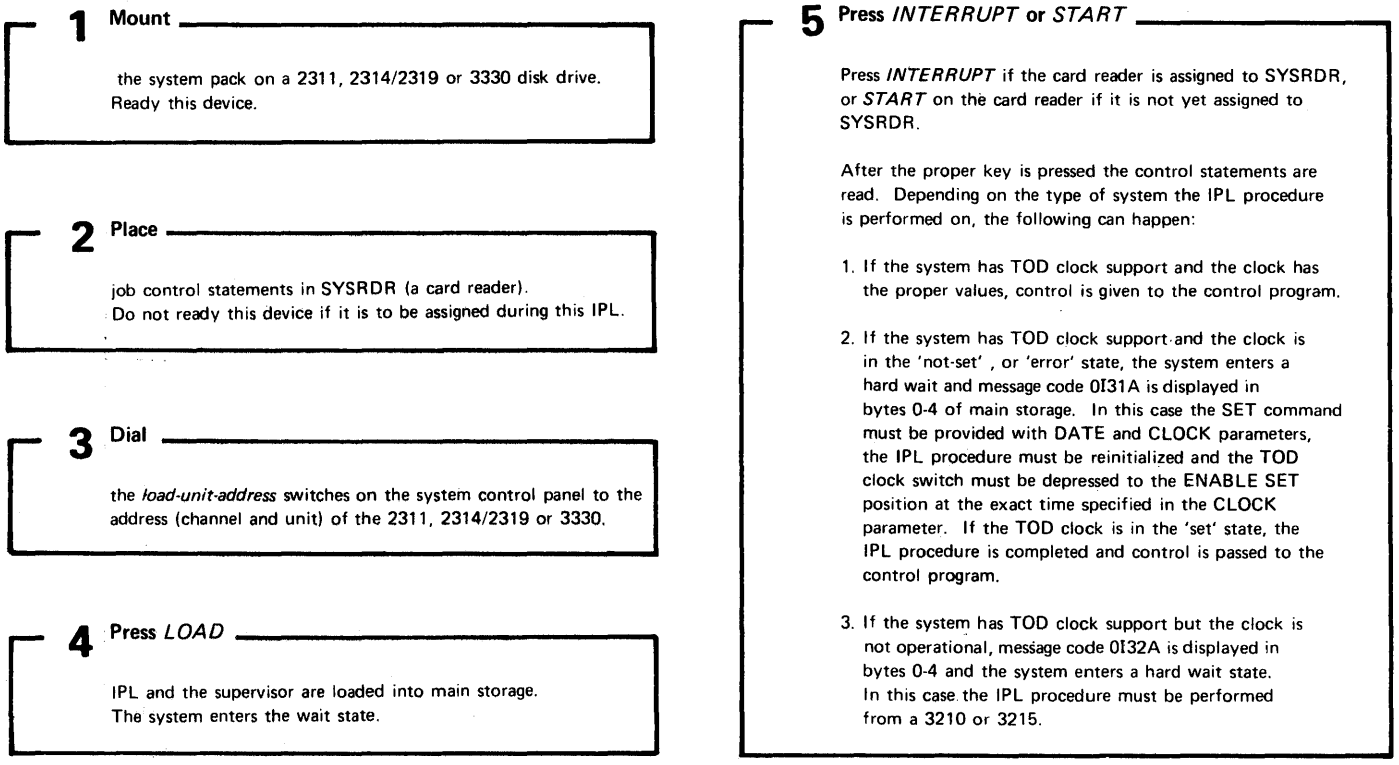


Figure V.1. The IPL procedure for card readers.

1 Mount

the system pack on a 2311, 2314/2319, or 3330 disk drive.
Ready this device.

2 Place

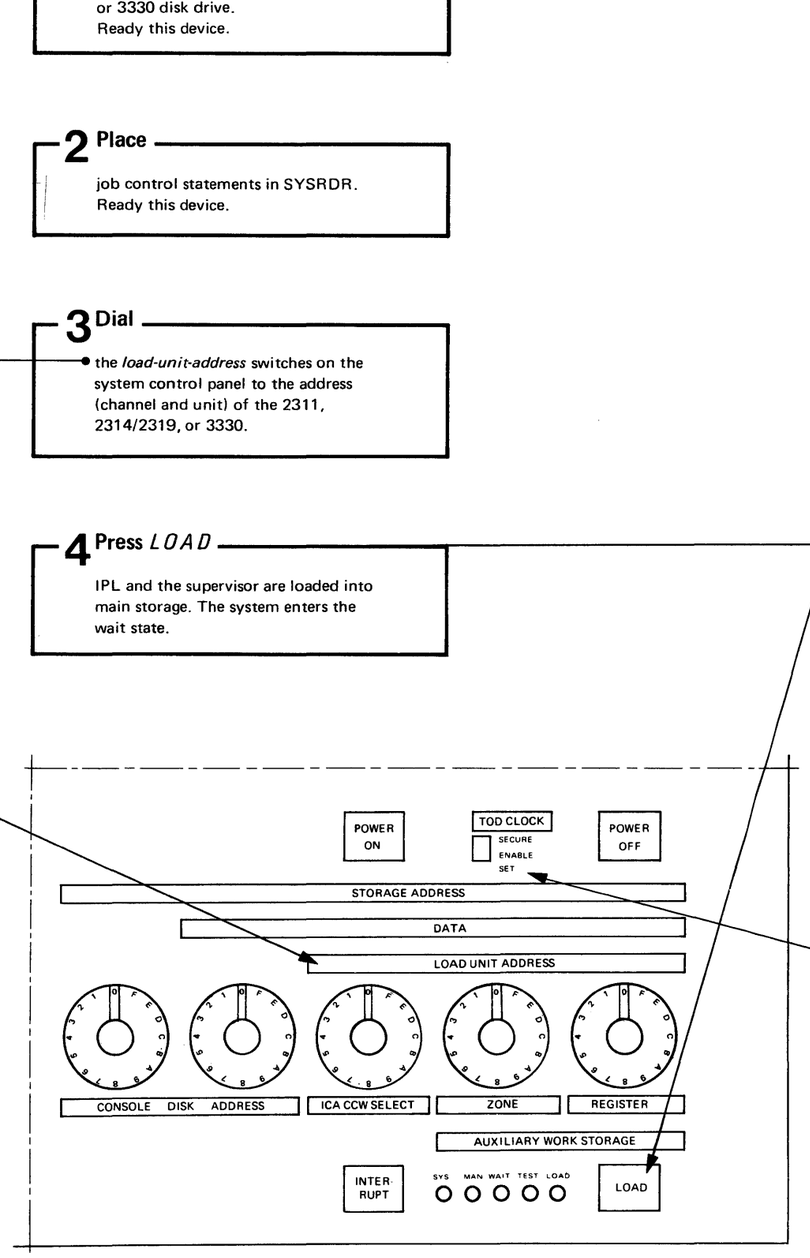
job control statements in SYSRDR.
Ready this device.

3 Dial

the *load-unit-address* switches on the system control panel to the address (channel and unit) of the 2311, 2314/2319, or 3330.

4 Press *LOAD*

IPL and the supervisor are loaded into main storage. The system enters the wait state.



5 Press *REQUEST*

One of the following sets of messages is printed on the console printer-keyboard:

0I30I DATE=$\begin{Bmatrix}\text{mm/dd/yy}\\\text{dd/mm/yy}\end{Bmatrix}$,CLOCK=hh/mm/ss,ZONE=$\begin{Bmatrix}\text{EAST}\\\text{WEST}\end{Bmatrix}$/hh/mm

0I10A GIVE IPL CONTROL COMMANDS

0I31A DATE REQUIRED,CLOCK REQUIRED,ZO

0I10A GIVE IPL CONTROL COMMANDS

6 Enter ADD and DEL commands

Devices can be added to, or deleted from, the PUB table.
If this is not required, omit this step and go to (7).

7 Enter SET command

(Message **0I30I**)

a. If all values are satisfactory, enter the SET command without parameters.

b. If the date of time-of-day is not satisfactory, enter the SET command with both DATE and CLOCK parameters. Depress *ENABL SET.*

c. If the zone is not satisfactory, enter the SET command with the ZONE parameter.

d. If none of the values is satisfactory, enter the SET command with all parameters. Depress the ***ENABL SET*** switch on the control panel.

(Message **0I31A**)

a. If the zone value is satisfactory, enter the SET co
DATE and CLOCK parameters. Depress *ENABL*

b. If the zone value is not satisfactory, enter the SE
with all parameters. Depress *ENABL SET*.

8

After the correct SET command is given, the message

0I20I DOS IPL COMPLETE

is printed. Control is then given to the supervisor.

5 Press *REQUEST*

One of the following sets of messages is printed on the console printer-keyboard:

0130I DATE=⟨mm/dd/yy / dd/mm/yy⟩,CLOCK=hh/mm/ss,ZONE=⟨EAST / WEST⟩/hh/mm
0110A GIVE IPL CONTROL COMMANDS

0131A DATE REQUIRED,CLOCK REQUIRED,ZONE=⟨EAST / WEST⟩/hh/mm
0110A GIVE IPL CONTROL COMMANDS

0132I TOD CLOCK INOPERATIVE; NO TOD SUPPORT
0131A DATE REQUIRED,CLOCK REQUIRED
0110A GIVE IPL CONTROL COMMANDS

0132I TOD CLOCK INOPERATIVE; NO TOD SUPPORT
0131A DATE REQUIRED
0110A GIVE IPL CONTROL COMMANDS

6 Enter ADD and DEL commands

Devices can be added to, or deleted from, the PUB table.
If this is not required, omit this step and go to (7).

7 Enter SET command

(Message **0130I**)

a. If all values are satisfactory, enter the SET command without parameters.

b. If the date of time-of-day is not satisfactory, enter the SET command with both DATE and CLOCK parameters. Depress *ENABL SET*.

c. If the zone is not satisfactory, enter the SET command with the ZONE parameter.

d. If none of the values is satisfactory, enter the SET command with all parameters. Depress the ***ENABL SET*** switch on the control panel.

(Message **0131A**)

a. If the zone value is satisfactory, enter the SET command with DATE and CLOCK parameters. Depress *ENABL SET*.

b. If the zone value is not satisfactory, enter the SET command with all parameters. Depress *ENABL SET*.

(Message **0132I** and **0131A**)

a. Enter the SET command with DATE and CLOCK parameters.

(Messages **0132I** and **0131A**)

a. Enter the SET command with DATE parameter

8

After the correct SET command is given, the message

0120I DOS IPL COMPLETE

is printed. Control is then given to the supervisor.

Figure V.2. The IPL procedure for a 3210 or 3215 console printer-keyboard (TOD clock support).

1 Mount

the system pack on a 2311, 2314/2319, or 3330 disk drive.
Ready this device.

2 Place

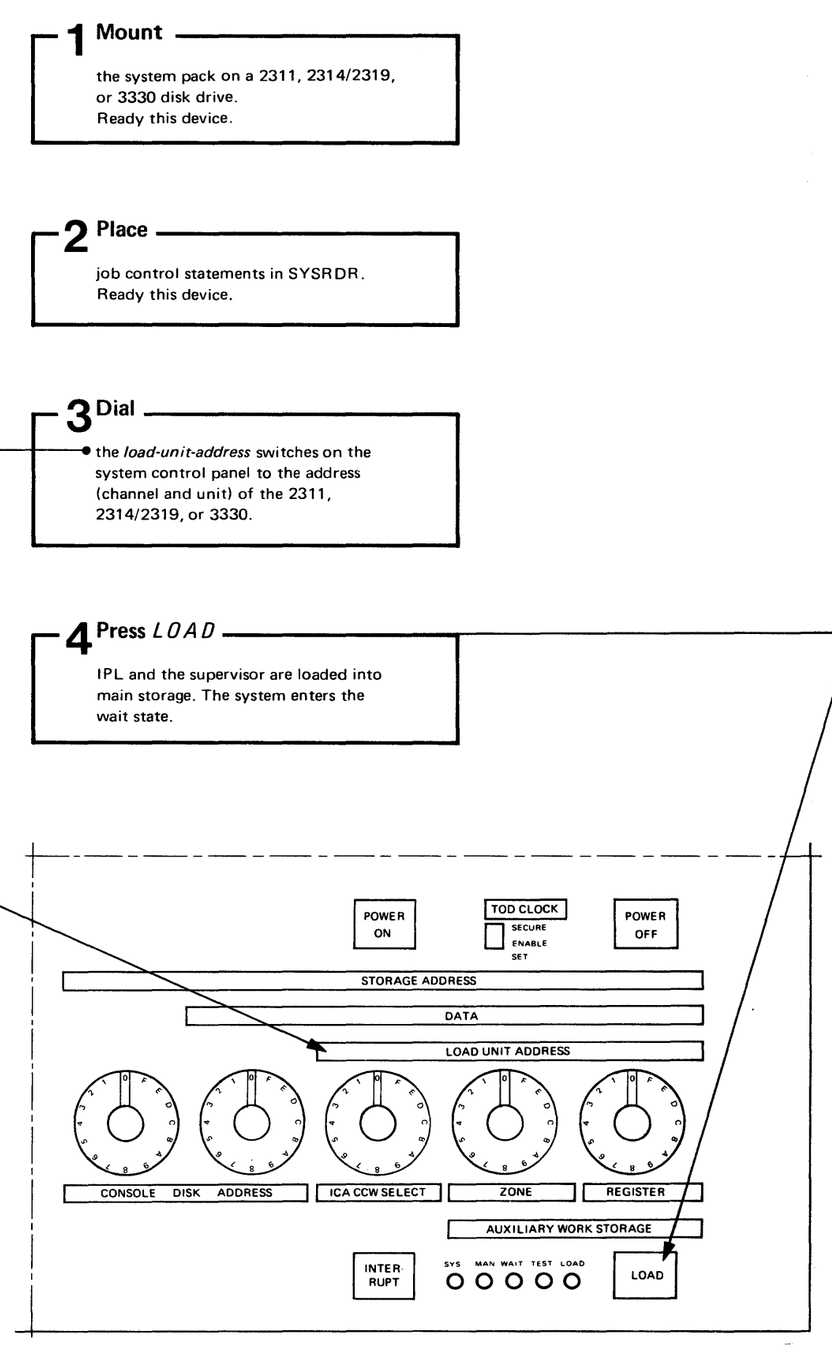
job control statements in SYSRDR.
Ready this device.

3 Dial

the *load-unit-address* switches on the system control panel to the address (channel and unit) of the 2311, 2314/2319, or 3330.

4 Press *LOAD*

IPL and the supervisor are loaded into main storage. The system enters the wait state.



5 Press *REQUEST*

One of the following sets of messages is printed on the console printer-keyboard:

0I31A	**DATE REQUIRED**	**0I31A**	**DATE REQUIRED,CLOCK REQUIRED**
0I10A	**GIVE IPL CONTROL COMMANDS**	**0I10A**	**GIVE IPL CONTROL COMMANDS**

6 Enter ADD and DEL commands

Devices can be added to, or deleted from, the PUB table.
If this is not required, omit this step and go to (7).

7 Enter SET command

Enter the SET command with DATE parameter.

Enter the SET command with DATE and CLOCK parameters.

8

after the correct SET command is given, the message

0I20I DOS IPL COMPLETE

is printed. Control is then given to the supervisor.

Figure V.3. The IPL procedure for a 3210 or 3215 console printer-keyboard (no TOD clock support).

Running Batch Jobs

The ESTVFMT program is no longer available for Error Statistics by Tape Volume (ESTV). Because ESTV itself has been changed and is now called Tape Error Statistics (TES), the ESTVUT program is used for TES rather than ESTV.

Symbolic Units Required for IBM-Supplied Programs

The names of the Utility programs have been changed. The new names and the old names are:

Utility Program	Version 4 Name	Version 3 Name
Alternate Track ASSGN	ALTDK	ATAD
	ALTDC	ATAM
Card to Printer/Punch	CDPP	CDPP
Card to Tape	CDTP	CDTP
Card to Disk	CDDK	CDDK
Copy Disk to Card	CDKCD	CRDC
Copy Disk to Disk	CDKDK	CRCC
Copy Disk/Data Cell to Tape	CDKTP	CRDT
Restore Card to Disk	RCDDK	CRCD
Restore Tape to Disk/Data Cell	RTPDK	CRTD
Initialize Disk	INTDK	INTD
	INTDC	INTM
Tape to Card	TPCD	TPCD
Tape to Tape	TPTP	TPTP
Tape to Printer	TPPR	TPPR
Tape to Disk	TPDK	TPDK
Tape to Data Cell	TPDC	TPDC
Tape Compare	TPCP	TPCP
Disk to Card	DKCD	DKCD
Disk to Disk	DKDK	DKDK
Disk to Printer	DKPR	DKPR
Disk to Tape	DKTP	DKTP
Disk to Data Cell	DKDC	DKDC
Data Cell to Data Cell	DCDC	DCDC
Data Cell to Printer	DCPR	DCPR
Data Cell to Tape	DCTP	DCTP
Data Cell to Disk	DCDK	DCDK
Clear Data Cell	CLRDC	CLDC
Clear Disk	CLRDK	CLRDSK
VTOC Display	LVTOC	LISTVTOC

Problem Determination

On-line Test Executive Program (OLTEP)

It is no longer a requirement that only one card be entered when the OLTEP test run definition is entered in the job stream. For each device a separate card may now be used.

USING OLTEP CONCURRENTLY WITH BTAM ON THE LOCAL 3270

Normally it is necessary to terminate a BTAM application program in order to run OLTEP tests on teleprocessing devices. It is possible to allow a BTAM application controlling a locally attached 3270 Information Display System to continue running during OLTEP processing. To do this, a special program, BT3270SC, must be run from the system console before and after OLTEP. This procedure is described under the local 3270 in the "Local Device-dependent Considerations" section of Basic Telecommunications Access Method, GC30-5001.

Diagnostic Operator Commands - MAP, LISTIO, ROD, and MODE

The MAP command allows you to display the size, upper limit, and active job in each partition. MAP can provide the necessary information to change the size of a partition or to determine what jobs are being processed.

The LISTIO command allows you to display the PUB (physical unit) and LUB (logical unit) assignments. LISTIO can provide the information to assign or reassign devices and to respond to certain error messages.

The ROD command causes the PUB2 table counters to be written on SYSREC. This command must be issued every time the system is shut down to ensure that no statistical data is lost.

The MODE command allows you to alter the recording mode. For MCAR/CCH the MODE command allows you to initiate or suppress HIR (Hardware Instruction Retry) and ECC (Error Correction Code) recording. In addition, you can set the EFL (Error Frequency Limit) for HIR and ECC and examine the status of HIR and ECC error recording. For TES recording, you can set the recording mode for unlabeled or nonstandard labeled tapes. In CE mode, the type of recording used for a specific device can be reset.

The MAP, LISTIO, and ROD command are fully described in DOS Operating Guide, GC24-5022; the MODE command is described in the section "Operator Commands" of this manual.

ESTV and EVA - Magnetic Tape Error Recording

The following sections, "Magnetic Tape Error Recording" and "System Error Recording", now contain the material formerly contained in the sections "ESTV and EVA - Magnetic Tape Error Recording" and "ERRLOG/MCRR and RMSR - System Error Recording", with their respective subsections.

Magnetic Tape Error Recording

Magnetic tape error statistics are collected in two ways:

1. EVA (Error Volume Analysis) collects tape errors by volume serial number during the execution of a job. When specific error limits are reached, these statistics are printed on SYSLOG.

2. RMSR (Recovery Management Support Recorder) collects tape error data during the execution of a job. The statistics are collected by volume serial number for standard labeled tapes and the records are written onto SYSREC. For nonstandard labeled and unlabeled tapes two modes of are available:

   a. Individual Recording (IR) - statistics are accumulated until a tape open occurs. At that time a record is written on SYSREC and the counters in the PUB2 table are reset.

   b. Combined Recording (CR) - statistics for all unlabeled or

nonstandard labeled tapes mounted on a particular tape drive are accumulated until a standard labeled tape is mounted. At that time a record is written on SYSREC and the counters in the PUB2 table are reset.

System Error Recording

The Recovery Management Support Recorder (RMSR) records system hardware errors and assists the customer engineer in providing a more reliable and serviceable system.

You are responsible for:

- Creating the recorder file (SET RF=CREATE).
- Issuing the ROD command in response to the problem determination action of an error message, or prior to shutting the system down or reloading the supervisor.
- Executing the EREP program and directing EREP to perform the correct function.
- Responding to error messages.
- Issuing the MODE command to set the type of recording to be done by the MCAR/CCH and tape error statistics portion of RMSR.

The RMSR feature includes several types of recovery and recording:

- MCAR (Machine Check Analysis and Recording) and CCH/ERP (Channel Check Handler/Error Recovery Procedure). These features record environmental data and attempt to recover from an error. If complete recovery is not possible, attempts are made to isolate the error to a program or a partition. If isolation is successful, the program, partition, or part of the partition is canceled and operation continues.

  The HIR and ECC functions can recover from and record errors, or simply recover from errors. The term used when only recovery is required is "quiet" mode.

  HIR and ECC have an EFL to keep the recorder file from filling too quickly when HIR or ECC encounters intermittant errors. If more than the specified number of errors occur within a certain time limit, the applicable function enters the quiet mode.

- Unit Check. A Unit Check record combines hardware and statistical data in the same record. When a unit check occurs on an I/O device, retry is performed. If retry is successful, the number of retries is accumulated with the statistical data and processing continues. If retry is not successful, a Unit Check record is written on SYSREC, the statistical counters are reset, and processing continues.

- Counter Overflow. Whenever a statistical counter for a device in the PUB2 table overflows, a record is written on SYSREC for that device. The statistical counters are reset and processing continues.

- Volume Dismount. When standard labeled tapes are processed, a volume dismount record is written on SYSREC every time a new volume is mounted. This record contains the statistical data for the previous volume. The statistical counters in the PUB2 table are cleared; processing continues and statistical data for the new tape volume is collected.

- I/O error logging includes RDE (Reliability Data Extractor). If ERRLOG=RDE is specified during system generation, RDE gathers hardware reliability data that IBM personnel use to evaluate hardware performance. Two types of records are written by RDE:.

  1. IPL records. These records specify the reason for reloading the supervisor.

  2. EOD records. These records are written after the ROD command is issued. The ROD command must be issued before system shutdown to ensure that all statistics are recorded.

EREP uses these records to identify RDE data.

The MODE command sets the recording mode for:

- MCAR/CCH. HIR or ECC is set to recording or quiet mode, the EFL error and time limits are set, and the status of recording is investigated.
- TES. The recording mode for unlabeled and nonstandard labeled tapes is set to combined or individual recording.

CREATING THE RECORDER FILE

When you add the ERRLOG option to your supervisor, you must create the recorder file on SYSREC. The information required to create the recorder file should be supplied after the last ASSGN statement for IPL and before the first JOB statement. The required control cards are:

```
  ASSGN SYSREC,X'cuu'
  SET RF=CREATE
// OPTION STDLABEL
// DLBL IJSYSRC,'DOS RECORDER FILE'
// EXTENT SYSREC,,,,nnnnn,nnnnn
     .
     .  (other label information
     .  to be stored on the
     .  standard label cylinder)
     .
// JOB FIRST
     .
     .
     .
```

The recorder file is created when the first job statement (// JOB FIRST) is read.

The operator commands are the same as the control cards, but they are entered through the console printer-keyboard.

- SYSREC is assigned to a disk unit (X'cuu') that is always available; usually it has the same physical address as SYSRES.

- The extent values nnnnn are supplied by the system programmer.

ROD Command

Before you press the POWER OFF button or reload the supervisor, issue the ROD command. This ensures that all statistical data held in the PUB2 table is added to the recorder file. The ROD command also causes the EOD record to be written on SYSREC.

ENVIRONMENTAL RECORDING, EDITING, AND PRINTING (EREP) PROGRAM

The EREP program can be used to process the data contained on SYSREC. Check with the person responsible for creating and maintaining the core image library to ensure that the EREP program is cataloged.

Executing EREP

Execute the EREP program at the request of a customer engineer or in response to an instruction in an error message. The operator commands required to execute EREP are:

```
  PAUSE BG,EOJ
// TLBL {EREPNEW}          (*)
       {EREPUP }
// TLBL {TAPEIN}           (**)
       {TESUP }
// ASSGN SYS007,X'cuu'  }
// ASSGN SYS008,X'cuu'  }  (tape drive ***)
// ASSGN SYS009,X'cuu'  }
// LBLTYP TAPE
// EXEC EREP
```

* This card is necessary only if you want to create or update a history/RDE tape. Use EREPNEW for creation and EREPUP for updating.

** This card is necessary only if you are creating or updating the TES history tape. Specify TAPEIN when creating and TESUP when updating.

*** One of these control cards is necessary when you are creating or updating one of the history tapes (history/RDE tape or TES history tape).

The system requests the source of option input: SYSLOG, SYSIPT, or none (edit and print the recorder file). If SYSLOG input is required, prompter messages are printed to which you should respond. If SYSIPT input is desired, punch the control cards shown in Figure V.4.

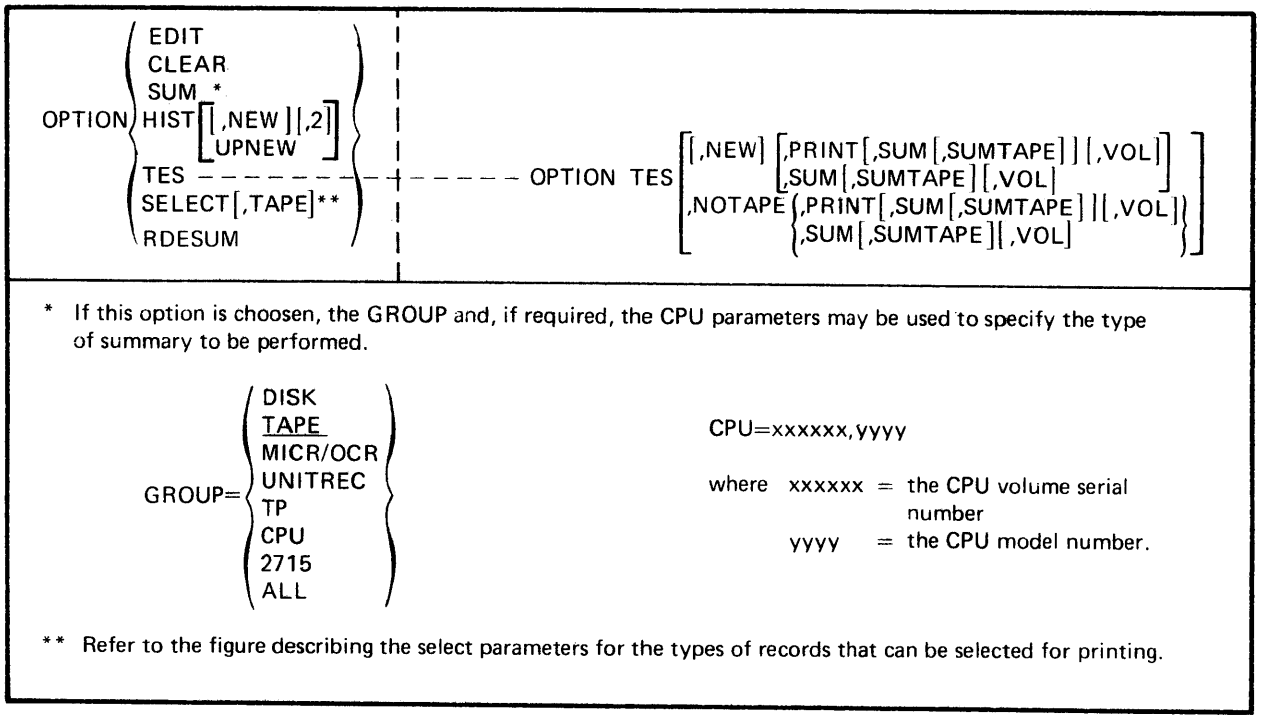


Figure V.4. The EREP options and the summary parameters.

There can only be one option per line (SYSLOG) or one option per card (SYSIPT). Only one option card for each type of option (EDIT, CLEAR, SUM, HIST, TES, and SELECT) may be entered on one EREP run. However, the SUM and SELECT options may be executed more than once on one single EREP run when they are entered via SYSLOG. Figure V.6 lists the EREP options.

You can alter the order of EREP actions by specifying two options. For example:

OPTION EDIT Edit and print the SYSREC file.

OPTION HIST Update the history tape, then clear the file.

Note: If an unrecoverable I/O error occurs on SYSREC while the CLEAR function of EREP is executing, EREP is abnormally terminated and you should reload the supervisor. This may be undesirable in an MPS system. However, if you do not reload the supervisor, the contents of the SYSREC file may be unpredictable.

History Tapes

You can only create a history tape if errors have been recorded on the SYSREC file. The EREP program can create or update two types of history tapes: the history/RDE tape and the TES history tape.

The history/RDE tape can be created by specifying OPTION HIST,NEW and updated by specifying OPTION HIST.

In addition, you can create a TES history tape; this tape contains tape error records only. If you want to maintain a TES history tape, you must create or update it on the same EREP run during which the history/RDE tape is created or updated. The TES history tape can be created by specifying OPTION TES,NEW and updated by specifying OPTION TES.

SELECT PARAMETER	COMMENTS
CPU=xxxxxx	All error records associated with a CPU may be selected for printing by entering the six-digit CPU serial number.
TYPE={MCAR, CCH, IPL, EOD, TP, UNIT, 1275}	A specific type of error record may be selected for printing. Any number of different types may be selected for each search.
DATE={yyddd,yyddd / yyddd}	All recordings made within a time span (measured in days) may be selected for printing. If two dates, separated by a comma, are specified, all recordings made in that time span are selected. If only one date is specified, all recordings made on that day are selected for printing.
TIME=hhmm,hhmm	All recordings made within a time span (measured in hours and minutes) may be selected for printing.
JOB=xxxxxxxx	All recordings made during the execution of a specific job may be selected for printing by specifying the eight-byte jobname from the job statement.
VOL=xxxxxx	The error records for a specific volume may be selected for printing by entering the six-byte volume serial number.
TERM=xxxxxxxx	The error records for a terminal may be selected by entering the eight-byte terminal name.
CUA=xxxx	Records may be selected for printing by entering the channel and unit address (in hexadecimal) or the line number for TP.
DEVICE=xxxxxx	The records associated with a specific type of device may be selected by entering the device type code (for example, 1403, 1442N1).
FORMAT=TES	Whenever a tape (2400- or 3400-series) error record is encountered, it is printed in the detail TES format by volume serial number. If FORMAT=TES is not specified, all tape error records are printed in the unit check format.
SEL2715={AREA, ADAPTER, SPECIAL}	The 2715 records are printed in area station format if the SEL2715 parameter is not specified. If printing by area, adapter, or special is required, however, the SEL2715 parameter must be specified.

Figure V.5. The select parameters.

OPTION	COMMENTS
OPTION EDIT	Edits and prints SYSREC onto SYSLST.
OPTION CLEAR	1. Edits and prints SYSREC onto SYSLST 2. Clears SYSREC.
OPTION SUM GROUP= (DISK, TAPE, MICR/OCR, UNITREC, TP, CPU, 2715, ALL) CPU=xxxxxx,yyyy	Prints the summarization of SYSREC onto SYSLST. The file is summarized by the hardware group(s) listed in the GROUP parameter. If records from multiple CPUs appear on the SYSREC file, specify the serial number (*xxxxxx*) and model number (*yyyy*) of the CPU whose records you wish to have summarized. If CPU data is not supplied, records from all CPUs appearing on the SYSREC file are summed together.
OPTION HIST,NEW[,2]	1. Creates the history/RDE tape on SYS009 2. Clears SYSREC.
OPTION HIST[,2]	1. Updates the history /RDE tape on SYS009 2. Clears SYSREC.
OPTION EDIT followed by OPTION HIST,NEW or OPTION HIST	1. Edits and prints SYSREC onto SYSLST 2. Creates or updates the history/RDE tape on SYS009 3. Clears SYSREC.
OPTION TES,NEW	Creates a TES history tape on SYS007.
OPTION TES	Updates a TES history tape on SYS007.
OPTION TES,NOTAPE,PRINT	Edits and prints tape error data from SYSREC onto SYSLST. The data is printed in the detail tape unit format.
OPTION TES,PRINT,NEW	1. Creates a TES history tape on SYS007 2. Edits and prints tape error data from SYSREC onto SYSLST in the detail tape unit format.
OPTION TES,PRINT	1. Updates the TES history tape on SYS007 2. Edits and prints tape error data from SYSREC onto SYSLST in the detail tape unit format.
OPTION TES,NOTAPE,SUM	Prints the summarized tape data from SYSREC onto SYSLST in the detail tape unit format.
OPTION TES,NOTAPE,PRINT,SUM	1. Edits and prints the tape error data from SYSREC onto SYSLST in the detail tape unit format. 2. Prints the summarization of the tape data from SYSREC onto SYSLST in the summarized tape unit format.
OPTION TES,SUM,VOL	1. Updates the TES history tape on SYS007 2. Summarizes the tape error data on SYSREC by volume serial number.
OPTION TES,PRINT,VOL	1. Updates the TES history tape on SYS007 2. Edits and prints the tape error data from SYSREC onto SYSLST in the detail volume serial number. format.
OPTION TES,PRINT,SUM,SUMTAPE,VOL	1. Updates the TES history tape on SYS007. 2. Edits and prints the tape error data from SYSREC onto SYSLST in the detail volume serial number format 3. Summarizes the tape error data on the history tape and prints it on SYSLST in the summarized volume serial number format.
OPTION TES,NOTAPE,SUM,SUMTAPE	Summarizes the tape error data on the history file and prints it on SYSLST in the summarized tape unit format.
OPTION SELECT (see note[1])	Selectively prints records from SYSREC onto SYSLST.
OPTION SELECT,TAPE (see note[1])	Selectively prints records from the history/RDE tape onto SYSLST.
OPTION RDESUM	Summarizes the IPL, EOD, MCAR, CCH, and Unit Check records for a specified period of from one to 30 days. These records are on the history/RDE tape (see note 2).
(none)	Edits and prints SYSREC onto SYSLST.

Note[1]. Records are selected by specifying select parameters. See Figure V.5 for the possible select parameters.

Note[2]. RDESUM does not summarize across multiple volumes. If EOF is encountered before the entire requested reporting period has been covered (this can be checked through the end date printed on the RDESUM listing), rerun RDESUM using the next volume in the multiple volume history/RDE file and the same reporting period you specified during the first RDESUM execution. A listing with the remainder of the requested information is thus generated.

Figure V.6. These are the EREP options.

Option card	Comments
OPTION TES,NEW	Creates a TES history file.
OPTION TES	Updates a TES history file.
OPTION TES,PRINT	Updates the TES history tape and then edits and prints the tape error data from SYSREC onto SYSLST in the detail tape unit format.
OPTION TES,NOTAPE,PRINT,VOL	Edits and print the tape error data from SYSREC onto SYSLST in the detail volume serial number format.
OPTION TES,NOTAPE,PRINT	Edits and prints the tape error data from SYSREC onto SYSLST in the detail tape unit format.
OPTION TES,PRINT,NEW,VOL	Creates a new TES history file and then edits and prints the tape error data from SYSREC onto SYSLST in the detail volume serial number format.
OPTION TES,PRINT,VOL	Updates the TES history tape and then edits and prints the tape error data from SYSREC onto SYSLST in the detail volume serial number format.
OPTION TES,PRINT,SUM,VOL	Updates the TES history tape and then edits and prints the tape error records from SYSREC onto SYSLST in the detail volume serial number format. Finally, the tape error records on SYSREC are summarized by volume serial number.
OPTION TES,PRINT,SUM,SUMTAPE,VOL	Updates the TES history tape and then edits and prints the tape error records from SYSREC onto SYSLST in the detail volume serial number format. Finally, the tape error data on the history tape is summarized and printed on SYSLST in the summarized volume serial number format.
OPTION TES,NOTAPE,SUM	Edits and prints the tape error data from SYSREC onto SYSLST in the summarized tape unit format.
OPTION TES,NOTAPE,SUM,SUMTAPE	Summarizes and prints the tape error data from the history tape onto SYSLST in the summarized tape unit format.

Figure V.7. EREP options for tape statistics.

PROCESSING TAPE ERROR STATISTICS WITH EREP

Several EREP options are available to process the tape error statistics on the SYSREC file. Figure V.7 describes the EREP options that apply to tape records.

PROCESSING THE TES HISTORY TAPE WITH THE ESTVUT UTILITY PROGRAM

When a TES history tape is created from the data on SYSREC, ESTVUT, the ESTV Dump File program is used to process the data on the TES history tape. This utility program dumps the TES history file on SYSLST.

Control cards necessary to run ESTVUT: ESTVUT can be executed either from a card reader or from SYSLOG. An example of the job control statements required for executing ESTVUT is:

```
// JOB ESTVDUMP
// ASSGN SYS005,X'181'
// ASSGN SYSLST,X'00E'
// TLBL TAPEIN
// LBLTYP TAPE
// EXEC ESTVUT
/*
/&
```

Symbolic unit assignments: Every symbolic unit required for execution of the ESTVUT program must be assigned, either temporarily for one job or permanently.

VOLUME SERIAL	DATE	TIME OF DAY	CHANNEL /UNIT	TEMP READ	TEMP WRITE	PERM READ
xxxxxx	yr/day	hr.mn.sc	cuu	nnn	nnn	nnn
PERM WRITE	NOISE BLOCKS	ERASE GAPS	CLEANER ACTIONS	SIOS USAGE	TAPE DENSITY	BLOCK LENGTH
nnn	nnn	nnn	nnn	nnnnn	nnn	nnnnn

Figure V.8. ESTVUT print format.

- SYS005 must be assigned to the magnetic tape unit on which the TES history file is mounted.
- SYSLOG must be assigned to a 3210 or 3215 for all executions of ESTVUT in order to log inquiries and accept replies.

Label information: Label information must be available to the system whenever the devices are used in the execution of ESTVUT.

- The first operand of the TLBL statement for the input tape must be TAPEIN.
- LBLTYP for tape is required if the program uses tape and has been cataloged as a self-relocating program (+0 on the PHASE card). This statement reserves space for processing standard label information.

Contents and format of printed output: When the operator specifies a printer as output device, the error statistics collected are formatted and printed as shown in Figure V.8. Each printed page contains 50 lines of data. The last printed page contains a message after the last line of data. This message is:

```
ESTV TAPE FILE DUMPED
```

Cataloging ESTVUT: ESTVUT consists of one module that has to be cataloged in the core image library. The module name to be used in the INCLUDE statement for this routine is:

```
IJBTESUT
```

Following is an example of the job control required to catalog the module in the core image library.

```
// JOB CATALOG
// OPTION CATAL
 PHASE ESTVUT,{+0}
              {S }
 INCLUDE IJBTESUT
// EXEC LNKEDT
/&
```

- +0 is used for a multiprogramming system
- S is used for a non-multiprogramming (batched-job) system.

SEREP

SEREP is a diagnostic program available to the CE. He will make this program available to you for recording unrecoverable system errors.

SEREP execution is only necessary if the system enters a wait state with the hexadecimal representation of the character S (X'E2') in byte 1 of main storage.

To execute SEREP:

1. Ensure that there is no system activity (console lights must not blink, magnetic tapes and disk access arms must not move).
2. Display byte 1 of main storage and ensure that it contains X'E2'.
3. Load the SEREP deck into the card reader.
4. Ready the reader and the printer.
5. Perform IPL from the card reader.

The error recording information is then edited and printed. SEREP printing is normally done on the device at address X'00E'. If your printer has another address, the customer engineer should alter your SEREP deck.

Operator Reference Information: Commands and Statements

Operator Commands

ADD -- ADD A DEVICE TO THE PUB TABLE

Apart from the PUB tables DOS Version 4 now also uses PUB2 tables. The space required for these PUB2 tables is assigned at system generation time. It is not possible tc add more devices of any one type than have been assigned PUB2 space. If too many devices have been added, you are informed through the message

0I29I INSUFFICIENT PUB2 SPACE AVAILABLE

which is printed on the console printer-keyboard at the time the system is loaded. The IPL program is canceled and you must delete devices until sufficient PUB2 space is available and then IPL again. To prevent this condition from occurring you should make sure for how many devices of each type PUB2 space has been reserved.

The following changes have to be made to the device type list in the base publication.

Add: 2596 for 2596 card read punch
3330 for 3330 disk storage
3410T9 for 3410 magnetic tape unit
3420T7 for 7-track 3420 magnetic tape unit
3420T9 for 9-track 3420 magnetic tape unit
3505 for 3505 card reader
3525P for 3525 card punch
3525RP for 3525 card punch with optional read feature

Delete: 1285
1404
1412
1445
7772

Change: 1050A for 3210 or 3215 console printer-keyboard
2400T7 for 7-track 24000-series magnetic tape units
2400T9 for 9-track 2400-series magnetic tape units

ASSGN -- ASSIGN LOGICAL NAME COMMAND

The specification of the IGN option with ASSGN is not valid for SYSRDR, SYSIPT, SYSIN, SYSREC, and SYSCLB, nor for PL/I (D) and COBOL programs.

If the ASSGN command cr statement is specified with the ALT parameter, a reassignment that has been made for the original assignment must also be made for the alternate assignment.

DLAB -- DASD LABEL INFORMATION COMMAND

The combination of this statement with VOL and XTENT must not be used to provide the extent and label information for a 3330.

DLBL -- DASD LABEL INFORMATION COMMAND

Tcgether with the EXTENT statement, only DLBL should be used to supply extent and label infcrmation for the 3330.

EXTENT -- DASD EXTENT INFORMATION COMMAND

Together with the DLBL statement, only EXTENT shculd be used to supply extent and label information for the 3330.

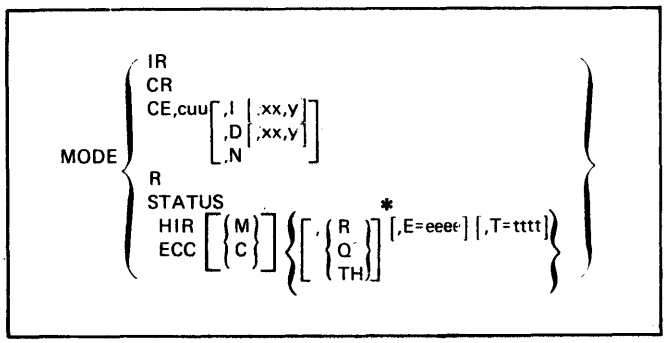
Note: The EXTENT cards must be checked carefully because an invalid field in the card causes the default cptions or the values entered by the previous EXTENT card tc be overwritten by the valid entries of the flagged statement.

MODE -- SYSTEM/370 ERROR RECORDING

This information replaces the MODE command informaticn in the base publication.

The MODE ccmmand can reset the recording mode for the nonstandard labeled and unlabeled tapes and set the recording mode for a particular device. This command initiates cr suppresses HIR (Hardware Instruction Retry) and ECC (Error Correcticn Code) errcr recording. It also sets the EFL (Error Frequency Limit) for

HIR and ECC or inquires about the status of HIR and ECC error recording. The format of the MODE command is:



* Note: When either HIR or ECC is specified, at least one of the optional operands within these braces must be selected. TH is only valid for the Model 145 when ECC,C is specified with the MODE command.

IR
CR
Recording mode for nonstandard labeled and unlabeled tape. Specify Individual Recording (IR) if you wish to record and then reset the tape error statistics at each tape OPEN. Specify Combined Recording (CR) to accumulate all the statistics from nonstandard labeled and unlabeled tape on a specific tape unit until a standard labeled tape is opened. Then one recording of the statistics from all the nonstandard labeled and unlabeled tapes is made on SYSREC, and the statistical counters are reset in the PUB2 table.

CE
The recording mode for a device at physical location CUU may be reset. The possible recording modes are:

b Normal. The default, normal, is assumed.

I Intensive. Normal recording continues. In addition, the next seven errors of a particular type (xx,y) or the next seven errors of any type (if xx,y is not specified) are recorder. The number of I/O retries required for success is not recorded.

D Diagnostic. Normal recording continues. In addition, the next seven errors of a particular type (xx,y), or the next seven errors of any type (if xx,y is not specified) are recorded. The number of I/O retries required for success is also recorded.

N No recording.

When the recording mode parameter is the last parameter of the MODE command, all errors are checked for recording. When in intensive or diagnostic mode, it is possible tc check for only one type of error. Indicate the bit tc be examined with:

(xx,y) where y is the bit (0-7) within the byte xx (0-31) of sense data to be checked.

R
Sets recording mode for HIR and ECC.

STATUS
Requests a report showing the current mode settings and EFL for HIR and ECC, as well as the number cf high speed buffer pages not being used.

This report has the form:

HIR,{R|Q},aaaa/eeee,bbbb/tttt

For Model 135
ECC,{R|Q}

For Model 145
ECC,{R|Q},{M|C},aaaa/eeee,bbbb/tttt

For Model 155
ECC,{R|Q},aaaa/eeee,bbbb/tttt

BUF DLT=xxx

aaaa = Current error count
eeee = Error count limit
bbbb = Current elapsed time
tttt = Time threshold.

HIR
Hardware Instruction Retry. This operand changes the mode of the HIR facility to R or Q and/or rcdifies the error count threshold and/or time threshold.

Note: When HIR is placed in quiet rcde, ECC alsc goes into quiet mode.

ECC — Error Correction Code. This operand changes the mode of the ECC facility to R or Q, and/or modified the error count threshold and/or time threshold. ECC,R and ECC,Q are the only valid modes of diagnosis for the Model 135. If ECC is specified for a Model 145, M or C must also be specified. ECC can also place the Model 145 Control Storage in threshold mode.

Note: Use of the Error Correction Code (ECC) in full recording mode may cause severe system degradation. Thus, the [ECC,M/C,R] operand combination of the MODE command should only be used by the customer engineer or at his request.

R — Recording Mode

MODE R - places both HIR and ECC in recording mode.

MODE HIR,R - places HIR in recording mode.

MODE ,ECC,R (Model 155) - if HIR is already in recording mode, it places ECC in recording mode.

MODE ,ECC,M,R (Model 145) - if HIR is already in recording mode, main storage is placed in recording mode.

MODE ECC,C,R (Model 145) - if HIR is already in recording mode, control storage is placed in recording mode.

Q — Quiet Mode

MODE HIR,Q - places both HIR and ECC in quiet mode.

MODE ECC,Q (Model 135 and 155) - places ECC in quiet mode.

MODE ECC,M,Q (Model 145) - places main storage in quiet mode.

MODE ECC,C,Q (Model 145) - places control storage in quiet mode.

M or C — Main or control storage: M or C is only valid for the Model 145. M or C must be specified when ECC is specified for the Model 145. M indicates main storage and C indicates control storage.

TH — Threshold Mode: TH is only valid for the Model 145 if ECC,C is specified. TH places the Model 145 control storage ECC in threshold mode.

E=eeee
T=tttt — Values entered for E and T must be within the following decimal ranges:

E - 8 (initial value) through 9999

T - 8 (initial value) through 9999

The IBM-supplied value is 8.

Notes:

1. Whenever HIR is in quiet mode, ECC mode must not be changed.
2. For the Model 135, the only valid mode commands are:

   MODE CE,...
   MODE STATUS
   MODE ECC,Q
   MODE ECC,R.

3. ECC can only be changed when HIR is in recording mode. Use of the Error Correction Code (ECC) if full recording mode may cause severe system degradation. Thus, the [ECC,M/C,R] operand combination of the MODE command should be used only by the customer engineer or at his request.

MTC -- MAGNETIC TAPE COMMAND

The DSE (data security erase) operand has been added to the MTC command for 3400-series magnetic tapes.

```
// MTC DSE,SYSnnn

   MTC DSE,{X'cuu'}
           {SYSnnn}
```

DSE — Data security erase (3400-series only). This command erases a tape from the point at which the operation is initiated up to the end-of-tape reflective marker. If data is written after the end-of-tape reflective marker, you must erase that data with [//] MTC ERG,SYSnnn. To ensure that a DSE failure is detected quickly, rewind or rewind-unload should be performed with an MTC rather than manually.

If the DSE command is issued when the tape is at load point, the

contents of the tape, including the volume label, are erased completely. In that case the tape must be reinitialized or a tapemark must be written on it before it can be used again.

The partition that issued the [//] MTC DSE command is placed in the wait state until the end-of-tape reflective marker is reached.

SYSnnn represents any logical unit.

X'cuu' represents the channel and unit in hexadecimal, where c is the channel number (0-6) and uu the unit number, 00-FE (0-254).

SET -- SET VALUE COMMAND

The SET command initializes the UPSI configuration, specifies the number of lines to be printed on SYSLST, specifies the remaining disk capacity when SYSLST or SYSPCH is assigned to disk, and defines to the system the status of the recorder file on SYSREC used by the Recovery Management Support Recorder (RMSR) feature. The SET card should precede the JOB card in job control sequence.

```
SET [UPSI=n1][,LINECNT=n2][,RCLST=n3]
    [,RCPCH=r4][,RF=n5][,DATE=n6]
```

The time-of-day clock can only be set during IPL. Therefore the CLOCK parameter of the job control SET command is no longer supported. The DATE parameter can only be specified if TOD support is not a part of your system or if the clock is not operational.

RF=n5 Defines to the system the status of the recorder file (IJSYSRC) on SYSREC used by the RMSR routines. n5 can be:

- YES — An active recorder file exists on the system and can be opened as an input file.
- CREATE — Instructs the system to create a recorder file when the first JOB card is encountered.

VOL -- VOLUME INFORMATION COMMAND

The VOL command, in combination with the DLAB and XTENT command, should not be used to supply label and extent information for the 3330.

XTENT -- DASD EXTENT INFORMATION COMMAND

The XTENT command, in combination with the DLAB and VOL command, should not be used to supply label and extent information for the 3330.

ZONE -- SET ZONE COMMAND

This is a new statement. It initializes the value of the job zone field in the communications region (bytes 143 and 144). If no ZONE statement is supplied, job control supplies the zone given in the system zone field in the communications region extension (bytes 68 and 69). If no DATE statement is supplied, the job date is updated by means of the values given in the system date field and in the ZONE statement.

Locations that are on Greenwich Mean Time need not specify the ZONE statement or can specify // ZONE EAST/00/00 or
// ZONE WEST/00/00.

```
// ZONE {EAST}/hh/mm
        {WEST}
```

EAST A geographical position east of Greenwich.

WEST A geographical position west of Greenwich.

hh/mm A decimal value which indicates the difference in hours and minutes between local time and Greenwich Mean Time. hh may be in the range 0-12, mm in the range 0-59.

This statement is only accepted if time-of-day clock support is included in the system. Otherwise, the message 1S0nD INVALID STATEMENT is printed on SYSLOG and SYSLST.

General Operating Techniques

Model 135 Techniques

DISPLAYING THE CURRENT PSW

Console Printer-Keyboard

- Hit STOP.
- Hit ALTER/DISPLAY; the PROCEED light turns on.
- Type in DP. The current PSW is printed on the console printer-keyword.
- Hit END.
- Hit START.

System Control Panel

Displaying at the system control panel is basically a function for CE use. You can display more efficiently using the alter/display facility, which also gives you a hard copy record of your actions and the system responses.

- If the HARDSTOP indicator is not on, set the RATE switch to SINGLE CYCLE.
- Set STORAGE SELECT to MAIN STORAGE.
- Set STORAGE ADDRESS switches to the address of the current PSW.
- Hit SET ADR AND DISPLAY. The PSW is displayed in the reference display window.

ALTERING THE CURRENT PSW

Console Printer-Keyboard

- Hit STOP.
- Hit ALTER/DISPLAY; the PROCEED light turns on.
- Type in AP, followed by the new PSW.
- Hit END.
- Hit START.

DISPLAYING MAIN STORAGE

Console Printer-Keyboard

- Hit STOP.
- Hit ALTER/DISPLAY; the PROCEED light turns on.
- Type in DM, followed by the address at which display is to begin. Typing of the contents of main storage at the console printer-keyboard starts automatically. You can stop the typing by either hitting ALTER/DISPLAY (the alter/display mode is retained) or END (the alter/display mode is terminated).
- Hit START.

System Control Panel

Displaying at the system control panel is basically a function for CE use. You can display more efficiently using the the alter/display facility, which also gives you a hard copy record of your actions and the system responses.

- If the HARDSTOP indicator is not on, set the RATE switch to SINGLE CYCLE.
- Set STORAGE SELECT to MAIN STORAGE.
- Set STORAGE ADDRESS switches to the address to be displayed.
- Hit SET ADR AND DISPLAY. The selected data is displayed in the reference display window.

CLEARING MAIN STORAGE

System Control Panel

- Hit and hold ENABLE SYSTEM CLEAR.
- Hit SYSTEM RESET (only once). The current PSW is set to zero; all data in main and protection storage is cleared to zeros.
- Release ENABLE SYSTEM CLEAR.
- Perform IPL procedure.

ALTERING MAIN STORAGE

Console Printer-Keyboard

- Hit STOP.
- Hit ALTER/DISPLAY; the PROCEED light turns on.
- Type in AM, followed by the address at which the new data is to be inserted.
- Type in new data.
- If the alter/display mode is to be retained, hit ALTER/DISPLAY.
- If the alter/display mode is to be terminated, hit END and START.

DISPLAYING REGISTERS

Console Printer-Keyboard

- Hit STOP.
- Hit ALTER/DISPLAY; the PROCEED light turns on.
- Type in DG (to display a general purpose register) or DF (to display a floating point register), followed by the address of the first and last register to be displayed. The address sequence wraps around, that is, the content of the highest available address is followed by the content of the lowest address (zero).
- Hit ALTER DISPLAY if the alter/display mode is to be retained.
- Hit END and START if the alter/display mode is to be terminated.

System Control Panel

Displaying at the system control panel is basically a function for CE use. You can display more efficiently using the alter/display facility, which also gives you a hard copy record of your actions and the system responses.

- If the HARDSTOP indicator is not on, set the RATE switch to SINGLE CYCLE.
- Set STORAGE SELECT to AUXILIARY STORAGE.
- Set rotary switches D and E to the positions shown in Figure V.9.
- Hit SET ADR AND DISPLAY. The selected register is displayed in the reference display window.

Register Number (Hex)	Rotary Switch Positions			
	Bytes 0 & 1		Bytes 2 & 3	
	D	E	D	E
0	0	0	0	1
1	0	2	0	3
2	0	4	0	5
3	0	6	0	7
4	0	8	0	9
5	0	A	0	B
6	0	C	0	D
7	0	E	0	F
8	1	0	1	1
9	1	2	1	3
A	1	4	1	5
B	1	6	1	7
C	1	8	1	9
D	1	A	1	B
E	1	C	1	D
F	1	E	1	F
0	2	0	2	1
1	2	2	2	3
2	2	4	2	5
3	2	6	2	7
4	2	8	2	9
5	2	A	2	B
6	2	C	2	D
7	2	E	2	F

Figure V.9. Rotary switch settings for register display.

ALTERING REGISTERS

Console Printer-Keyboard

- Hit STOP.
- Hit ALTER/DISPLAY; the PROCEED light turns on.
- Type in AG (to alter a general purpose register) or AF (to alter a floating point register), followed by the address of the first and, if required, last register to be altered.
- Type in the new data to be placed in the specified register(s).
- Hit ALTER DISPLAY if the alter/display mode is to be retained.
- Hit END and START if the alter/display mode is to be terminated.

STOPPING ON ADDRESS COMPARE

System Control Panel

- Hit STOP.
- Ensure STORAGE SELECT is set to main storage.
- Set INTERVAL TIMER to DISABLE.
- Set rotary switches A-E (STORAGE ADDRESS) to desired stop address.
- Set ADDRESS COMPARE to select desired condition for stop, for example, ANY.
- Set ADDRESS COMPARE CONTROL three-position lever switch to STOP.
- Hit START.

Index

Module 5. Additional Information

Module Outline

What Else has been Changed in DOS Version 4?

System Generation

Many changes have been made to System Generation. A lot of new information has been added due to the changed functions of the Recovery Management Support Recorder (RMSR) and its features. Impact is also felt from new device support (mainly 3330 Disk Storage) and time-of-day clock support. Because of the volume of changed information it is outside the scope of this manual to include that information. You can find all details on how to generate your system in DOS Version 4 System Generation, GC33-5008.

Messages

A large number of messages has been changed, added, or deleted on account of the new or changed features in DOS Version 4 (new device support, RMSR, time-of-day clock support, EREP). For easy reference a new messages book has been published: DOS Version 4 Messages, GC33-5009. It lists all the messages required by System/370 operators.

Utility Programs

A small change has been made to the assign alternate track-disk (ALTDK) utility program. The initialize disk (INTDK) utility program has a new option, quick initialization (IQ) for the 3330. Some new restrictions apply to INTDK. In addition, all phase and module names have been changed for DOS Version 4 System Utilities.

Assembler

The assembler is basically unchanged for DOS Version 4. The 14K D variant can additionally make use of the 3330, 3410, 3420, 3505, and 3525. Workfiles on the 3330 may not use more than 256 cylinders; for this restriction a new message has been added.

Assign Alternate Track-disk

The track location parameter (R=ccccchhh) of the assign alternate track-disk program (ALTDK) can address cylinders 0-403 of the IBM 3330 Disk Storage. Only unconditional flagging without surface analysis (parameter IF) can be requested. When a 3330 track has been flagged as defective, the assign alternate track-disk program cannot be used to unflag that track.

The parameters IA and IU of the utility modifier statement are invalid for the 3330.

Initialize Disk

The Initialize Disk utility program (INTDK) can be invoked by means of the following utility modifier statement.

2311/2314/2319:

```
// UID {IR}
       {IA},Cn,R=(ccccchhh)
       {IS}
```

3330:

```
// UID{IS},Cn
      {IQ}
```

Surface analysis is not provided for the 3330. Instead of this analysis a quick initialization (parameter IQ) is provided for these devices.

The parameters IA and IR are invalid for the 3330. The IQ (quick initialization) parameter has been added.

The IQ parameter is invalid for the 2311 and 2314/2319. If IS is specified, the Replace Option (R=(ccccchhh)) is ignored.

The UPSI card (// UPSI 00000001) to be used for System/370 emulators is invalid for the 3330.

QUICK INITIALIZATION

The disk packs of the 3330 (the 3336 Disk Packs) are preinitialized by IBM. A home address (HA) and a track descriptor record (R0) are written on each track and alternate tracks are assigned for defective tracks. Thus only a quick initialization is necessary for these devices. This quick initialization writes a track descriptor record (R0) on each track, 2 IPL bootstrap records initialized with binary zeros, volume label(s), and the VTOC. The quick initialization function is invoked by specifying IQ in the input option parameter of the utility modifier statement.

VTOC Display

Because the module names have changed for DOS Version 4 System Utilities, the job streams required to link-edit and catalog the VTOC Display program (LVTOC) have to be written as shown in Figure VI.1.

Available I/O Area

The Initialize Disk (INTDK) and VTOC Display (LVTOC) utility programs can run in a 14K byte partition without any restriction. The other programs, when run in a 14K byte partition, can only perform a limited number of functions. The number of functions that can be performed depends on the required record size.

ALTDK REQUIREMENTS

In a 10K byte partition the record size may not be larger than 8,450 bytes. Normal transfer of the records from the defective to the assigned alternate track and vice versa would be impossible for larger records. If larger records are being processed, a message (8254D) is printed and the operator must either ask for the record to be truncated or the job to be canceled. If the record is truncated, the part exceeding the buffer size contains binary zeros. If no truncation is desired, the partition size must be at least 10K bytes plus the amount by which the record size (key length + data length) exceeds 8,450 bytes.

```
a. Batch-only supervisor

    // JOB BATCH          User-defined job name.
    // OPTION CATAL       Causes the program to be catalcged in the core image library.
     INCLUDE IJWLTVB     Used with batch-only supervisor. This module is
                         nonself-relocating.
    // LBLTYP TAPE        Required if tape label prccessing is to be performed.
    // EXEC LNKEDT        Executes the linkage edit program.
    /&                    Defines the end of the job stream.


b. Multiprogramming supervisor

    // JOB MULTI          User-defined job name.
    // OPTION CATAL       Causes the program to be catalcged in the core image library
     INCLUDE IJWLTVM     Used with multiprogramming supervisor. This module is
                         self-relocating.
    // EXEC LNKEDT        Executes the linkage edit program.
    // LBLTYP TAPE        Required if tape label prccessing is to be performed.
    // EXEC LVTOC         Executes the VTOC Display Program.
    /&                    Defines the end of the job stream.
```

Figure VI.1. Job streams for the VTOC display program.

For the update option (UY), the I/O area must be large enough to contain the update record plus all the records on the track with a record number greater than that of the updated record. If this restriction is not met, message 8255I is printed and the job is canceled.

DEVICE	PROBLEM PROGRAM AREA	MAXIMUM RECORD SIZE
2311	10K	3,625
2314/2319	12K	7,294
3330	18K	13,030
2321	10K	2,000

CLRDK REQUIREMENTS

In a 10K byte partition the record size may not exceed 8,400 bytes. If the record size is larger, the job is canceled. For records with a record size larger than 8,400 bytes, the job can only be run in a partition that is at least 10K bytes plus the amount by which the record size exceeds 8,400 bytes.

COPY AND RESTORE DISK REQUIREMENTS

All copy and restore disk programs require a buffer that is large enough to contain all the records on a single track. The following table lists the partition sizes required for records with a length that is equal to the various track capacities. This length is also listed.

Conversion Considerations for System Utilities

The phase and module names of the System Utilities have been changed for DOS Version 4. Figure VI.2 lists the old and new phase names side by side per utility. All the examples given in DOS and TOS Utility Programs, GC24-3465, are valid for DOS Version 4 after the correct phase names have been inserted.

Note: The old System Utilities can be used for systems that do not include any of the new devices supported by DOS Version 4.

Other System Utilities

The only parameter of the other system utilities that has been changed to support the 3330 is the device-type description parameter E=(e). 2311, 2314, and 3330 are all valid entries for this parameter.

	PHASE NAME	
	Version 3	Version 4
Assign Alternate Track - Disk	ATAD	ALTDK
Assign Alternate Track - Data Cell	ATAM	ALTDC
Clear Disk	CLRDSK	CLRDK
Clear Data Cell	CLDC	CLRDC
VTOC Display	LISTVTOC	LVTOC
Initialize Disk	INTD	INTDK
Initialize Tape	INTT	INTTP
Initialize Data Cell	INTM	INTDC
Copy Disk to Card	CRDC	CDKCD
Copy Disk to Tape	CRDT	CDKTP
Copy Disk to Disk	CRDD	CDKDK
Restore Card to Disk	CRCD	RCDDK
Restore Tape to Disk	CRTD	RTPDK

Figure VI.2. The old and new phase names for system utilities.

6.6 DOS Version 4 Additional Information

Supervisor Planning Concepts

COMREG*

Displacement hexadecimal	0	8	0A	0C	17	18	20	24	28	2C
Displacement decimal	0	8	10	12	23	24	32	36	40	44
	Date	Address of PPBEG	Address of EOSSP	Problem Program Use	UPSI Byte	Job Name	Highest Storage Address of the Partition	End Address of Last Phase Fetched or Loaded	Address of Uppermost Byte of Phase with Highest Ending Address	Label Area Length
	XXXXXXXX	XX	XX	XXXXXXXXXXX	X	XXXXXXXX	XXXX	XXXX	XXXX	XX

Displacement hexadecimal	2E	30	34	35	36	37	38	39	3A	3B	3C	3E
Displacement decimal	46	48	52	53	54	55	56	57	58	59	60	62
	PIK (PID)	End of Storage Address	Machine Confg. Byte	System Confg. Byte	Standard Language Translator I/O Options	Dump, Log and ASCII Options	Job Control Byte	Linkage Control Byte	Language Translator Control Byte	Job Duration Indicator Byte	Disk Address of Label Cylinder	Address of FOCL
	XX	XXXX	X	X	X	X	X	X	X	X	XX	XX

Job Control Switches

Displacement hexadecimal	40	42	44	46	48	4A	4C	4E	4F	58	5A	5C
Displacement decimal	64	66	68	70	72	74	76	78	79	88	90	92
	Address of PUB	Address of FAVP	Address of JIB	Address of TEB	Address of FICL	Address of NICL	Address of LUB	Line Count for SYSLST	System date	LIOCS Comm. Bytes	Address of 1st Part of PIB Table	ID Number of Last Checkpoint
	XX	XX	XX	XX	XX	XX	XX	X	XXXXXXXXX	XX	XX	XX

Displacement hexadecimal	5E	60	62	64	66	68	6A	6C	6E
Displacement decimal	94	96	98	100	102	104	106	108	110
	Length of LUB ID Queue = No. of Channel Queue Entries	Address of Disk Information Block (DIB)	Address of Error Recovery Block	Address of PC Option Table less 8 bytes	Address of IT Option Table less 8 bytes	Address of OC Option Table less 8 bytes	Key of Program with Timer Support	Address of the LUBID Queue	Logical Transient Key
	XX	XX	XX	XX	XX	XX	XX	XX	XX

Displacement hexadecimal	70	7C	7E	80	84	86	87	88	8C	8E	8F
Displacement decimal	112	124	126	128	132	134	135	136	140	142	143
	Supervisor Constants	Address of 2nd Part of PIB Table	Address of MICR DTF Table (PDTABB)	Address of QTAM Vector Table	Address of BG Comm. Region	Option Indicator	System Configuration Byte 2	Pointer to Comm. Region Extension	Reserved	Disk Configuration	Job zone in minutes
	XXXXXXXXXXX	XX	XX	XXXX	XX	X	X	XXXX	XX	X	XX

* The address of the communications region is in fixed location X'14'-X'17'.

Displacement values illustrated can be used to access the listing and/or the key that follows the figure. The key offers more detailed information about each area when necessary.

Figure VI.3. System communications region.

The following changes and additions have been made to the Communications Region:

- Displacement 59.
  Bit 6: 0 = No DATE statement processed
  1 = DATE statement processed.

- Displacement 134.
  Bit 0: Reserved.

- Displacement 135.
  Bit 1 : 0 = No TOD clock support
  1 = TOD clock support.
  Bits 2-7: Reserved.

- Displacement 140: Disk Configuration Byte.
  Bits 0-5: Reserved.
  Bit 6 : 0 = 3330 not supported
  1 = 3330 supported.
  Bit 7 : Always set to 1: 2311/2314 supported.

- Displacement 143: Job Zone.
  If ZONE=EAST, the value is positive
  If ZONE=WEST, the value is negative.

FOPT MACRO

Interval Timer Support (IT)

This parameter specifies whether the interval timer can be handled by problem programs. The interval timer cannct be used for time recording functions. A problem program can set the time interval for the interval timer through the SETIME macro. By using the STXIT, EXIT, and TECB macros, a specific routine within the problem program is entered when this time interval elapses. In a multitasking environment, only the main task can set a Timer Event Control Block (TECB).

If Job Accounting support is included in your system, the start and stop times for Job Accounting are calculated from the values at locations 80 and 84.

Time-of-Day Clock Support (TOD)

This parameter specifies whether your system includes support for the Time-of-Day (TOD) clock. The TOD clock keeps track of the time-of-day and is used for time-stamping functions. The TOD clock gives the realistic time at any given moment; you can obtain the time through the use of the GETIME macro. To set the proper time initially, the ZONE parameter is also available in the FOPT macro. This parameter sets the difference between local time and Greenwich Mean Time.

Tape Error Recording

This information replaces the corresponding information in the base publication.

The three options and their system generation specifications for tape error recording are:

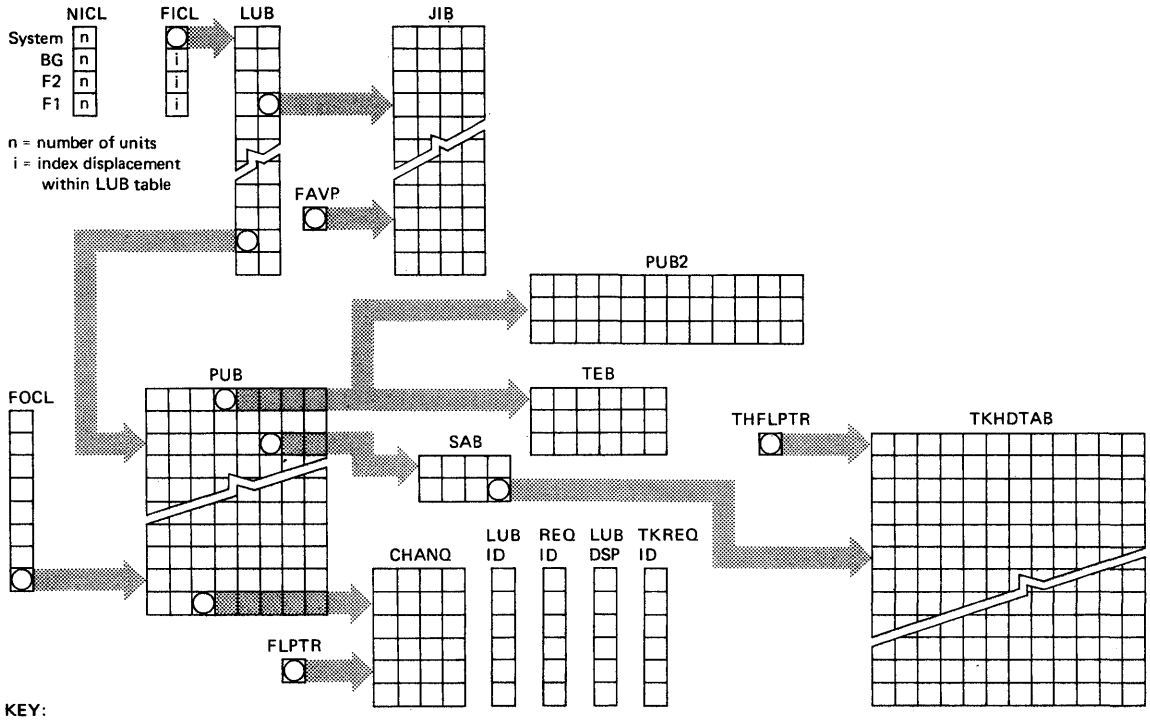
- Tape Error Block (TEB) by unit, TEB=n.
- Tape Error Statistics (TES), TEVB=(IR/CR).
- Error Volume Analysis (EVA), EVA=(r,w).

Any one or any combination of these options may be selected. A TEB table is generated for the TEB option. For the TES options the PUB2 table is used. Figure VI.4 shows the I/O interrelationship.

TEB: The system generates the number of tape cartridge reader error blocks specified by n. The 2495 Tape Cartridge Reader status is automatically collected and written on SYSLOG at the end of each job using the tape cartridge reader. The n must at least be equal to the number of tape cartridge readers attached to the system; additional TEBs should be specified for possible future expansion.

TES: The system makes a recording on SYSREC every time a new volume is detected. The tape serial number is compared at tape open; if it is not equal to the serial number in the PUB2 table, a Volume Dismount Record is written on SYSREC. The information on the SYSREC file is used to create a TES history tape; the contents of this tape is then dumped to SYSLST by means of the ESTV Dump File Program, ESVTUT.

EVA: The system prints a message on SYSLOG when the temporary read error threshold (r) or the temporary write error threshold (w) has been exceeded on a currently accessed tape volume. The number of SIO instructions is also included in the message. EVA can be used for both labeled and unlabeled tape volumes.



KEY:

NICL (Number in Class) : The first byte contains the number of system class units. The second, third, and fourth bytes contain the number of programmer class units (BG, F2, F1).

FICL (First in Class) : The first byte points to the first system class unit in the LUB table. (Always the first LUB table entry.) The second byte points to the first programmer class unit in the LUB table BG area. The third points to the first programmer class unit in the LUB table F2 area. The fourth points to the first programmer class unit in the LUB table F1 area.

LUB (Logical Unit Block) Table : The first byte points to a PUB table entry (if the logical unit is assigned) or contains X'FF'. The second byte points to a JIB table entry or contains X'FF'.

PUB (Physical unit block) Table : The first two bytes contain the channel and unit address of the physical device; the third a CHANQ pointer; the fourth a TEB pointer; the fifth device type codes; the sixth a device characteristic code or a SAB pointer; the seventh the channel scheduler flag; and the eighth has the job control flag.

FOCL (First on Channel List) : The first byte points to the first PUB (highest priority) on channel zero. The next byte points to the first PUB (highest priority) on channel one, etc. A hexadecimal FF indicates the associated channel is not supported.

TEB (Tape Error Block by Unit) : One TEB is built for each tape cartridge reader at supervisor generation time if tape error statistics by unit are required.

PUB2 Table : Contains statistical data about the errors occurring on an I/O device.

FAVP (First Available Pointer) : A one-byte pointer to the next available JIB entry.

JIB (Job Information Block) : The first two bytes contain extent or LUB information. The third contains ownership and JIB flags. The fourth contains JIB chaining information.

CHANQ (Channel Queue) Table : The first byte contains the chain field (a pointer to the next in queue). The last three bytes contain the CCB address.

LUBID (LUB Identification) : A one-byte pointer to the LUB making the I/O request.

REQID (Requestor Identification) : A one-byte pointer to the program containing the CCB.

LUBDSP (LUB Displacement) : A one-byte value equal to the absolute LUB number.

FLPTR (Free List Pointer) : A one-byte pointer to the next free entry in the channel queue.

SAB (Seek Address Block) : A four-byte (BCCH) address that is the current disk address of the device plus a fifth byte that contains a Track Hold Table pointer or X'FF'. If the Track Hold function is not supported, the fifth byte contains X'00'.

TKHDTAB (Track Hold Table) : The first byte contains a pointer to the next available entry (or X'FF'); bytes 2-4 have CCB address of the requesting task; bytes 5-10 have disk address (BBCCHH) of track being held; byte 11 has key of owning track; and byte 12 has two uses: bit 0=1 means a task is waiting for the track, and bits 4-7 count the number of holds on the track. Note that the number of holds is one greater than the value of bits 4-7 of the last byte.

THFLPRT (Track Hold Free List Pointer) : A one-byte pointer to the next free entry in the Track Hold Table.

TKREQID (Track Requestor Identification) : A one-byte pointer to the PIB of the task requesting I/O.

Figure VI.4. I/O table interrelationship.

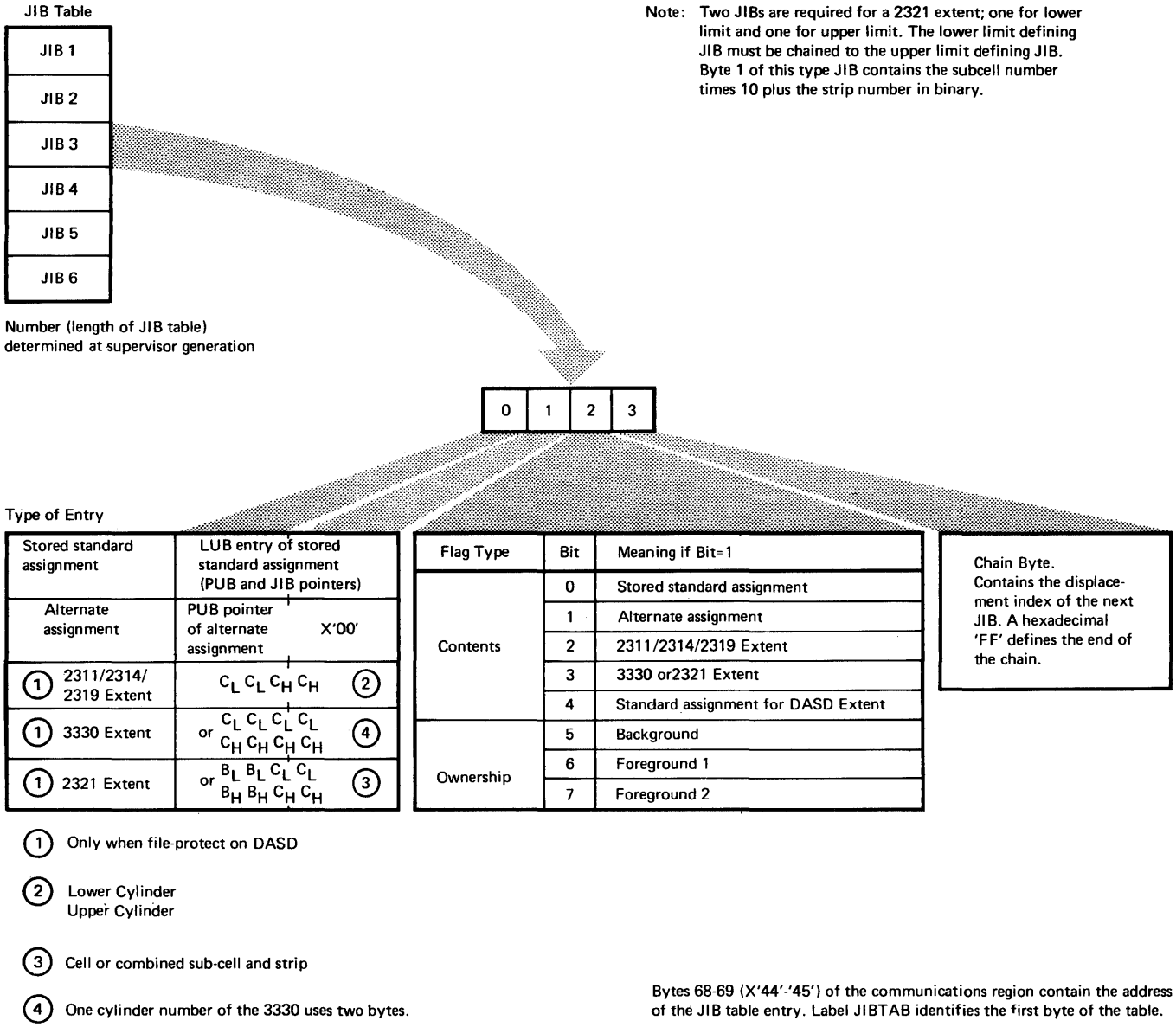


Figure VI.5. Job information block (JIB) table.

DASD FILE PROTECT SUPPORT (DASDFP)

Mode of Operation

Figure VI.5 describes the JIB entries required for 2311, 2314/2319, 2321, 3330. It replaces the corresponding figure in the base publication.

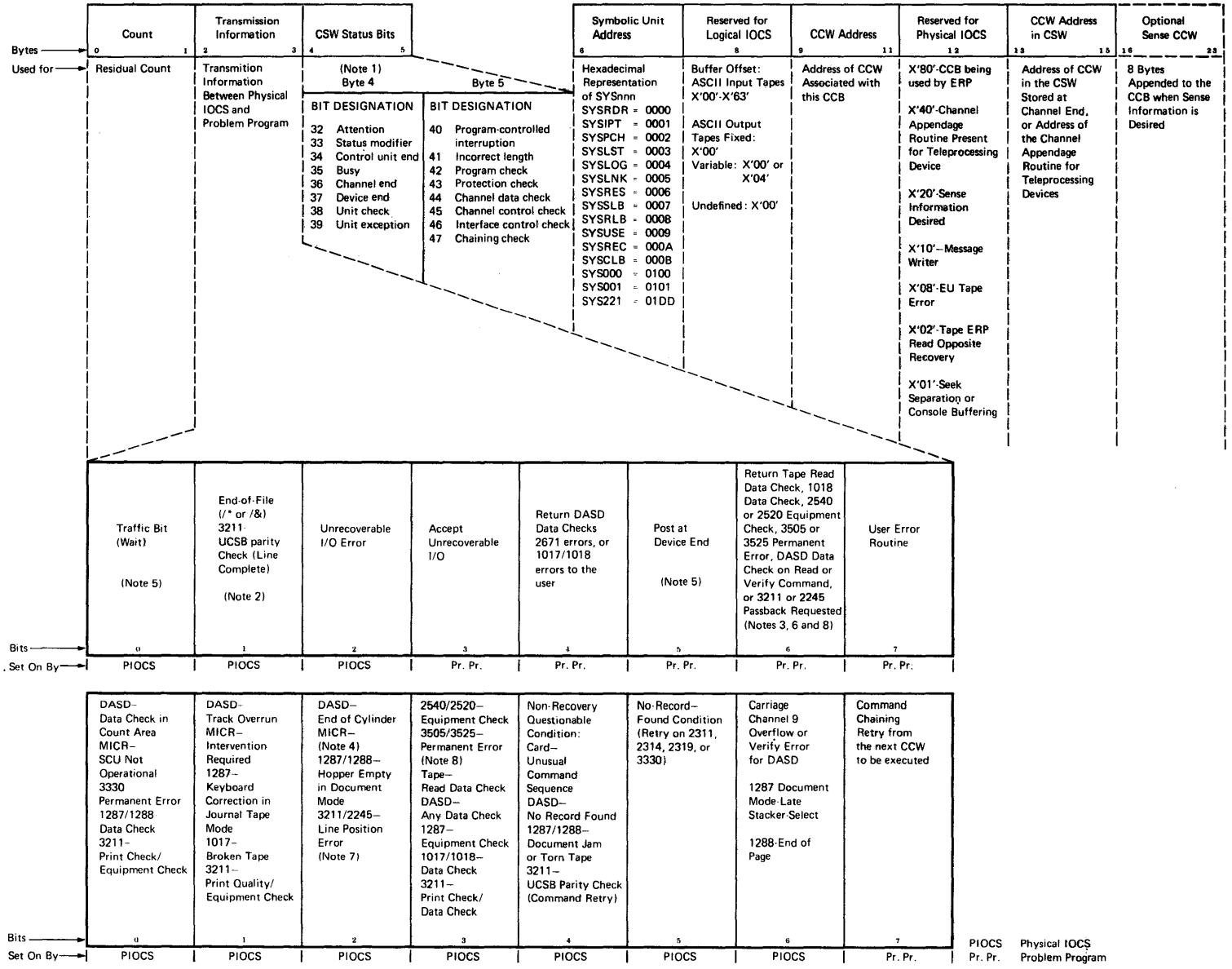
Note: To get file protection for all disks, DASDFP must be specified for the largest capacity disk of your system.

Data Management

PHYSICAL INPUT/OUTPUT CONTROL SYSTEM (PIOCS)

Command Control Block (CCB)

The CCB establishes communication between the problem program and physical IOCS. The fields of the CCB are shown in Figure VI.6, which replaces the corresponding figure in the base publication.



Note 1. Bytes 4 and 5 contain the status bytes of the Channel Status Word (Bits 32-47). If byte 2, bit 5 is on and device end results as a separate interrupt, device end will be ORed into CCB byte 4.
Note 2. Indicates /* or /& statement encountered on SYSRDR or SYSIPT. Byte 4, bit 7 (unit exception) is also on.
Note 3. DASD Data Checks on count not returned.
Note 4. For 1255/1259/1270/1275/1419, disengage. For 1275/1419D,'I/O Error in external interrupt routine (channel data check or busout check).
Note 5. The traffic bit (Byte 2, bit 0) is normally set on at channel end to signify that the I/O was completed. If byte 2, bit 5 has been set on, the traffic bit and bits 2 and 6 in byte 3 will be set on at device end. Also see Note 1.
Note 6. 1018 ERP does not support the Error Correction Function.
Note 7. For 3211, this error occurs as an equipment check, data check, or FCB parity check.
For 2245, this error occurs as a data check or FCB parity check.
Note 8. For 3505 and 3525 input and output files using ERROPT, byte 3, bit 3 is set on if a permanent error occurs. Byte 2, bit 6 is set on to allow you to accept permanent errors.

Figure VI.6. Command control block (Part 1 of 3).

Byte	Bit	Condition Indicated		On Values for Third Operand in CCB Macro	Mask for Test Under Mask Instruction
		1 (ON)	0 (OFF)		
2	0 Traffic Bit (WAIT)	I/O Completed. Normally set at Channel End. Set at Devices End if bit 5 is ON.	I/O requested and not completed		X'80'
	1 End of File on System Input	/* or /& on SYSRDR or SYSIPT. Byte 4, Unit Exception Bit is also ON.			X'40'
	3211 UCSB Parity Check (line complete)	Yes	No		
	2 Unrecoverable I/O Error	I/O error passed back due to program option or operator option.	No program or operator option error was passed back.		X'20'
	3[1] Accept Unrecoverable I/O Error (Bit 2 is ON)	Return to user after physical IOCS attempts to correct I/O error[2].	Operator Option: Dependent on the Error	X'1000'	X'10'
	4[1] 2671 data check.	Operator Options: Ignore, Retry, or Cancel.	Operator Option: Retry or Cancel.	X'0800'	X'08'
	1017/1018 data checks. Return any DASD data checks.	Ignore or Cancel. Return to user.	Cancel.		
	5[1] Post at Device End.	Device End condition is posted, that is, byte 2, bit 0 and byte 3, bits 2 and 6 set at Device End. Also byte 4, bit 5 is set.	Device End conditions are not posted. Traffic bit is set at channel End.	X'0400'	X'04'
	6[1] Return Uncorrectable tape read data check, (2495); 1018 data check, 2540 or 2520 punch equipment check; 3505 or 3525 permanent error[6], DASD read or verify data check; 3211 or 2245 passback requested. (Data checks on count not returned.)	Return to user after physical IOCS attempts to correct 3211, tape, or DASD error. Return to user when 1018 data check[4] Byte 3, bit 3 is also on for 3505 and 3525 permanent errors.	Operator Option: Ignore or Cancel for tapes, punches, or paper tape punch (1018). Retry or cancel for DASD.	X'0200'	X'02'
	7[1] User Error Routine	User handles error recovery.[3]	A physical IOCS error routine is used unless the CCB sense address operand is specified. The latter requires user error recovery.	X'0100'	X'01'
3	0 Data check in DASD count Field	Yes-Byte 3, bit 3 is OFF, Byte 2, bit 2 is ON.	No		X'80'
	Data check - 1287 or 1288.	Yes	No		
	MICR - SCU not operational.	Yes	No		
	3211 Print Check (equipment check.)	Yes	No		
	1 DASD Track overrun.	Yes	No		X'40'
	1017 broken tape.	Yes	No		
	Keyboard correction 1287 in Journal Tape Mode.	Yes	No		
	3211 print quality error (equipment check).	Yes	No		
	MICR intervention required.	Yes	No		
	2 End of DASD Cylinder	Yes	No		X'20'
	Hopper Emty 1287/1288 Document Mode.	Yes	No		
	MICR- 1255/1259/1270/1275/ 1419, disengage.	Document feeding stopped.	No		
	1275/1419D, I/O error in external interrupt routine.	Channel data check or Busout check.			
	3211 /2245 line position error.[5]	Yes	No		

Figure VI.6. Command control block (Part 2 of 3).

6.12 DOS Version 4 Additional Information

Byte	Bit		Condition Indicated		One Values for Third Operand in CCB Macro	Mask for Test Under Mask Instruction
			1 (ON)	0 (OFF)		
3	3	Tape read data check (2400 or 3400-series or 2495); 2540 or 2520 equipment check; 3505 or 3525 permanent error; or any DASD data check.	Operation was unsuccessful. Byte 2, bit 2 is also ON. Byte 2, bit 6 is also ON. Byte 3, bit 0 is OFF.	No		X'10'
		1017/1018 data check.	Yes	No		
		1287/1288 equipment check	Yes	No		
		3211 data check (print check).	Yes	No		
	4	Questionable Condition:	Card. Unusual command sequence (2540). DASD: No record found. 1287/1288: Document jam or torn tape.			X'08'
		Nonrecovery				
		UCSB parity check (command retry).	Yes	No		
	5[1]	No record found condition	Retry command if no record found condition occurs (disk).	Set the questionable condition bit ON and return to user.	X'0004'	X'04'
	6	Verify error for DASD or Carriage Channel 9 overflow	Yes. (Set ON when Channel 9 is reached only if Byte 2, bit 5 is ON).	No		X'02'
		1287 document mode - late stacker select.	Yes	No		
		1288 End -of-Page (EOP).	Yes	No		
	7[1]	Command Chain Retry	Retry begins at last CCW executed.	Retry begins at first CCW of channel program.	X'0001'	X'01'

1 User Options Bits. Set in CCB macro. Physical IOCS sets the other bits OFF at EXCP time and ON when the condition specified occurs.
2 I/O program check, command reject, or tape equipment check always terminates the program.
3 You may handle Channel Checks and interface Control Checks. The occurrence of a channel data check, unit check, or chaining check causes a byte 2, bit X'20' of the CCB to turn on, and completion posting and dequeuing to occur. I/O program and protection checks always cause program termination. Incorrect length and unit exception are treated as normal conditions (posted with completion). Also, the user must request device end posting (CCB byte 2, bit X'04') in order to obtain errors after channel end.
4 Error correction feature for 1018 is not supported by physical IOCS. When a 1018 data check occurs and CCB byte 2, bit X'02' is on, control returns directly to the user with CCB byte 3, bit X'10' turned on.
5 A line position error can occur as a result of an equipment check, data check, or FCB parity check.
For 3211, a line position error can occur as a result of an equipment check, data check, or FCB parity check; for 2245, line position errors can occur as a result of a data check or FCB parity check.
6 Set for output files to allow data management to return to your routines on permanent errors.

Figure VI.6. Command control block (Part 3 of 3).

LOGICAL INPUT/OUTPUT CONTROL SYSTEM (LIOCS) corresponding figure in the base publication.

Modular/Tabular System

DTF (DEFINE THE FILE) MACROS: , Figure VI.7 gives the possible module names for CDMOD, PRMOD, PTMOD, and MTMOD. It replaces the

Logic Module	Prefix	4th Character	5th Character	6th Character	7th Character	8th Character	Subsetting/ Supersetting + Permitted *Not Permitted
CDMOD	IJC	F RECFORM=FIXUNB V RECFORM=VARUNB U RECFORM=UNDEF	A CTLCHR=ASA Y CTLCHR=YES C CONTROL=YES Z Neither CTLCHR nor CONTROL specified	B RDONLY=YES and TYPEFLE=CMBND C TYPEFLE=CMBND H RDONLY=YES and TYPEFLE=INPUT I TYPEFLE=INPUT N RDONLY=YES and TYPEFLE=OUTPUT O TYPEFLE=OUTPUT	Z Neither WORKA nor IOAREA2 specified W WORKA=YES I IOAREA2=YES B Both WORKA=YES and IOAREA2=YES Z WORKA=YES not specified (CMBND file only)	0 DEVICE=2540 1 DEVICE=1442 2 DEVICE=2520 3 DEVICE=2501 4 DEVICE=2540 and CRDERR=RETRY 5 DEVICE=2520 and CRDERR=RETRY 6 DEVICE=3505 7 DEVICE=3525 and FUNC=R,FUNC=P, or FUNC omitted A DEVICE=3525 and FUNC=RP B DEVICE=3525 and FUNC=RW C DEVICE=3525 and FUNC=PW D DEVICE=3525 and FUNC=I E DEVICE=3525 and FUNC=RPW	* * * * * IJC F A B B 0 V Y V I 1 U + H W 2 C I Z 3 Z N 4 O 5 6 7 A B C D E
PRMOD	IJD	F RECFORM=FIXUNB V RECFORM=VARUNB U RECFORM=UNDEF	A CTLCHR=ASA Y CTLCHR=YES T DEVICE=3525 and 2-line print support C CONTROL=YES S STLIST=YES Z Neither CTLCHR nor CONTROL nor DEVICE nor STLIST specified	B if ERROPT=YES (ERROPT=name in DTFPR) and PRINTOV=YES P if PRINTOV=YES and ERROPT is not specified (ERROPT=RETRY or is omitted in DTFPR) E if ERROPT=YES (ERROPT=name in DTFPR) Z if neither ERROPT (ERROPT=RETRY or is omitted in DTFPR) nor PRINTOV is specified I PRINTOV=YES, DEVICE=3525, and FUNC=W[T] or FUNC is not specified F PRINTOV=YES, DEVICE=3525, and FUNC=RW[T] C PRINTOV=YES, DEVICE=3525; and FUNC=PW[T] D PRINTOV=YES, DEVICE=3525, and FUNC=RPW[T] O PRINTOV=YES is not specified, DEVICE=3525, and FUNC=W[T] or FUNC is not specified R PRINTOV=YES is not specified, DEVICE=3525, and FUNC=RW[T] S PRINTOV=YES is not specified, DEVICE=3525, and FUNC=PW[T] T PRINTOV=YES is not specified, DEVICE=3525, and FUNC=RPW[T]	I IOAREA2=YES Z IOAREA2 not specified	V RDONLY=YES and WORKA=YES W WORKA=YES Y RDONLY=YES Z Neither RDONLY nor WORKA specified	* * + * * IJD F A P I V V Y Z Z W U S + Y T I Z + O C + Z F R + C S + D T + B E

Figure VI.7. Generated name structure for logic modules.

Macro Instruction		TYPE OF PROCESSING WITH LOGICAL IOCS																
		Sequential												Direct Access Method	Indexed Sequential File Management System			
		3210/3215 Printer-Keyboards	1287 Optical Reader	1403/1443/ 3211 Printer	1419/1255/ 1259 Magnetic Ink. Character Reader	1270/1275 Optical Reader/Sorter	1442/2520/2540/ 3525 Punch	1442/2501/2520/ 2540/2596/3505/ 3525[10] Reader	2311/2314/2319/ 3330 Disk Drive	2321 Data Cell	2400 and 3400 Magnetic Tape Units	2671/1017 Paper Tape Reader	1018 Paper Tape Punch		Load File	Add Records	Random Retrieve	Sequential Retrieve
Initialize	OPEN(R)		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	LBRET[1]								X	X	X			X				
Process	GET	X	X		X	X		X[2]	X	X	X	X						X
	PUT	X		X			X	X[4]	X[3]	X	X		X					X
	READ		X		X	X			X		X			X			X	
	WRITE								X		X			X	X	X	X	
	CHECK				X	X			X		X							
	RELSE[5]								X		X							
	TRUNC[6]								X		X							
	WAITF		X		X	X								X	X	X	X	
	RDLNE		X															
	RESCN		X															
	DSPLY		X															
Set Mode	SETFL														X			
	ENDFL														X			
	SETL																	X
	ESETL																X	
Non Data Operations	CNTRL		X	X			X	X	X	X	X			X				
	CHNG[7]										X							
	PRTOV			X			X[11]											
	DISEN				X	X												
	LITE				X[9]	X[9]												
	ERET								X	X	X				X	X	X	X
Work Files for DASD and Magnetic Tape	READ								X		X							
	WRITE								X		X							
	CHECK								X		X							
	NOTE								X		X							
	POINTR								X		X							
	POINTW								X		X							
	POINTS								X		X							
Complete	CLOSE(R)		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	FEOV										X							
	FEOVD								X	X								
	FREE								X[8]	X[8]			X					
	LBRET[1]								X	X	X							
	SEOV										X							

Notes:
1. Applies only if DTFSR, DTFMT, DTFDA, or DTFPH LABADDR or XTNTXIT is specified.
2. In the 2520 or 2540, GET normally reads cards in the read feed. If TYPEFLE=CMBND is specified, GET reads cards at the punch-feed-read station.
3. PUT rewrites on input DASD record if UPDATE is specified.
4. In the 1442, 2520, or 2540, PUT punches on input card with additional information if TYPEFLE=CMBND is specified; PUT is supported by the 3525 if read/punch associated files are specified.
5. Applies only to blocked input records.
6. Applies only to blocked output records.
7. Provided only for upward compatibility for BPS and BOS.
8. Workfiles only.
9. Applicable to 1419 and 1275 with the Pocket Light Feature.
10. 3525 Card Punch with read feature.
11. 3525 Card Punch with print feature.

Figure VI.8. Logical IOCS imperative macros and devices.

Device Support for Assembler D

The following devices are additionally supported the DOS 14K Assembler D:

- 3505 Card Reader.
- 3525 Card Punch
- 3400-series Magnetic Tape Units
- 3330 Disk Storage.

If a 3330 disk storage extent is used for any of the assembler workfiles, the maximum number of cylinders that may be allocated is 256. If more than 256 cylinders are allocated, message IJQ117I is generated and the job step is terminated.

Diagnostic Error Messages

The following error message has been added for the Assembler D as used by DOS Version 4.

IJQ117I ABCRT - MORE THAN 256 CYLINDERS FOR WORKFILE

Cause: The extent for SYS001, SYS002, or SYS003 spans more than 256 cylinders on a 3330 disk pack.

System Action: The job step is terminated.

Programmer Action: Use the EXTENT cards or LSERV output to determine which file has the wrong extent. Perform any actions necessary to define the file on an allowable number of cylinders.

If the problem recurs have the LSERV output or EXTENT cards, program listing, and job stream available to complete your problem determination action.

Operator Action: If the job was submitted using standard (permanent) labels, execute LSERV and return the output to your programmer.

Telecommunications Access Methods

Basic Telecommunications Access Method (BTAM)

BTAM has changed for DOS Version 4 to include support for:

- The 2798 Guidance Display Unit.
- The 3270 Information Display System.
- The 3735 Programmable Buffered Terminal.
- The Recovery Management Support Recorder (RMSR).

Changes and additions to BTAM for the 2798 and the 3270 are described in DOS Version 4 Basic Telecommunication Access Method, GC27-6978. Changes for the 3735 are OS/DOS 3735 Programmer's Guide, GC30-3001.

The Recovery Management Support Recorder (RMSR) in BTAM provides a new macro instruction, RMSRTAB, to replace the SDRTAB macro instruction. However, SDRTAB may continue to be used; as with RMSRTAB, SDRTAB generates an RMSR table (an MNOTE informs you about the table) and RMSR processing is performed. For each existing BTAM application program the BTAM logic module, which is generated by the BTMOD macro instruction, must be reassembled before the program is run under DOS Version 4.

Queued Telecommunications Access Method (QTAM)

DOS QTAM is described in QTAM Message Processing Program Services, GC30-5003, and QTAM Message Control Program, GC30-5004. The contents of these manuals applies to DOS Version 4 QTAM, except for the following changes and restrictions:

- DOS Version 4 QTAM supports the 3330 Disk Storage. DEVICE=3330 can be specified as an operand of the TYPE=DA and TYPE=CK DTFQT macro instructions. If the 3330 is to be used, existing QTAM message control programs must be reassembled.
- Neither RMSR nor OBR/SDR error recording is available with DOS Version 4 QTAM. OBRSDR cannot be specified as an operand of the TERMTBL macro instruction. Existing QTAM message control programs that use RMSR or OBR/SDR must be reassembled.
- The 7772 Audio Response Unit is not supported by DOS Version 4 QTAM.

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DOS Version 4

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