NEVADA COBOL
for the Commodore 64

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Programmers' Reference Manual

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We hope you enjoy using NEVADA COBOL™ for the Commodore 64. NEVADA COBOL for the Commodore 64 runs under CP/M® 2.2 Operating System. Here are several other Commodore software packages which you should know about:

NEVADA FORTRAN™
This is an 8080/8085/Z80 version of FORTRAN IV. The compiler works from disk (also using the assembler) to produce machine code that executes at maximum CPU speed. First, a source program is entered as FORTRAN IV program statements and compiled to produce assembly code. Next, any errors must be corrected. Then, intermediate code is assembled into 8080 object code which is now ready for execution under CP/M.

EASY SCRIPT 64
This is a powerful word processor with table producing capabilities, comprehensive printer controls, easy update facilities, easy document handling, the ability to interact with EASY SPELL 64, and more.

THE WORD MACHINE and THE NAME MACHINE
This is an easy-to-learn and easy-to-use wordprocessing package. Perfect for letters, address lists, memos, and notes, these programs let you overtype, insert, and delete text; personalize form letters; and print in draft, formal, or informal formats.

EASY SPELL 64
Easy Spell 64 features the following: the automatic correction of spelling errors, the ability to count the number of words in your manuscript and interact with Easy Script 64, and a built-in 20,000 word dictionary that lets you add words not already stored there.

EASY MAIL 64
With Easy Mail 64, you can easily manage your address files. Label printing is also simplified with Easy Mail's ability to search for specific fields/categories. The program's features include entry, change, or deletion of a file by name or number; the capability to print one or two abreast labels; a HELP screen; and the ability to print a complete printout of all the data in each of your records.

EASY CALC 64
Easy Calc 64 is an easy-to-use electronic spread sheet which features editing functions and HELP screens. With Easy Calc 64, you can also print bar charts and individually formatted tables.

THE MANAGER
The Manager is a general data base for handing your files.

THE COMMODORE 64 MACRO ASSEMBLER DEVELOPMENT SYSTEM
This package is designed for experienced Assembly language programmers. Everything you need to create, assemble, load, and execute 6500 series Assembly language code is included.

SCREEN EDITOR
The Screen Editor helps you design software by letting you create and edit your own screens. This programming tool is for users with some computer experience.

SUPER EXPANDER 64
This cartridge is a powerful extension of the BASIC language which gives you the commands needed to easily access and implement Commodore's graphics, music, and sound capabilities. You will be amazed at how quickly and easily you can plot points and lines; draw arcs, circles, ellipses, rectangles, triangles, octagons; paint shapes with specified colors; read game paddle and joystick locations; create music and sound; display text; split screens to display both text and graphics; and program the function keys.

THE EASY FINANCE SERIES
Commodore is proud to announce **an entire series** of EASY FINANCE software packages which may solve many of your business and personal needs. The EASY FINANCE series is called "easy" because all of the programs are simple to operate and require no programming experience. Here is a brief description of each:

EASY FINANCE I — LOANS
LOANS shows you how to make the most out of your hard-earned money by calculating 12 different loan concepts for you. Principal, regular payment, last payment, and remaining balance are just some of the functions EASY FINANCE I can determine.

EASY FINANCE II — INVESTMENTS
INVESTMENTS helps you make the right financial decisions by showing you how to make the most out of 16 investment concepts. Functions such as future investment value, initial investment, and internal rate of return can be calculated.

EASY FINANCE III — ADVANCED INVESTMENTS
ADVANCED INVESTMENTS is an advanced version of EASY FINANCE II. It shows you how to make the most out of 16 more investment concepts. Financial terms are clarified and functions such as discount commercial paper, financial management rate of return, and financial leverage and earnings per share are included.

EASY FINANCE IV — BUSINESS MANAGEMENT
This is a business management package that shows managers how to make the right decisions about production, inventory, control, compensation, and much more. Lease purchase analysis, depreciation switch, and optimal order quantity are some of the 21 functions this program can calculate for you.

EASY FINANCE V — STATISTICS
STATISTICS shows you how to make the most out of statistics. This includes payoff matrix analysis, regression analysis forecasting, and apportionment by ratios.

Please contact your local Commodore dealer for additional information on other software available for your Commodore computer.

Thank you for owning a Commodore computer. Now that you are a member of the Commodore family, maybe you'd like to expand your computer's family. Here is a list of additional hardware which is compatible with your Commodore computer:

1525 Printer
This printer is an 80-column, dot-matrix, impact printer for creating printouts and hard-copies from your VIC 20 or Commodore 64. The printer features 30 characters per second print speed and prints graphics and text characters.

1526 Printer
This bi-directional, 80 column, dot-matrix, impact printer is excellent for creating printouts and hardcopies from your computer. The printer features programmable line spacing and a print format interpreter.

1520 Plotter/Printer
This is a four color, high resolution plotter that connects directly to your VIC 20 or Commodore 64 computer. With the 1520 Plotter/Printer you can plot on a piece of paper, the unique color graphics that you have created on your screen.

Commodore Speech Module
The speech module cartridge comes with a built-in vocabulary of 234 words which are easily programmed into sentences. The module "talks" in a pleasant female or male voice . . . it can generate other types of voices with special vocabularies geared to each software package. The speech module works with disk, tape, and also has a slot for accepting plug-in cartridges.

1701/1702 Monitor
This full color monitor is compatible with the VIC 20, Commodore 64, and other computers. The 1701/1702 Monitor features high quality resolution video and a built-in speaker with audio amplifier.

1530 DATASSETTE™
The 1530 DATASSETTE is a low cost, highly reliable way to store and retrieve programs and data. It features keys for Play, Record, Fast-Forward, Rewind, and Stop. The 1530 DATASSETTE uses standard audio cassette tapes and allows naming of programs and files, verification of programs, and programmable end of tape marker sensing.

Joystick and Paddles
Controls for games and entertainment.

Modem
The 1600 Modem telephone interface lets you communicate with other computer systems over your telephone line! The modem package includes cassette-tape terminal software, a free password and one-hour subscription to the CompuServe System™* and software controls for duplex, baud rate, and parity. There is also an optional adapter available for non-modular phones. The 1650 Automatic Modem features all of the above plus automatic answer and automatic dial.

PET 64
This unique machine combines many of the Commodore 64 features with the capabilities of the Commodore PET. However, sprites, color, and sound are not featured on this machine.

SX-64/DX-64 Portable Color Computers
These new computers are Commodore 64's in a convenient portable style. The model SX-64 (single disk drive) and DX-64 (double disk drive) are excellent investments for business people, as well as affordable for today's students.

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PREFACE

This reference manual assumes you already have the knowledge to program in COBOL and have read the Commodore 64 CP/M Operating System User's Guide. An additional list of supplementary materials can be found in the back of this book.

This manual is **not** a tutorial and will not teach you "how to" program in COBOL. However, for the experienced COBOL programmer who is already familiar with the CP/M Operating System, this manual provides the necessary tools for using NEVADA COBOL on your Commodore 64. The manual includes:

- General concepts of COBOL programming
- Details on using COBOL
- A list of Reserved Words
- A description of the four Divisions of a COBOL program
- Sample Programs
- Error Codes and Messages
- A Glossary of Terms

We hope you enjoy using NEVADA COBOL on your Commodore 64.

USER CONVENTIONS

It is recommended that you familiarize yourself with the Commodore keyboard. Here is a brief discussion of certain keys and symbols, and their respective use in the NEVADA COBOL manual. This will also help you interpret the syntax of the commands, including their optional features.

{ } Braces indicate that a choice must be made

[ ] Square brackets indicate optional information that may be omitted

... Several consecutive periods, "ellipses", specify that the preceding clauses can be repeated.

<CR> To continue on after a line of input, press the RETURN key.

Lower-case characters represent data to be supplied by the programmer

Emboldened UPPER-CASE characters are key words that must be used

Upper-case characters that are not emboldened are optional reserved words

COBOL RESERVED WORDS

The following ANSI-1974 COBOL Reserved Words can be used with NEVADA COBOL for the Commodore 64.

ACCEPT
ACCESS
ADD
ADVANCING
AFTER
ALL
ALPHABETIC
ALTER
AND
ARE
AREA
ASSIGN
AT
AUTHOR

BEFORE
BLOCK
BY

CALL
CANCEL
CHARACTERS
CLOSE
COLLATING
COMMA
COMP
COMPUTATIONAL
CONFIGURATION
CONTAINS
COPY
CURRENCY

DATA
DATE-COMPILED
DATE-WRITTEN
DEBUGGING
DECIMAL-POINT
DELIMITER
DEPENDING
DISPLAY
DIVIDE
DIVISION

ELSE
END
ENVIRONMENT
EQUAL
ERROR
EXIT

FD
FILE
FILE-CONTROL
FILLER
FIRST
FOR
FROM

GIVING
GO
GREATER

HIGH-VALUE
HIGH-VALUES

I-O
I-O-CONTROL
IDENTIFICATION
IF
INITIAL
INPUT
INPUT-OUTPUT
INSPECT
INSTALLATION
INTO
INVALID
IS

JUST
JUSTIFIED

KEY

LABEL
LEADING
LEFT
LESS

LINE
LINES
LINKAGE
LOW-VALUE
LOW-VALUES

MEMORY
MODE
MODULES
MOVE
MULTIPLY

NEXT
NO
NOT
NUMERIC

OBJECT-COMPUTER
OCCURS
OF
OFF
OMITTED
ON
OPEN
OR
ORGANIZATION
OUTPUT

PAGE
PERFORM
PIC
PICTURE
PROCEDURE
PROCEED
PROGRAM
PROGRAM-ID

QUOTE
QUOTES

RANDOM
READ
RECORD

RECORDS
REDEFINES
RELATIVE
REPLACING
REWRITE
RIGHT
ROUNDED
RUN

SAME
SECTION
SECURITY
SELECT
SENTENCE
SEQUENCE
SEQUENTIAL
SIGN
SIZE
SOURCE-COMPUTER
SPACE
SPACES
SPECIAL-NAMES
STANDARD
STATUS
STOP
SUBTRACT
SYNC
SYNCHRONIZED

TALLYING
THAN
THROUGH
THRU
TIMES
TO

UNTIL
USAGE
USING

VALUE

WITH
WORDS
WORKING-STORAGE
WRITE

ZERO
ZEROES
ZEROS

The following words are NEVADA COBOL Reserved Words (Not ANSI-1974):

ASCII
BEGINNING
COMP-3
COMPUTATIONAL-3
DISK
ENDING
FILE-ID
PRINTER

FILES ON THE NEVADA COBOL DATA DISK

CC.COM is the COBOL COMPILER and is always on the default drive at compile time.

W4.COM is a random file and is always on the default drive at compile time.

W5.CBL is the error message file and is always on the default drive at compile time. This file is a standard text file that may be changed by the user.

RUN.COM is the run time loader/subroutine code and can be on any drive. It is only used at run time.

ERRORS.COM displays the error report from the default drive. This program is used to re-display the error report from the last compile but is not required for compiling.

RENUMBER.CBL is a COBOL source code program that must be compiled before it can be used. It renumbers COBOL source programs.

CONFIG.CBL is a COBOL source code program that must be compiled before it can be used. It will configure the CRT for line length, BIOS and the delete character, etc.

CONVHEX.COM is used in conjunction with the CP/M assembler for those of you wishing to write called programs in assembly language. It converts (.HEX) files to (.OBJ) files. This program is executed as follows:

COMVHEX file-name**[.HEX]**

The program will create the output file if necessary with the same file-name and type (.OBJ). If you do a lot of work in assembly language, you may want to get Nevada FORTRAN, as it comes with an assembler that is compatible with Nevada COBOL.

FILES THAT WILL BE CREATED AT COMPILE TIME

W1.WRK is a work file and will be created on the default drive or the assigned drive at compile time.

W3.WRK is the error work file and will be created on the default drive at compile time.

1 INTRODUCTION

COBOL (Common Business Oriented Language) is a programming language that has been used for business applications since the early 1960's. COBOL is based on English and uses certain words and syntax rules derived from English. NEVADA COBOL for the Commodore 64 is an updated subset of COBOL and is designed for small businesses with a Commodore 64 microcomputer.

As in English, the basic unit of COBOL is the word. A "word" may be a COBOL reserved word or a word that you define. Reserved words have specific meaning to the COBOL compiler; programmer-defined words can be assigned to data-names and procedure-names and must conform to the COBOL rules for the formation of names.

As the programmer, you combine Reserved Words and your programmer-defined words into clauses and statements. A clause or a statement specifies one action to be performed, one condition to be analyzed, or one description of data. These clauses and statements can then be combined into sentences.

Sentences may be simple (one statement or clause), or they may be compound (several statements or several clauses). Logically related sentences can be combined into paragraphs; related paragraphs can be combined into sections. These sections are then placed in one of the appropriate program divisions.

There are four divisions in a COBOL program:

INDENTIFICATION DIVISION.
ENVIRONMENT DIVISION.
DATA DIVISION.
PROCEDURE DIVISION.

Each of the four divisions is briefly described in the chart at the end of this chapter. A more detailed description of the divisions is given in the subsequent chapters.

SETTING UP

The following is a list of the required Hardware:

- Your Commodore 64 computer
- The Commodore Z80 microprocessor (This is your CP/M Operating System cartridge.)
- A Commodore 1541 single disk drive or a Commodore IEEE interface and a CBM dual disk drive model 4040
- A video display monitor such as the Commodore Color Monitor Model 1701/1702

The following is a list of the required Software:

- Commodore's CP/M Operating System disk
- A text editor ED. COM is found on your Commodore CP/M Operating System disk.

GETTING STARTED

Throughout our discussion we will be referring to the following disks:

NEVADA COBOL Data disk
Included in your NEVADA COBOL software package, this disk should only be read. A listing of the files contained on this disk can be found at the front of this manual.

CP/M Operating System disk
This is your Commodore CP/M Operating System disk that you use with your Z80 cartridge.

CP/M-NEVADA COBOL Operations disk
This is a disk which you create.

Note that you should NEVER write on your NEVADA COBOL Data disk. To pervent any mistakes from occurring, be sure that your NEVADA COBOL Data disk is write protected. (Place a standard protection label over the "square cornered" notch on the disk.) Before continuing, consult your Commodore 64 CP/M Operating System User's Guide if you are not familiar with the DIR, ERA, PIP, and STAT commands.

Follow these steps to get started using NEVADA COBOL:

1. Use one of your CP/M Operating System disk backup copies to create your CP/M-NEVADA COBOL Operations disk. If you don't have a backup copy of the CP/M Operating System disk, see Section 4.2 The Copy Utility in your Commodore CP/M Operating System User's Guide.

2. Use the CP/M ERA command to erase all of the files except the PIP.COM and ED.COM files from your newly created NEVADA COBOL Operations disk.

3. If you are using the IEEE interface and the Commodore dual disk drive, insert the newly created CP/M-NEVADA COBOL Operations disk into drive 0 (A). Insert the NEVADA COBOL Data disk into drive 1 (B). Now, boot CP/M.

   If you have a 1541 single disk drive, insert the newly created CP/M NEVADA COBOL Operations disk into the disk drive and boot CP/M.

After CP/M is booted, the computer automatically displays an 'A >' prompt. This signifies disk A is ready to be accessed. Here is a sample of how each file should be copied on a single disk drive system. Remember, we will refer to the NEVADA COBOL Data disk as disk 'B' and the CP/M-NEVADA COBOL Operations disk as disk 'A'.

Use the PIP command to copy the files from your NEVADA COBOL Data disk to the CP/M-NEVADA COBOL Operations disk. PIP will prompt you throughout the entire copy process. To invoke the PIP program, input PIP after the 'A >' prompt:

A> PIP <CR>

After RETURN is pressed, an asterisk (*) is displayed on the following line. Now, copy and verify the file CONFIG.CBL:

*A:CONFIG.CBL = B:CONFIG.CBL[V]

The following prompt will then be displayed:

Insert disk B into drive 0, press return

Insert the NEVADA COBOL Data disk and press RETURN. The PIP program will read the file CONFIG.CBL from the disk. After a short period of time, the following prompt will be displayed:

Insert disk A into drive 0, press return

Insert the CP/M-NEVADA COBOL Operations disk and press RETURN. The PIP program will now write onto the disk the CONFIG.CBL file. Upon completion, an asterisk will appear. You can now continue copying your files from the NEVADA COBOL Data disk to the CP/M-NEVADA COBOL Operations disk using the following format:

*A:destination = B:source[V]

Continue this process until all files from the NEVADA COBOL Data disk are copied to the CP/M-NEVADA COBOL Operations disk. PIP can be terminated at any time by pressing RETURN after any asterisk (*) prompt.

We suggest now placing your NEVADA COBOL Data disk in a safe place. You will not need it unless something happens to your Operations disk. Depending on how much program development you do, it may be wise to backup your CP/M-NEVADA COBOL Operations disk at least once a day.

COBOL PROGRAMMING CONCEPTS

In English, vocabulary and punctuation are used to form sentences so that concepts can be clearly understood. In COBOL, similar techniques are used to form program statements. Here is a table to highlight some of these techniques.

Concept	Function	Example
Punctuation	A . , ; must immediately follow the last character of a word and be followed by a space. The , and ; are interchangeable. The opening parenthesis, '(', cannot be followed by a space; the closing parenthesis, ')' cannot be preceded by a space.	0001 MOVE MONEY (10) TO SAVING AND LOAN.
Verbs	Verbs are used in the PROCEDURE DIVISION. All verbs fall into the following categories:	

Type	Description	Example
Imperative	Gives a direct processing instruction	GO TO PERFORM
Conditional	Tests a condition (IF cannot appear in imperative statements)	IF A = B
Compiler Directing	Instructs the compiler during compilation time	COPY
Input-Output	Assists in the transfer of data between peripherals and memory	OPEN, CLOSE, READ, WRITE

MOVE Verb	Transfers data from one area of memory to another	MOVE (old field) TO (new field)
	To send to more than one field	MOVE (old field) TO (new field), (new field), (new field)
	To transfer numbers, use a numeric MOVE a) Align the decimal points b) Move the digits c) Fill in zeros	
Arithmetic	To add,	ADD (value) TO (field)
	subtract,	SUBTRACT (field1) FROM (field2) GIVING (field3)
	multiply and	MULTIPLY (number of times) BY (receiving field)
	divide values	DIVIDE (divisor) INTO (dividend) GIVING (quotient)
Sequence Control	To pass control to a statement that is not in sequential order	
	To permanently transfer control	GOTO (procedure name)
	To temporarily transfer control and return to the statement following the sequence interruption	PERFORM
	The last portion of a sequence control procedure consists of either of these	PERFORM (A) THRU (B) EXIT

THE FOUR DIVISIONS OF A COBOL PROGRAM

The IDENTIFICATION DIVISION lets you specify:

- Program Name
- Programmer's Name
- System or application
- Dates when written and compiled
- Security restrictions

```
0001  IDENTIFICATION DIVISION.
0002  PROGRAM-ID.
0003        T6WF.
0004* THIS PROGRAM CREATES A FILE OF FIXED LENGTH
0004* RECORDS IF THE RECORD SIZES ARE CHANGED TO
0004* YOUR NEEDS, CAN BE USED TO CREATE THE SPACE
0004* NEEDED (ALLOCATE) FOR A RANDOM FILE.
```

The ENVIRONMENT DIVISION lets you specify:

- Source — Computer used to compile the program
- Object — Computer used to execute the compiled Object program
- The Input-Output section for identifying the File — Control; i.e., location of each file referenced and how each file will be used
- Filenames may be up to 30 characters

```
0005  ENVIRONMENT DIVISION.
0006  CONFIGURATION SECTION.
0007  SOURCE-COMPUTER.
0008        8080-CPU.
0009  OBJECT-COMPUTER.
0010        8080-CPU.
0011  INPUT-OUTPUT SECTION.
0012  FILE-CONTROL.
0013        SELECT FILE1 ASSIGN TO DISK
0014          ORGANIZATION IS SEQUENTIAL
0015          ACCESS MODE IS SEQUENTIAL.
```

The DATA DIVISION lets you:

- Give a detailed description of all the data to be used, i.e., format of each file and record within each file
- Assign data-names to each of the items of data to be used
- Describe in the Working Storage Section records and data items that are not part of the files, but are used during the processing of the object program
- The Working Storage Section identifies intermediate storage areas along with constant values used.

```
0016  DATA DIVISION.
0017  FILE SECTION.
0018  FD FILE1
0019       LABEL RECORDS ARE STANDARD
0020       VALUE OF FILE-ID IS OUT-FILE-NAME
0021       BLOCK CONTAINS 1 RECORD
0022       DATA RECORDS ARE O-RECORD.
0023  01 O-RECORD.
0024       02 SEQ PIC 9999.
0025       02 REC1 PIC IS X(156).
0026       O2 SEQ2 PIC 9999.
0027  WORKING-STORAGE SECTION.
0028  01 OUT-FILE-NAME PIC X(14)
0029          VALUE "A:TESTF.WRK".
0030  01 X1 PIC 9999
0031          VALUE 0001.
```

The PROCEDURE DIVISION lets you:

- Define the necessary instructions for solving the program

```
0032  PROCEDURE DIVISION
0033  BEGIN.
0034       DISPLAY "ENTER OUTPUT FILE NAME".
0035       DISPLAY OUT-FILE-NAME WITH NO ADVANCING.
0036*  TO ACCEPT AND USE THE FILE-NAME JUST DISPLAYED
0036*  YOU CAN HIT THE <CR> KEY. SEE #2 UNDER ACCEPT.
0036       ACCEPT OUT-FILE-NAME.
0037       OPEN OUTPUT FILE1.
0038       MOVE SPACES TO O-RECORD.
0039  BEGIN2.
0040       MOVE X1 TO SEQ.
0041       MOVE X1 TO SEQ2.
0042       ADD 1 TO X1.
0043       DISPLAY O-RECORD.
0044       WRITE O-RECORD.
0045       IF X1 IS = TO 201
0046          GO TO EOJ.
0047       GO TO BEGIN2.
0048  EOJ.
0049       CLOSE FILE1.
0050       STOP RUN.
0051  END PROGRAM T6WF.
```

2 RUNNING NEVADA COBOL

Now, boot up the newly created NEVADA COBOL Operations disk. Notice that CP/M display's the amount of memory available. Compiling and executing of COBOL programs should be done with the same CP/M version or one of larger memory unless your COBOL programs are given an upper address limit. Also, do not write protect this Operations disk because during compile time, data will be written onto it.

The next step is to compile the program called CONFIG. This is done by typing the following:

A> CC CONFIG

The disk drive(s) will work away and the COBOL compiler will finally display SUCCESSFUL COMPILE. If you have any problems compiling, read ahead about compiling a program, as on small disk drives you may have to assign files to other disk drives or make space available on the default drive. Normally, everything should go smoothly and work properly if the compiler has been copied correctly.

Next, type the following:

A> RUN CONFIG

where RUN.COM and CONFIG.OBJ are both on the current logged-in disk drive (A). The program CONFIG is used to specialize the RUN time package and asks the following questions:

ENTER SCREEN INFORMATION
ENTER 2-DIGIT HEXADECIMAL CODE FOR DELETE-KEY
enter 08
ENTER 2-DIGIT HEXADECIMAL CODE FOR BACKSPACE CURSOR
enter 08
IS THE BACKSPACE PRECEDED WITH AN ESCAPE CHARACTER (Y/N)?
enter N
ENTER # OF CHARACTERS ACROSS SCREEN
enter 40
ENTER # OF LINES PER SCREEN PAGE
enter 25
DOES YOUR BIOS ISSUE A CR/LF AT THE END OF EACH LINE (Y/N)?
enter Y
DOES YOUR PRINTER REQUIRE A LINE FEED (Y/N)?
enter Y

DO YOU WANT TO USE CPM FUNCTION 1 & 2 CONSOLE I-O (Y/N)?

usually Y (user's option)
If N, other information will be displayed
Answer N if you will be sending escape characters to the CRT.

DOES YOUR CPM BACKSPACE AND BLANK THE DELETED CHARACTER (Y/N)?

this is usually N

DO YOU WANT TO ACCEPT ANY HEX CHARACTER OR ONLY DISPLAY ASCII (H/A)?

this is usually A

EOJ CONFIG RETURNING TO CPM
CC RENUMBER

Compiling RENUMBER.LBL creates RENUMBER. OBJ which automatically numbers or renumbers user written programs.

Once the CONFIG program has been run and you are satisfied with the ACCEPT/DISPLAY functions, the programs are no longer needed on the CP/M-NEVADA COBOL Operations disk and may be removed as follows:

A> ERA CONFIG.*
A> ERA RENUMBER.CBL

On some single density 5¼ disks, you may want to have a separate disk for compiling only. This disk needs only the following files:

CC.COM	about 6K.
W4.COM	about 30K.
W5.COM	about 6K.

And at run time, you can also have a separate disk. It only needs one file:

RUN.COM	about 12K.

With this disk file arrangement, the COBOL compiler will work on disks with very limited disk space.

BUILDING A PROGRAM

The first step is to create a COBOL source program file. This file will later be submitted to the COBOL compiler for compilation. Create the file by using a text editor. You can copy an existing COBOL source file such as RENUMBER.CBL that is on the NEVADA COBOL Data disk and create a new program file called, for example, MYPROG.CBL. Then, modify MYPROG.CBL as required. This saves keying time as well as avoiding the possibility of misspelling required keywords.

Each line of the COBOL source file must be terminated with a carriage return line feed. This is automatically done with text editor, ED.COM which should now be on your CP/M-NEVADA COBOL Operations disk.

COBOL CODING FORMAT

	ANSI-1974 column	NEVADA COBOL column
Sequence number	1-6	1-4
Indicator area	7	5
A-field	8-11	6-9
B-field	12-72	10-70

1. You can use either format because the compiler looks at the first line of the source program and determines either 4 position or 6 position line numbers are used. When converting ANSI programs to NEVADA COBOL (or vice versa) adjust the sequence number by two positions and the other columns will align properly. We felt that 9999 sequence numbers would be enough for microprocessors and would also be compatible with other microprocessor software (i.e. RENUMBER, edits, etc.).

2. The indicator area can contain only the following:
   - `*` which indicates a comments line.
   - `/` which indicates a comments line after head of forms.
   - SPACE which indicates a standard COBOL statement line.
   - D which indicates a Debugging line.
   - — which indicates a continuation line. When a non-numeric literal is continued, a quotation mark (") must also appear in column 10.

   All other characters are flagged by the compiler and are treated as comment lines.

3. Sequential line numbers are required because all errors are referenced by a line number.

4. Each line must be terminated by a carriage return line feed (ODOA hex).

EXAMPLE:
Columns
12345678901234567890123456789O
0001 IDENTIFICATION DIVISION.
0002* this is a comment line. the next line is blank
0003*

COMPILING A PROGRAM

To compile a program simply type CC file-name. A copyright message will appear until the error report is displayed or until the successful compile message is displayed. Using the error report line number/message, correct the source and recompile if necessary. The compile can be interrupted (aborted) by pressing the CONTROL-C keys. In the following examples, the CP/M operating system gives the prompt A > and the user types in the rest of the line.

A> CC RENUMBER <CR>

In the above case, the source file RENUMBER.CBL is on the default drive. The object code file will be created if necessary on the default drive with the file-name of RENUMBER.OBJ. The work file W1 will be created if necessary on the default drive.

A> CC SOURCE.BBB <CR>

In the above example, all assignable files are on disk drive B. The type field is used for drive assignment. The first position is for the source file, the second position is for the object file and the third position is for W1, a large work file. All source files must be type '.CBL'.

A> CC CONFIG.ABB <CR>

In the above case, the source file CONFIG.CBL is on drive (A) and the object file CONFIG.OBJ will be created if necessary on drive (B) as will the work file W1.WRK.

Warning: If you forget and type CC file-name.CBL, you will get a CP/M BDOS Select Error. This is because the computer will look for drive C: or L: in error.

EXECUTING A PROGRAM

Once the object file has been produced, the program can be executed by simply typing RUN file-name. The run time package is called RUN and lives in memory locations 100H to 2EFFH. It contains a special loader and all the required run time subroutines. Execution of the program can be interrupted (aborted) by pressing the CONTROL C keys.

A> RUN[u:]OBJECT <CR>

In the above case, RUN is on the logged-in drive. The optional [u] would be the disk drive of where the OBJECT resides if other than drive (A).

B> RUN A:PAYROLL <CR>

In the above case, RUN.COM is on the current logged-in drive (B) and PAYROLL.OBJ is on drive (A).

A> RUN RENUMBER <CR>

where RUN.COM and the object program RENUMBER.OBJ are both on the current logged-in disk drive (A). The program RENUMBER is used to renumber the first four positions of COBOL source code programs. After loading, the following prompt appears:

ENTER FILE NAME A:FILENAME.TYP

at this point the user enters his program-name.

A:CONFIG.CBL

The program then renumbers the requested file-name and when complete displays:

RENUMBERING COMPLETE

In some cases, the renumber program issues error messages. If an input line is all spaces (blank) or if any of the first four positions contain a tab character (09H), the user is notified that the line has been skipped. This is because the renumber program uses the rewrite statement which cannot expand the input. Warning, on some implimentations of CP/M, it has been reported that these blank lines cause the file to be destroyed. If this should happen, you must not use blank lines or tabs!

EXAMPLE:
Columns
1234567890123456
0001*
*
9999/ head of form comment line is OK

LISTING A PROGRAM

To list a NEVADA COBOL source code program, use the CP/M TYPE command; and, if you have a printer, use CTRL-P.

```
A> TYPE RENUMBER.CBL[CTRL-P] <CR>
A> TYPE CONFIG.CBL <CR>
A> TYPE W5.CBL <CR>
```

3 IDENTIFICATION DIVISION

The IDENTIFICATION DIVISION of a COBOL program is entirely for documentation purposes only and is treated as comments by the compiler. However, the required key words are checked, so all text must be in upper-case and follow the COBOL rules.

FUNCTION: To identify the source program for documentation purposes.

FORMAT:

IDENTIFICATION DIVISION.
PROGRAM-ID. program name.
[AUTHOR. comment entry.**]**
[INSTALLATION. comment entry.**]**
[DATE-WRITTEN. comment entry.**]**
[DATE-COMPILED. comment entry.**]**
[SECURITY. comment entry.**]**

EXAMPLE:

```
0001  IDENTIFICATION DIVISION.
0002  PROGRAM-ID. TEST1.
0003  AUTHOR. COMMODORE BUSINESS MACHINES.
0004  INSTALLATION. WEST CHESTER, PA
0005  DATE-WRITTEN. JULY 1, 1983.
0006  DATE-COMPILED. JULY 17, 1983.
0007  SECURITY. COPYRIGHT CBM, INC.
0008*   comment lines with * in column 5 can be lower-case.
```

Another statement that can be placed in the IDENTIFICATION DIVISION is the COPY statement. The COPY statement inserts text into the source program at compile time.

FORMAT:
COPY u:filename.

RULES:

1. A COPY cannot occur within another COPY.
2. The disk unit (u:) is optional. The current logged-in disk drive is used as the default if the unit is not specified.
3. The COPY statement should be preceded by a space and terminated by a period, normally, starting in column 7.
4. The file type is not part of the COPY statement, but must be type CBL.

EXAMPLE:

```
0001  IDENTIFICATION DIVISION.
0002  PROGRAM-ID. TESTCOPY.
0003     COPY A:FILE1.
0008     COPY A:FILE2.
0015     COPY B:FILE3.
```

The following represents a separate file named FILE1.CBL to be included (copied) by the above copy statement line 0003.

```
0004  AUTHOR. COMMODORE BUSINESS MACHINES.
0005  INSTALLATION. WEST CHESTER, PA
0006  DATE-WRITTEN. AUGUST 7, 1982.
0007  DATE-COMPILED. AUGUST 7, 1982.
```

4 ENVIRONMENT DIVISION

The ENVIRONMENT DIVISION identifies the computer to use for program compilation and execution. The ENVIRONMENT DIVISION may consist of a CONFIGURATION SECTION, INPUT-OUTPUT SECTION and COPY information.

FORMAT:

ENVIRONMENT DIVISION.
CONFIGURATION SECTION.
SOURCE-COMPUTER. comment [WITH **DEBUGGING MODE**].
OBJECT-COMPUTER. comment

{**MODULES**}
{**WORDS**}
[**MEMORY** SIZE integer-1 {**CHARACTERS**}]
[**MEMORY BEGINNING** integer-1 **ENDING** integer-2]
[PROGRAM COLLATING **SEQUENCE** IS **ASCII**].
SPECIAL-NAMES. [**CURRENCY** SIGN **IS** literal-1]
[**DECIMAL-POINT IS COMMA**].

RULES:

1. The generated object code uses memory up to integer-1 CHARACTERS (upper-address limit), if specified. Format 2 specifies a MEMORY BEGINNING address and an ENDING address used to relocate CALLed programs. If these clauses are not used, the generated object code will use all available contiguous memory.
2. At compile time, the Compiler uses all available contiguous memory.
3. When WITH DEBUGGING MODE is specified, lines with "D" in column 5 are also compiled.
4. PROGRAM COLLATING SEQUENCE IS ASCII is treated as comments by the compiler since the machine collating sequence is ASCII.
5. The literal which appears in the CURRENCY SIGN IS literal clause is used in the PICTURE clause to represent the currency symbol. The literal is limited to a single character and must not be one of the following characters.

   a. digits 0 thru 9;
   b. alphabetic characters A, B, C, D, L, P, R, S, V, X, Z, or the space;
   c. special characters ,* + – ;()"/ =

   If this clause is not present, only the currency sign is used in the picture clause.

6. The clause DECIMAL-POINT IS COMMA means that the function of comma and period are exchanged in the character-string of the PICTURE clause and in numeric literals.

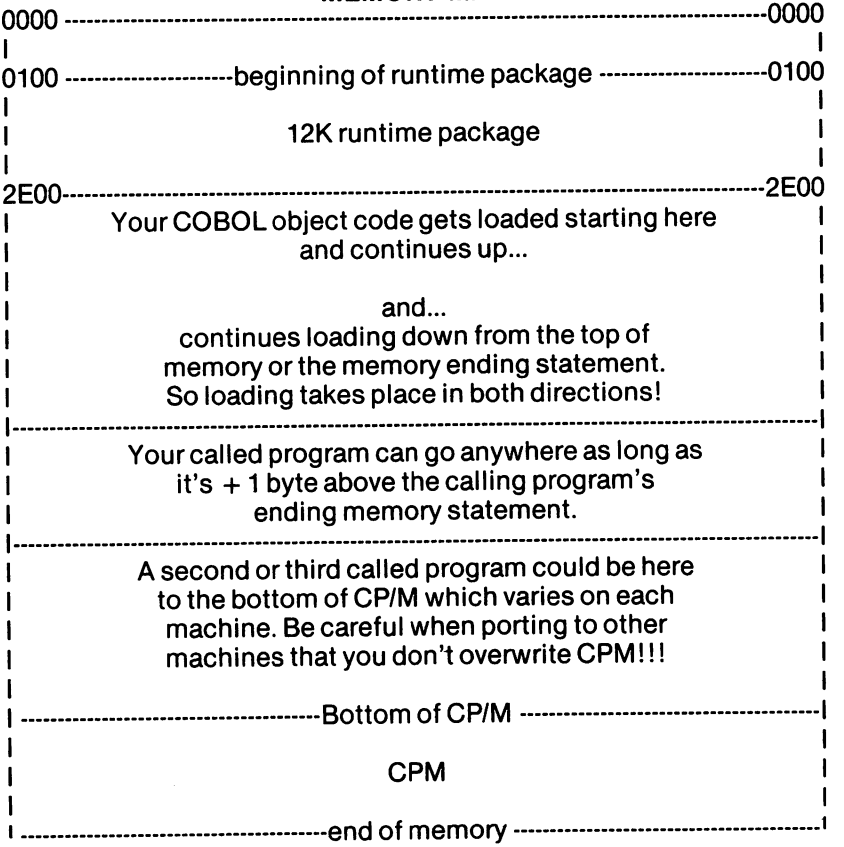
7. Integer-1 and integer-2 in the MEMORY SIZE clause are addresses. Users with relocated versions please remember to adjust these addresses upwards.

EXAMPLE:

```
0011   ENVIRONMENT DIVISION.
0012   CONFIGURATION SECTION.
0013   SOURCE-COMPUTER. 8080-CPU.
0014        WITH DEBUGGING MODE.
0015   OBJECT-COMPUTER. 8080-CPU.
0016        MEMORY SIZE 16383 CHARACTERS.
0017*  the following line would be used for called programs.
0018        MEMORY BEGINNING 16384 ENDING 32767.
```

Here is a Memory Map to help you visualize where the various portions of your program may be placed in memory.

MEMORY MAP



The **INPUT-OUTPUT** SECTION names each file used and specifies the associated external hardware devices.

FORMAT:

INPUT-OUTPUT SECTION.

FILE-CONTROL.

SELECT filename-1 **ASSIGN** TO

{**PRINTER**}
{**DISK**}

[, **ORGANIZATION** is {**SEQUENTIAL**} {**RELATIVE**}]

[, **ACCESS** MODE **IS** {**SEQUENTIAL**} {**RANDOM**}]

[**RELATIVE** KEY **IS** dataname-1]

[RECORD **DELIMITER** IS **STANDARD**]

[, FILE **STATUS** IS dataname-2].

I-O-CONTROL.

SAME [**RECORD**] AREA FOR filename-1, filename-2...

RULES:

1. Each filename-1 must be unique.
2. The RECORD DELIMITER statement cannot be used with the PRINTER.
3. When the RECORD DELIMITER statement is specified, each record is variable length and separated by a carriage return and line feed.
4. On a delimited write, the record to be transferred is first searched from right to left for the first non-blank character and the delimiter is placed one position to the right of it. The record including the delimiter is then transferred.
5. On a delimited read, the record is transferred from left to right until the record area is filled or until a delimiter is detected in the incoming data. The delimiter is not transferred to the user area. If the data record is shorter than the record area space, the previous data remains unaltered.

6. Dataname-2 must be defined in the WORKING-STORAGE section as a two (2) character alphanumeric data item.

Position 1 (STATUS KEY 1)	Position 2 (STATUS KEY 2)
0 = Successful completion	0 = No information available
1 = AT END	X = SEE ERROR CODES
2 = INVALID KEY	
3 = PERMANENT ERROR	
9 = SEE STATUS KEY 2	

7. ORGANIZATION IS RELATIVE applies only to fixed length DISK files. If this clause is not specified, then ORGANIZATION IS SEQUENTIAL is assumed.
8. The RELATIVE KEY uniquely identifies each record in a RANDOM file by an integer greater than zero. This number specifies the records logical ordinal position in the file. For example, the tenth record is the one addressed by relative record number 10 and is in the tenth record area.
9. The RELATIVE KEY is multiplied by the record size and divided by the physical block size and the block is retrieved.
10. The RELATIVE KEY is always an unsigned integer with size 7 or less in the WORKING-STORAGE SECTION.
11. SAME RECORD AREA is for documentation purposes only.
12. A RELATIVE file is created with a fixed length sequential write program to allocate the file space.
13. When RECORD DELIMITER is not specified, the records are output in fixed length format — each one the size of the longest record description for that file.
14. On INVALID KEY the user record area results are unspecified (filled with padding 1AH characters).
15. On fixed length read when the last record is short, the remainder of the user area is filled with padding characters.
16. On a DELIMITED read when a short record is read, the results to the right of the last valid input character are unspecified (whatever was there from before the read). It's a good idea to move spaces to the record area before each read.
17. On a DELIMITED read if the input data contains a tab character (09H), it is passed to the user unchanged. If we expanded the tabs, then we could not use packed decimal data types because of the possibility of 09H a valid combination in packed decimal. Therefore, we don't process the tabs. This allows the use of packed decimal (COMP-3) data types in DELIMITED files. CP/M has a program called PIP that can be used to expand tab characters. See your Commodore

64 CP/M Operating System User's Guide for a description of the PIP (T) option.

18. If the DISK is SELECTed, then the information will be associated with the DISK. However, if the PRINTER is SELECTed, you have the option of sending information to the PRINTER or DISK. The choice can be made at compile time or at run time depending on which LABEL RECORDS clause is chosen in the (FD) File Description entry, described later.

EXAMPLE:

```
0021   INPUT-OUTPUT SECTION.
0022   FILE-CONTROL.
0023       SELECT OLD-PAYROLL-MASTER-FILE
0024         ASSIGN TO DISK
0025         ORGANIZATION IS SEQUENTIAL
0026         ACCESS MODE IS SEQUENTIAL
0027         RECORD DELIMITER IS STANDARD
0028         STATUS IS STA-1
0029       SELECT LISTING ASSIGN TO PRINTER.
0030       SELECT NEW-PAYROLL-MASTER-FILE
0031         ASSIGN TO DISK
0032         ACCESS MODE IS RANDOM
0033         RELATIVE KEY IS KEY3
0034         STATUS IS STA-2
```

NOTE: Also see Appendix I Sample Programs at the end of this manual.

The COPY statement inserts text into the source program at compile time.

FORMAT:

COPY u:file-name.

RULES:

1. A COPY cannot occur within another COPY.
2. The disk unit (u:) is optional. If not specified, the default drive is used.
3. The COPY statement should be preceded by a space and terminated by a period, normally, starting in column 7.
4. The file type is not part of the COPY statement, but must be type CBL.

EXAMPLE:

```
0011   ENVIRONMENT DIVISION.
0012   COPY A:FILE4.
0013*    the following copy looks for FILE5.CBL on the default
0014*    drive
0015   COPY FILE5.
```

5 DATA DIVISION

The DATA DIVISION specifies the particular characteristics of each file.

FORMAT:

DATA DIVISION.
FILE SECTION.
FD file-name

[,**BLOCK** CONTAINS integer-1 {**RECORDS**} {**CHARACTERS**}]

LABEL {**RECORD** IS **OMITTED**} {**RECORDS** ARE **STANDARD**}

VALUE OF FILE-ID IS {data-name-1} {**literal-1**}

[**DATA** {**RECORD** IS} {**RECORDS** ARE} record-name-1 [record-name-2]].

RULES:

1. BLOCK CONTAINS clause is for documentation purposes only.
2. LABEL RECORDS ARE STANDARD must be used for all disk files and may be used for printer files.
3. VALUE OF FILE-ID must also be used for all disk files and may be used for printer files.
4. Literal-1 is a 1-14 character file name and disk unit. The disk unit is optional and if not present at run time, the currently logged-in disk unit will be used.
5. To send output directly to the printer, specify VALUE OF FILE-ID IS "A:PRINTER". Any other file-name sends the output to the disk.
6. LABEL RECORD IS OMITTED can only be used for SELECTed PRINTER files and sends output directly to the printer which cannot be redirected at run time. Also, if this clause is used, then the clause VALUE OF FILE-ID cannot be used.

   However, if the clause LABEL RECORDS ARE STANDARD is used in conjunction with a SELECTed PRINTER file, then the clause VALUE OF FILE-ID must be used. This combination allows the user the choice of redirecting the printer output to the disk at compile time or run time.

At compile time, the user can specify the printer by using a literal which contains the key word PRINTER. Any other name will be treated as a disk file name and the information will be sent to it. If the file does not exist, it will be created.

If the user wishes to reassign the printer at run time, then a data-name is used in place of the literal. The keyword PRINTER is used as the value of the data-name if the information is to be sent to the printer. Any other name will send the information to the disk. If the disk file does not exist, it will be created.

EXAMPLE:

```
0041   DATA DIVISION.
0042   FILE SECTION.
0043   FD  NEW-PAYROLL-MASTER-FILE
0044         LABEL RECORDS ARE STANDARD
0045         VALUE OF FILE-ID IS "A:MASTER.ACT"
0046         DATA RECORDS ARE HOURLY, SALARY.
0047*   note record descriptions go here. see next examples
0066   FD  LISTING LABEL RECORDS ARE STANDARD
0067*   note the next line sends data directly to the printer
0068*   see cp/m STAT command for printer assignment
0069*   using the LST: to serial or parallel port
0070         VALUE OF FILE-ID IS "PRINTER"
0071         DATA RECORD IS PRINT-LINE.
0100   FD  THE-SOURCE  LABEL RECORDS ARE STANDARD
0101         VALUE OF FILE-ID IS THE-FILE
0102         DATA RECORD IS DISK-IN.
0103   FD  LIST-SPOOL
0104         LABEL RECORDS ARE STANDARD
0105*   note the next line sends data to disk file for later
0106*   printing. see cpm TYPE command using control-p.
0107         VALUE OF FILE-ID IS "B:LIST.TXT"
0108         DATA RECORD IS PRT-LINE.
0109   FD  LIST2
0110*   note the next line sends data directly to printer
0111         LABEL RECORD IS OMITTED
0112         DATA RECORD IS PRT-LINE2.
```

RECORD DESCRIPTION — A description of each record is stated in the DATA DIVISION. Here, the particular characteristics of the data fields for each record are specified.

FORMAT:

```
                {data-name-1}
level-number {FILLER}          [REDEFINES data-name-2]
   [, OCCURS integer-1 TIMES]
     {PIC}
   [, {PICTURE} IS {character-string-1}]
    {SYNC}                  {LEFT}
   [{SYNCHRONIZED} [  {RIGHT}]]
    {JUST}
   [{JUSTIFIED} RIGHT]
   [BLANK WHEN ZERO]
                   {COMP}
                   {COMP-3}
                   {DISPLAY}
                   {COMPUTATIONAL-3}
   [[, USAGE IS] {COMPUTATIONAL  }]... .
```

WORKING-STORAGE SECTION.

same as above and

```
                {[ALL] literal}
                {QUOTE}    {HIGH-VALUE}
                {ZERO}     {LOW-VALUE}
[, VALUE IS     {SPACE}] ... .
```

LINKAGE SECTION.

same as above without value clauses.

RULES:

1. Level-number must be an integer between 01 and 49 or 77.
2. The VALUE clause cannot be used in an item which also contains an OCCURS or REDEFINES clause.
3. The OCCURS clause cannot be used in a 01 or 77 level entry.
4. The WORKING-STORAGE area must be initialized before use, as its initial value is unspecified.
5. The plural form of SPACE, ZERO, HIGH-VALUE, LOW-VALUE and QUOTE can be used.
6. A PICTURE clause must be specified only for elementary items.
7. The maximum number of characters allowed in character-string-1 is 30.

8. The character-string-1 describes the characteristics and editing requirements of the data. It describes the size of the data, the editing to be performed on the data, and the category of the data. There are five types of data that can be described with a picture clause:

   A. Alphabetic character strings contain the symbols 'A' and 'B'. The contents of the alphabetic described item can be any combination of the (26) letters of the Roman alphabet and the space character from the COBOL character set.

   B. Numeric character strings contain the symbols '9', 'S', and 'V'. The number of digit positions that can be described must range from 1 to 18 inclusive. The contents of the numeric described item can contain the Arabic numerals 0-9 and +, – signs.

   C. Alphanumeric character strings contain the symbols 'A', 'X', '9'. Its contents can be any printable ASCII character.

   D. Alphanumeric edited character strings contain the symbols 'A', 'X', '9', 'B', 'O' '/'.

   E. Numeric edited character strings contain the symbols "B, /, V, Z, O, 9".

   The following characters can also be contained "* . , + – $ CR DB". (Note: CR and DB may cause a shift to the left in the placement of the decimal point.)

   A description of each individual character follows:

   Each A represents a character position that can contain only a letter of the alphabet or a space.

   Each B represents a character position into which the space character will be inserted.

   The S indicates the presence (but not the representation nor the position) of an operational sign, and must be written as the leftmost character in the picture string.

   The V indicates the location of the assumed decimal point and may appear only once in a character string.

   Each X indicates a character position that may contain any allowable character from the ASCII set.

   Each Z represents a leading numeric character position; when that position contains a zero, the zero is replaced by a space character. Each Z is counted in the size of the item.

Each 0 represents a character position into which the numeral zero will be inserted and is counted in the size of the item.

Each 9 represents a character position that contains a numeral and is counted in the size of the item.

Each comma represents a character position into which a comma will be inserted and is counted in the size of the item.

The period represents a character position into which the period will be inserted and is counted in the size of the item. It also is used for alignment purposes.

The minus sign (–) represents a character position into which the editing sign control symbol will be inserted and is counted in the size of the item.

The plus sign (+) represents a character position into which the editing sign control symbol will be inserted and is counted in the size of the item.

Each asterisk represents a leading numeric character position into which the asterisk (*) will be inserted and is counted in the size of the item.

The currency symbol ($) represents a character position into which the ($) is inserted and is counted in the size of the item.

The credit and debit symbols (CR) (DB) each represent two character positions into which they will be inserted and are counted in the size of the item. CR and DB may cause a shift in the placement of the decimal point.

9. The USAGE IS clause determines the format of numeric data items stored internally and externally. The default value is DISPLAY which represents ASCII format with the sign stored in the units position bit 7. A positive sign is a 0 bit and a negative sign is 1 bit. Thus, a negative number prints as a lower case letter (– 500 = 50p) unless it is moved to an edited field. COMPUTATIONAL-3 (COMP-3) directs the compiler to store digits two to the byte in packed decimal format with the sign stored in the right hand end 4 bits. A positive sign is 0000 and a negative sign is 0001. COMPUTATIONAL (COMP) directs the compiler to store values in binary Intel 8080 format with a maximum value of decimal 32767. No matter how the COMP picture is described 9 or 9999, the compiler always assigns 2 bytes for storage.

10. Binary data types should not be used in delimited files because of the possibility of duplicating the delimiter character.
11. When moving numeric values greater than 32767 to a binary data type, the results are unspecified. For purposes of data conversion to binary, the value 67.000 is greater than 32767 if the binary picture is 99V999.
12. Justified can only be used with elementary data items and cannot be used wth numeric or edited picture items.
13. REDEFINES must not be used in Level 01 entries in the File Section. Use the Data Records clause and repeated level 01's for multiple records in the file section.
14. COMP & COMP-3 may be used at the group level.

EXAMPLE:

```
0047  01  HOURLY.
0048      02 PAY-TYPE PICTURE IS X.
0049      02 FIRST-NAME PICTURE IS X(20)
0050      02 LAST-NAME PICTURE X(20)
0051      02 SOC-SEC-NUM PIC 9(9) USAGE IS COMP-3.
0052      02 ITM1 PICTURE IS X.
0053      02 ITM11 REDEFINES ITM1 PIC 9.
0054      02 INCOME PIC S9(16)V99.
0055      02 TAXES OCCURS 10 TIMES PICTURE IS S9(10)V99.
0056  01  MONTHLY.
0057      05 FILLER PIC X.
0058      05 GRP-ITM.
0059      10 GRP-ITM2.
0060      15 GRP-AMT PIC 9(6)V99.
0061      15 GRP-AMT-1 PIC 9(6)V99.
0062  01  PRINT-LINE PICTURE IS X(132).
0081  WORKING-STORAGE SECTION.
0082  01  INVENTORY.
0083      02 PART-NUM PICTURE 9(5) USAGE IS COMP-3.
0084      02 QTY-IN-STOCK PIC 9(6) COMP-3.
0085      02 W-INDEX PICTURE 99 VALUE IS 01 COMP.
0086      02 W-ITM2 PIC X(5) VALUE "TEST1".
0087  01  A-TABLE.
0088      02 T1 PIC X(5) VALUE "FIRST".
0089      02 T2 PIC X(5) VALUE "SECOND".
0090      02 T3 PIC X(5) VALUE "THIRD".
0091  01  B-TABLE REDEFINES A-TABLE.
0092      02 ORDER OCCURS 3 TIMES PICTURE X(5).
```

```
0093  01   EDIT.
0094           02 E-1 PICTURE $,$$$,$$$,$$$,$$$,$$$.99CR.
0095           02 E-2 PIC  99V999+.
0096           02 E-3 PIC ZZ,ZZZ,ZZZ.99-.
0097           02 E-4 PIC $,$$$,$$$.99DB.
0098*   by using the ACCEPT verb the next file name can be
0100*   changed at object time.
0101  01   THE-FILE PICTURE X(14) VALUE "A:FILENAME.WRK".
0102  01   KEY3 PIC 9(7) COMP-3 VALUE 1.
0103           02 KEY1 PIC X.
0104           02 KEY2 PIC X.
0105*   maximum record or item size is 4095
0106  01   BIG-ITEM PIC X(4095).
```

Also, within the DATA DIVISION is the COPY statement. The COPY statement inserts text into the source program at compile time.

FORMAT:

COPY u:file-name.

RULES:

1. A COPY cannot occur within another COPY.
2. The disk unit (u:) is optional and if not present, the default drive is used.
3. The COPY statement should be preceded by a space and terminated by a period, normally starting in column 7.
4. The file type is not part of the COPY statement, but must be type CBL.

EXAMPLE:

```
0041  DATA DIVISION.
0042  COPY A:FILE6.
0055  COPY A:FILE7.
0105  COPY A:FILE8.
```

6 PROCEDURE DIVISION.

The PROCEDURE DIVISION of a COBOL program specifies the procedures that will be used to solve the given problem.

FORMAT:

PROCEDURE DIVISION.
    [USING data-name-1 [, data-name-2] ...].

[section-name **SECTION** [segment-number]].
paragraph name.
    problem-solving statements.
paragraph-name.
    .
    .
    .
    problem-solving statements.
END PROGRAM program-name.

RULES:

1. The first entry in the PROCEDURE DIVISION must be a paragraph name, section-name of USING statement.
2. Each paragraph-name or section-name must be unique.
3. Each paragraph-name must be followed by a period.
4. Each problem-solving statement must be made up of reserved words, words previously described in a previous division, paragraph-names, figurative constants, numeric literals, non-numeric literals and/or punctuation marks.

EXAMPLE:

```
0100  PROCEDURE DIVISION.
0101  BEGIN.
0102        DISPLAY "HELLO".
0103        STOP RUN.
0104  END PROGRAM TEST1.
```

Note: Keywords that can be used as part of the solution in the PROCEDURE DIVISION follow. They are arranged in alphabetical order for easy reference.

ACCEPT lets you input data from the keyboard and assigns that data to the specified data item (identifier).

FORMAT:

ACCEPT identifier.

RULES:

1. The ACCEPT device is the console video typewriter.
2. Data is transferred from left to right until the receiving data item (identifier) is filled or until a carriage return is entered. The carriage return key is used to release the item and is not transferred to memory.
3. The delete key can be used to backspace if a mistake is made.
4. The backspace does not go past the beginning of the ACCEPT field.
5. In the CP/M mode using function 1 & 2 when the right end of a field is exceeded, a " < " character notifies the user the last character was not entered into memory. This is done because CP/M automatically echo's the input character when it is keyed and it appears to the user as if it was processed internally when it was not. However, if the RUN time package is modified to use function 6 or direct BIOS, then the characters exceeding the user field are not output to the screen.
6. See DISPLAY UNIT and the program CONFIG for details on setting up the CRT drivers.
7. The carriage return character is not echoed to the screen unless the CP/M function 1 & 2 mode is being used where CP/M automatically echo's it.

EXAMPLE:

```
0101   PROCEDURE DIVISION.
0102   BEGIN.
0103       ACCEPT EMPLOYEE-NAME (X1).
0104       ACCEPT TODAYS-DATE.
0105       DISPLAY "ENTER FILE NAME
           < D:FFFFFFFF.EEE >".
0106       ACCEPT THE FILE-NAME.
0107*
0108*  clear the screen on a sol-20 next.
0109       DISPLAY " "0B" ".
0110*  note screen-full can be 80*24 = 1920 size item.
0111       DISPLAY SCREEN-FULL.
0112*  set the cursor using a hexadecimal string.
0113       DISPLAY " "1B,01,3F" ".
0114       ACCEPT INPUT-ITEM.
```

ADD lets you add two numeric data items and store the sum.

FORMAT:

```
      {literal-1}              {literal-2}
ADD   {identifier-1}  [TO]     {identifier-2}
```

[GIVING identifier-3] **[ROUNDED]**

[,ON **SIZE ERROR** imperative-statement]

RULES:

1. Each ADD verb statement must contain an addend and an augend.
2. Figurative constants cannot be used.
3. Only numeric items and numeric literals can be used, except identifier-3 which can be an elementary numeric edited item.
4. The composite of operands must not contain more than 18 digits.
5. An identifier can only reference an elementary item.
6. Each operand can contain an operational sign and an implied decimal point.
7. Operands are aligned according to implied decimal points.
8. ROUNDED performs a test to see if right truncation will occur and, if it will, adjusts the result by adding 1 if the truncated digit is 5 or greater.
9. ON SIZE ERROR performs a test to see if overflow has occurred and, if it has, executes the imperative-statement.

EXAMPLE:

```
0150   ADD SALES-TAX TO TOTAL GIVING GRAND-TOTAL
0151       ROUNDED ON SIZE ERROR GO TO ERROR-ROUTINE.
```

ALTER modifies a predetermined sequence of operations.

FORMAT:

ALTER paragraph-name-1 **TO PROCEED TO** paragraph-name-2.

RULES:

1. Paragraph-name-1 must be the name of a paragraph which contains a single sentence consisting of:

   GO TO paragraph-name.

2. The execution of the ALTER statement modifies the GO TO paragraph-name-1, so that subsequent executions of paragraph-name-1 transfer control to paragraph-name-2.

EXAMPLE:

```
0200  PARA-6. GO TO BEGIN.
0201  PARA-7.
0202     ALTER PARA-6 TO PROCEED TO END-OF-JOB.
0203     GO TO PARA-6.
0204  END-OF-JOB.
```

The **CALL** statement causes control to be transferred from one object program to another, within the RUN unit.

FORMAT:

```
      {literal-1}
CALL  {identifier-1}
    [USING data-name-1 [data-name-2]...]
```

RULES:

1. Literal-1 must be a nonnumeric literal.
2. Identifier-1 must be defined as an alphanumeric data item such that its value can be a program name.
3. The USING phrase is included in the CALL statement only if there is a USING phrase in the Procedure Division header of the called program and the number of operands in each USING phrase must be identical.
4. Each of the operands in the USING phrase must have been defined as a data item in the File Section or Working-Storage Section, and must have a level-number of 01 or 77.
5. The program whose name is specified by the value of literal-1 or identifier-1 is the called program; the program in which the CALL statement appears is the calling program.
6. The execution of a CALL statement causes control to pass to the called program.
7. A called program is in its initial state the first time it is called within a RUN unit and the first time it is called after a CANCEL to the called program. On all other entries into the called program, the state of the program remains unchanged from its state when last exited. This includes all data fields, the status and positioning of all files, and all alterable switch settings.
8. Called programs may contain CALL statements. However, a called program must not contain a CALL statement that directly or indirectly calls the calling program.
9. The data-names, specified by the USING phrase of the CALL statement, indicate those data items available to a calling program that may be referred to in the called program. The

order of appearance of the data-name in the USING phrase of the CALL statement and the USING phrase in the Procedure Divsion header is critical. Corresponding data-names refer to a single set of data which is available to the called and calling program. The correspondence is positional, not by name.

NEVADA COBOL details:

1. Called programs must be type .OBJ.
2. Each called program is dynamically loaded the first time and entered into a table in the RUN time package. Future calls go directly to the called program.
3. Up to five active called programs may be resident at any one time. At that point, one will have to be CANCELed before any other can be loaded.
4. You can CALL another main program from the current program, thus overlaying the first program. Since the working-storage section always begins at the same point in memory, those data-items not initialized with value statements will contain the information from the prior program. Be sure to CANCEL the program to remove it from the table because once the table is full and a program is called, the job will terminate.
5. CALLed programs need not be COBOL programs. However, they must be type .OBJ and be ORGed (assembled with proper origin). The .OBJ file contains the machine language code for a program, the address at which the run time package is to load it, and the address at which execution of the loaded program is to begin. An .OBJ file consists of one or more segments that have the format:

#BYTES	DESCRIPTION
2	Number of code and data bytes in segment
2	Load address of code and data belonging to the segment.
Variable	Code and/or data.

   The RUN time package will load each segment at the specified address until a starting address is encountered. A starting address is represented as load address with a zero byte count.
6. A program is supplied to convert CP/M HEX files to .OBJ format named CONVHEX.COM.
7. The RUN time package transfers control to the called program by means of an 8080 CALL instruction. The called program should return via the 8080 RET instruction. The called program should use its own stack not the COBOL stack.

8. Parameters are passed to the called program in the registers. H & L = parameter 1, D & E = parameter 2, B & C = either parameter 3 or the address of the left end of a list of parameter addresses (if more than three parameters are passed). The parameters consist of 16-bit addresses pointing to the right end of each data-name.

9. In some cases, it is possible to execute called programs without the calling program for testing when no data is being passed. Since the loading format is the same for all type .OBJ programs, you can A> RUN NEXTPROG.

EXAMPLE:

```
0001   CALL "NEXTPROG" USING REC-1, REC-2.
0555   CALL NEXT-PROG USING REC-1, REC-2.
       *
       *  also see complete programs at end of manual.
```

The **CANCEL** statement releases the memory areas occupied by the referenced program.

FORMAT:

```
              {literal-1}
CANCEL        {identifier-1}
```

RULES:

1. Subsequent to the execution of a CANCEL statement, the program referred to therein ceases to have any logical relationship to the RUN unit in which the CANCEL statement appears. A subsequently executed CALL statement naming the same program will result in that program being initiated in its initial state. The memory areas associated with the named programs are released so as to be made available for disposition by the operating system.

2. A program named in the CANCEL statement must not refer to any program that has been called and has not yet executed an EXIT PROGRAM statement.

3. A logical relationship to a cancelled subprogram is established only by execution of a subsequent CALL statement.

4. A called program is cancelled either by being referred to as the operand of a CANCEL statement or by the termination of the run unit of which the program is a member.

5. No action is taken when a CANCEL statement is executed naming a program that has not been called in this unit or has been called and is at present cancelled. Control passes to the next statement.

EXAMPLE:

```
0001   CANCEL "LASTPROG".
0555   CANCEL LAST-PROG.
```

Note: See the Sample Programs in Appendix I.

CLOSE terminates the processing of input and output files.

FORMAT:

CLOSE file-name

RULES:

1. A file must be opened before it can be closed.
2. If required, the CLOSE statement writes the final block with padding before closing the file.

EXAMPLE:

```
0300   END-OF-JOB.
0301       CLOSE NEW-PAYROLL-MASTER-FILE.
0302       CLOSE OLD-PAYROLL-MASTER-FILE.
0303       CLOSE LISTING.
```

The **COPY** statement inserts text into the source program at compile time.

FORMAT:

COPY u:file-name.

RULES:

1. A COPY cannot occur within another COPY.
2. The disk unit (u:) is optional and not present, the default drive will be used.
3. The COPY statement should be preceded by a space and terminated by a period, normally, starting in column 7.
4. The file type is not part of the COPY statement but must be type CBL.

EXAMPLE:

```
0100   PROCEDURE DIVISION.
0101   PARAGRAPH-A.
0102       COPY A:FILEA.
2500   PARAGRAPH-B.
2501       COPY A:FILEB.
3500   PARAGRAPH-C
3501       COPY B:FILEC.
```

DISPLAY lets you display data on the video monitor.

FORMAT-1:

```
            {literal-1}          {literal-2}
DISPLAY     {identifier-1}    [{identifier-2}] ...
                [WITH NO ADVANCING]
```

FORMAT-2:

```
                {literal-3}
DISPLAY UNIT    {identifier-3}.
```

RULES:

1. The DISPLAY device is the video monitor.
2. If the literal is a numeric literal, then it must not be signed as the sign would be displayed as a lower case letter.
3. A carriage return and line feed are executed before data transfer begins unless WITH NO ADVANCING is specified.
4. Data4 is transferred from left to right until all of the data in literal or identifier-1 is transferred.
5. If data is longer than 64 or 80 characters as set by the CONFIG program, the video display will continue on the next line. In this way, the entire screen can be filled with one DISPLAY statement.
6. Each literal may be any figurative constant, except ALL.
7. If a figurative constant is specified as one of the operands, only a single occurrence of the figurative constant is displayed.
8. The DISPLAY statement causes the contents of each operand to be transferred to the hardware device in the order listed.
9. The DISPLAY UNIT literal changes the I-O driver at run time as follows:

   "OX" skips CP/M and uses the BIOS driver.
   "2X" uses CP/M function 1 & 2 drivers.
   "6X" uses CP/M 2.X function 6 drivers.
   X will allow any character to be input. Any other character in this position will allow only ASCII input. All of these changes are temporary.

10. To permanently change the RUN time package drivers, read the instructions for the program CONFIG.
11. UNIT 0 or UNIT 6 must be used if you are sending or receiving characters other than ASCII, such as video control characters. This is because CP/M monitors function 1 and 2 and will not allow certain control characters to pass to and from the user.

EXAMPLE:

```
0350  ERROR-ROUTINE.
0351        DISPLAY ERROR-MESSAGE (ERROR-CODE).
0352        DISPLAY FIRST-NAME, LAST-NAME, "NAME".
0359D       DISPLAY "DEBUG MODE ERROR ROUTINE".
0360        DISPLAY "CONTINUE ON SAME LINE" WITH NO
            ADVANCING.
0370*  the next line clears the screen on a Sol-20 or VDM-1
0380        DISPLAY " "OB" ".
0391*  the next line clears the screen on Hazeltine-1520
0392        DISPLAY " "7E,1C" ".
0393*  each CRT is different but if you know the commands you
0394*  can also set the cursor and display in reverse.
0395*  the next line sets the I-0 driver for BIOS any
0396*  incoming character will be passed to user.
0397        DISPLAY UNIT "OX".
0500*  the following sequence is a common debugging method.
0501  PARAGRAPH-A.
0502*  line 0505 is a debugging line used when testing
0503*  to let the programmer know that the paragraph has been
0504*  executed
0505D       DISPLAY "PARAGRAPH-A".
```

DIVIDE lets you divide one numerical data item into another and set the value of an item equal to the quotient.

FORMAT:

DIVIDE {identifier-1} **INTO** {identifier-2}
[**GIVING** identifier-3]
[**ROUNDED**] [, ON **SIZE ERROR** imperative-statement]

RULES:

1. Each DIVIDE statement must contain a dividend and a divisor.
2. Each identifier must refer to an elementary numeric item, except the identifier-3 which may be an elementary numeric edited item.
3. The composite of operands must not contain more than 18 digits.
4. An identifier can only reference an elementary item.
5. Each operand can contain an operational sign and an implied decimal point.
6. Operands are aligned according to implied decimal points.

7. ROUNDED performs a test to see if right truncation will occur and, if it will, adjusts the results by adding 1 if the truncated digit is 5 or greater.
8. ON SIZE ERROR performs a test to see if overflow has occurred and, if it has, executes the imperative-statement.

EXAMPLE:

```
0400  CALC-1.
0401      DIVIDE HOURS INTO GROSS-PAY GIVING
          HOURLY-RATE
0402        ROUNDED ON SIZE ERROR GO TO ERR-2.
0403      DIVIDE HOURS INTO MILES.
```

END PROGRAM specifies the physical end of the program.

FORMAT:

END PROGRAM program-name

RULES:

1. This entry must be the last physical statement in every source program.
2. This is a Compiler Directing statement that tells the Compiler it is the last statement in the COBOL source program file to be processed.

EXAMPLE:

```
      *  all program statements must be above
9999  END PROGRAM TEST1.
```

EXIT furnishes an end point for a series of procedures.

FORMAT-1:

EXIT.

FORMAT-2:

EXIT PROGRAM.

RULES:

1. The EXIT statement must appear in a sentence by itself, and be the only sentence in the paragraph.
2. An execution of an EXIT PROGRAM statement in a called program causes control to be passed to the calling program. Execution of an EXIT PROGRAM statement in a program which is not called, behaves as if the statement were an EXIT statement.

EXAMPLE:

```
0500  PARA-END.
0501        EXIT.
0600  END-SUBPROGRAM.
0601     EXIT PROGRAM.
```

GO TO lets you leave the normal sequence of procedures and continue at another area of the program.

FORMAT-1:

GO TO procedure-name-1.

FORMAT-2:

GO TO procedure-name-1, [procedure-name-2]...
DEPENDING ON identifier.

RULES:

1. The GO TO statement must be the last statement in a sequence.
2. Identifier is the name of a numeric elementary item described without any positions to the right of the assumed decimal point.
3. When a paragraph is referenced by an ALTER statement, that paragraph can consist only of a paragraph header followed by a format-1 GO TO statement.
4. When a GO TO statement, represented by format-1 is executed, control is transferred to procedure-name-1 or to another procedure-name if the GO TO statement has been modified by an ALTER statement.
5. When a GO TO statement represented by format-2 is executed, control is transferred to procedure-name-1, procedure-name-2, etc., depending on the value of the identifier being 1, 2, ..., n. If the value of the identifier is anything other than the positive or unsigned integers 1, 2, ..., n, then no transfer occurs and control passes to the next statement in the normal sequence for execution.

EXAMPLE:

```
0330  IF A-SWITCH IS EQUAL TO 1
0331     MOVE X-AMT TO Y-AMT
0332     GO TO A-SUBROUTINE.
0333     GO TO MAIN-PROGRAM.
0334  CASE-STATEMENT-PARA.
0335     GO TO A-PARA, B-PARA, C-PARA DEPENDING ON X1.
0336  ALTERED-PARA.
0337     GO TO FIRST-PARA.
```

THE **IF** statement causes a condition to be evaluated. The subsequent action of the object program depends on whether the value of the condition is true or false.

FORMAT-1:

```
                    {statement-1}          {ELSE statement-2}
IF {condition}      {NEXT SENTENCE}        {ELSE NEXT SENTENCE}

{condition}:

                    {= < >          }
                    {EQUAL TO       }
                    {LESS THAN      }      {literal}
identifier-1 IS [NOT] {GREATER THAN}       {identifier-2}

{condition}:

                    {NUMERIC}
identifier-3 IS [NOT] {ALPHABETIC}
```

FORMAT-2:

```
              {OR }
IF condition  {AND} condition
```

RULES:

1. Statement-1 and statement-2 represent an imperative statement.
2. Non-numeric comparisons are made left to right using the ASCII collating sequence.
3. Numeric comparisons are made by aligning the decimal points and treating them as algebraic quantities.
4. Identifier-3 must be a DISPLAY (ASCII) data type.
5. If the condition is true, statement-1 is executed if specified. If statement-1 contains a procedure branching statement, control is explicitly transferred in accordance with the rules of that statement. If statement-1 does not contain a procedure branching statement, the ELSE phrase, if specified, is ignored and control passes to the next executable sentence.
6. The ELSE NEXT SENTENCE phrase may be omitted if it immediately precedes the terminal period of the sentence.
7. If the condition is true and the NEXT SENTENCE phrase is specified instead of statement-1, the ELSE phrase, if specified, is ignored and control passes to the next executable sentence.

8. If the condition is false, statement-1 or its surrogate NEXT SENTENCE is ignored, and statement-2, if specified, is executed. If statement-2 contains a procedure branching statement, control is explicitly transferred in accordance with the rules of that statement. If statement-2 does not contain a procedure branching statement, control passes to the next executable sentence. If the ELSE statement-2 is not specified, statement-1 is ignored and control passes to the next executable sentence.

9. If the condition is false, and the ELSE NEXT SENTENCE phrase is specified, statement-1 is ignored, if specified, and control passes to the next executable sentence.

10. Two conditions can be combined by the logical operators AND and OR.

EXAMPLE:

```
0340   IF LAST-NAME IS NOT ALPHABETIC
0341      MOVE ERR-CODE TO MESG
0342      ADD 1 TO ERR-COUNT
0343      GO TO KEY-PUNCH-ERROR
0344   ELSE
0345      PERFORM A-PARA THRU B-PARA.
0346   IF HOURLY-RATE  <3.90 AND FRINGE-BENEFITS < 6000
0347      GO TO MIN-WAGE-ERROR.
0348   IF A = B
0349      OR = C
0350      OR = D
0351      OR X NOT > Y
0352      MOVE S TO W
0353   ELSE
0354      MOVE S TO AW.
```

The **INSPECT** statement provides the ability to tally, replace, or tally and replace occurrences of single characters in a data item.

FORMAT-1

```
INSPECT identifier-1 TALLYING
                     {ALL       {literal-1} }
                     {LEADING   {identifier-3} }
{identifier-2 FOR { {CHARACTERS}
            {AFTER}          {literal-2}
          [{BEFORE} INITIAL {identifier-4}]}...}...
```

FORMAT-2

```
INSPECT identifier-1 REPLACING
                       {literal-4}
  CHARACTERS BY        {identifier-6}
                           {AFTER}          {literal-5}
                         [{BEFORE} INITIAL {identifier-7}

{ALL}
{FIRST}          {literal-3}          {literal-4}
{LEADING}    {   {identifier-5} BY    {identifier-6}
                                 {AFTER}          {literal-5}
                               [{BEFORE} INITIAL {identifier-7}
```

FORMAT-3

```
INSPECT identifier-1  TALLYING
                      {ALL       {literal-1} }
                      {LEADING   {identifier-3} }
{identifier-2 FOR { {CHARACTERS}
            {AFTER}          {literal-2}
          [{BEFORE} INITIAL {identifier-4}]}...}...

REPLACING
                       {literal-4}
  CHARACTERS BY        {identifier-6}
                           {AFTER}          {literal-5}
                         [{BEFORE} INITIAL {identifier-7}

{ALL}
{FIRST}          {literal-3}          {literal-4}
{LEADING}        {identifier-5} BY    {identifier-6}
                                 {AFTER}          {literal-5}
                               [{BEFORE} INITIAL {identifier-7}
```

RULES:

1. Identifier-1 must reference either a group item or any category of elementary item, described (either implicitly or explicitly) as usage is DISPLAY.
2. Identifier-3...identifier-n must reference either an elementary alphabetic, alphanumeric or numeric item described (either implicitly or explicitly) as usage is DISPLAY.
3. Each literal must be nonnumeric and may be any figurative constant, except ALL.
4. Literal-1, 2, 3, 4, 5 and the data items referenced by identifier-3, 4, 5, 6, and 7 must be one character in length.

FORMATS 1 and 3 only

5. Identifier-2 must reference an elementary numeric data item.
6. If either literal-1 or literal-2 is a figurative constant, the figurative constant refers to an implicit one character data item.

FORMATS 2 and 3 only

7. The size of the data referenced by literal-4 or identifier-6 must be equal to the size of the data referenced by literal-3 or identifier-5. When a figurative constant is used as literal-4, the size of the figurative constant is equal to the size of literal-3 or the size of the data item referenced by identifier-5.
8. When the CHARACTERS phrase is used, literal-4, literal-5 or the size of the data item referenced by identifier-6, identifier-7 must be one character in length.
9. When a figurative constant is used as literal-3, the data referenced by literal-4 or identifier-6 must be one character in length.

GENERAL RULES:

1. Inspection (which includes the comparison cycle, the establishment of boundaries for the BEFORE or AFTER phrase, and the mechanism for tallying and/or replacing) begins at the leftmost character position of the data item referenced by identifier-1, regardless of its class, and proceeds from left to right to the rightmost character position as described in general rules 4 through 6.

2. For use in the INSPECT statement, the contents of the data item referenced by identifier-1, 3, 4, 5, 6, or 7 will be treated as follows:

   a. If any of identifier-1, 3, 4, 5, 6 or 7 are described as alphanumeric, the INSPECT statement treats the contents of each such identifier as a character-string.

   b. If any of identifier-1, 3, 4, 5, 6 or 7 are described as alphanumeric edited, numeric edited or unsigned numeric, the data item is inspected as though it had been redefined as alphanumeric and the INSPECT statement had been written to reference the redefined data item.

   c. If any of the identifier-1, 3, 4, 5, 6 or 7 are described as signed numeric, the data item is inspected as though it had been moved to an unsigned numeric data item of the same length and then the rules in general rule 2b had been applied.

3. In general rules 4 through 11 all references to literal-1, 2, 3, 4 and 5 apply equally to the contents of the data item referenced by identifier-3, 4, 5, 6 and 7, respectively.

4. During inspection of the contents of the data item referenced by identifier-1, each properly matched occurrence of literal-1 is tallied (formats 1 and 3) and/or each properly matched occurrence of literal-3 is replaced by literal-4 (formats 2 and 3).

5. The comparison operation to determine the occurrences of literal-1 to be tallied and/or occurrences of literal-3 to be replaced, occurs as follows:

   a. The operands of the TALLYING and REPLACING phrases are considered in the order they are specified in the INSPECT statement from left to right. The first literal-1, literal-3 is compared to an equal number of contiguous characters, starting with the leftmost character position in the data item referenced by identifier-1. Literal-1, literal-3 and that portion of the contents of the data item referenced by identifier-1 match if, and only if, they are equal, character for character.

b. If no match occurs in the comparison of the first literal-1, literal-3, the comparison is repeated with each successive literal-1, literal-3, until either a match is found or there is no successive literal-1, literal-3. When there is no successive literal-1, literal-3, the character position in the data item referenced by identifier-1 (immediately to the right of the leftmost character position considered in the last comparison cycle) is considered as the leftmost character position, and the comparison cycle begins again with the first literal-1, literal-3.

c. Whenever a match occurs, TALLYING and/or REPLACING takes place as described in general rules 8 through 10. The character position in the data item referenced by identifier-1 (immediately to the right of the rightmost character position that participated in the match) is now considered to be the leftmost character position of the data item referenced by identifier-1, and the comparison cycle starts again with the first literal-1, literal-3.

d. The comparison operation continues until the rightmost character position of the data item referenced by identifier-1 has participated in a match or has been considered as the leftmost character position. When this occurs, inspection is terminated.

e. If the CHARACTERS phrase is specified, an implied one character operand participates in the cycle described in paragraphs 5a through 5b above, except no comparison to the contents of the data item referenced by identifier-1 takes place. This implied character is considered always to match the leftmost character of the contents of the data item referenced by identifier-1, participating in the current comparison cycle.

6. The COMPARISON OPERATION determines the occurrences of literal-1 to be tallied and/or occurrences of literal-3 to be replaced and is affected by the BEFORE and AFTER phrase as follows:

Using the BEFORE Phrase

a. If the BEFORE phrase is specified, then the associated literal-1, literal-3 or implied operand of the CHARACTERS phrase participate only in comparison cycles involving contents of the data item referenced by identifier-1 from its leftmost character position, up to but not including, the first occurrence of literal-2, literal-5.

   The position of this first occurrence of literal-2 is determined before the first cycle of the comparison operation is begun.

b. If there is no occurrence of literal-2, literal-5 within the contents of data item referenced by identifier-1, then its associated literal-1, literal-3, or the implied operand of the CHARACTERS phrase participates in the comparison operation as though the BEFORE phrase had not been specified.

c. If, on any comparison cycle, literal-1, literal-3 or the implied operand of the CHARACTERS phrase does not match the contents of the data item referenced by identifier-1, then they are not eligible to participate in the comparison operation.

Using the AFTER Phrase

a. If the AFTER phrase is specified, then the associated literal-1, literal-3, or implied operand of the CHARACTERS phrase participates only in comparison cycles involving contents of data items referenced by identifier-1 from its character position immediately to the right of the rightmost character position of the first occurrence of literal-2, literal-5, and the rightmost character position of the data item referenced by identifier-1.

   The position of this first occurrence is determined before the first cycle of the comparison operation is begun.

b. If there is no occurrence of literal-1, literal-5 within the contents of the data item referenced by identifier-1, then its associated literal-1, literal-3, or the implied operand of the CHARACTERS phrase is not eligible to participate in the comparison operation.

c. If, on any comparison cycle, literal-1, literal-3 or the implied operand of the CHARACTERS phrase does not match the contents of the data item referenced by identifier-1, then they are not eligible to participate in the comparison operation.

FORMAT 1

7. The contents of the data item referenced by identifier-2 is not initialized by the execution of the INSPECT statement.
8. The rules for TALLYING are as follows:
   a. If the ALL phrase is specified, the contents of the data item referenced by identifier-2 is incremented by one (1) for each occurrence of literal-1 matched within the contents of the data item referenced by identifier-1.
   b. If the LEADING phrase is specified, the contents of the data item referenced by identifier-2 is incremented by one (1) for each contiguous (adjacent) occurrence of literal-1 matched within the contents of the data item referenced by identifier-1, provided that the leftmost such occurrence is at the point where comparison began in the first comparison cycle in which literal-1 was eligible to participate.
   c. If the CHARACTERS phrase is specified, the contents of the data item referenced by identifier-2 is incremented by one (1) for each character matched, in the sense of general rule 5e, within the contents of the data item referenced by identifier-1.

FORMAT 2

9. The required words ALL, LEADING, and FIRST are adjectives.
10. The rules for replacement are as follows:
    a. When the CHARACTERS phrase is specified, each character matched, in the sense of general rule 5e, in the contents of the data item referenced by identifier-1 is replaced by literal-4.
    b. When the adjective ALL is specified, each occurrence of literal-3 matched in the contents of the data item referenced by identifier-1 is replaced by literal-4.
    c. When the adjective LEADING is specified, each contiguous occurrence of literal-3 matched in the contents of the data item referenced by identifier-1 is replaced by literal-4, providing that the leftmost occurrence is at the point where comparison began in the first comparison cycle that literal-3 was eligible to participate.
    d. When the adjective FIRST is specified, the leftmost occurrence of literal-3 matched within the contents of the data item referenced by identifier-1 is replaced by literal-4.

FORMAT 3

11. A format 3 INSPECT statement is interpreted and executed as through two successive INSPECT statements specifying the same identifier-1 had been written with one statement being a format 1 statement with TALLYING phrases identical to those specified in the format 3 statement, and the other statement being a format 2 statement with REPLACING phrases identical to those specified in the format 3 statement. The general rules given for matching and counting apply to the format 1 statement and the general rules given for matching and replacing apply to the format 2 statement.

Here are six examples of the INSPECT statement:

INSPECT word TALLYING count FOR LEADING "L" BEFORE INITIAL "A", count-1 FOR LEADING "A" BEFORE INITIAL "L".

Where word = LARGE, count = 1, count-1 = 0.
Where word = ANALYST, count = 0, count-1 = 1.

INSPECT word TALLYING count FOR ALL "L", REPLACING LEADING "A" BY "E" AFTER INITIAL "L".

Where word = CALLAR, count = 2, word = CALLAR.
Where word = SALAMI, count = 1, word = SALEMI.
Where word = LATTER, count = 1, word = LETTER.

INSPECT word REPLACING ALL "A" BY "G" BEFORE INITIAL "X".

Where word = ARXAX, word = GRXAX.
Where word = HANDAX, word = HGNDGX.

INSPECT word TALLYING count FOR CHARACTERS AFTER INITIAL "J" REPLACING ALL "A" BY "B".

Where word = ADJECTIVE, count = 6, word = BDJECTIVE.
Where word = JACK, count = 3, word = JBCK.
Where word = JUJMAB, count = 5, word = JUJMBB.

INSPECT word REPLACING ALL "X" BY "Y", "B" BY "Z", "W" BY "Q" AFTER INITIAL "R".

Where word = RXXBQWY, word = RYYZQQY.
Where word = YZACDWBR, word = RAQRYEZ.

INSPECT word REPLACING CHARACTERS BY "B" BEFORE INITIAL "A".

word before: 12 XZABCD
word after: BBBBBABCD

MOVE transfers data from one data area to another.

FORMAT:

```
        {literal-1}
MOVE    {identifier-1} TO identifier-2 [identifier-3]...
```

RULES:

1. Identifier-1 and literal-1 represent the sending area and identifier-2 indentifier-3, ..., represent the receiving area.
2. The data designated by the literal-1 or identifier-1 is moved first to identifier-2, then to identifier-3, ... The rules referring to identifier-2 also apply to the other receiving areas. Any subscripting associated with identifier-2, ..., is evaluated immediately before the data is moved to the receiving data item.
3. Any MOVE in which the sending and receiving items are both elementary items is an elementary move. Every elementary item belongs to one of the following categories: numeric, alphabetic, alphanumeric, numeric edited, alphanumeric edited. These categories are described in the PICTURE clause. Numeric literals belong to the category numeric, and nonnumeric literals belong to the category alphanumeric. The figurative constant ZERO belongs to the category numeric. All other figurative constants belong to the category alphanumeric.

   The following rules apply to an elementary move between these categories:

   a. The figurative constant SPACE, a numeric edited, alphanumeric edited, or alphabetic data item must not be moved to a numeric or numeric edited data item.

   b. A numeric literal, the figurative constant ZERO, a numeric data item or a numeric edited data item must not be moved to an alphabetic data item.

   c. A non-integer numeric literal or a non-integer numeric data item must not be moved to an alphanumeric or alphanumeric edited data item.

   d. All other elementary moves are legal and are performed according to the rules given in general rule 4.

4. Any necessary conversion of data from one form of internal representation to another takes place during legal elementary moves, along with any editing specified for the receiving data item:

   a. When an alphanumeric edited or alphanumeric item is a receiving item, alignment and any necessary space filling takes place. If the size of the sending item is greater than the size of the receiving item, the excess characters are truncated on the right after the receiving item is filled. If the sending item is described as being signed numeric, the operational sign will not be moved; if the operational sign occupied a separate character position, that character will not be moved and the size of the sending item will be considered to be one less than its actual size (in terms of standard data format characters).

   b. When a numeric or numeric edited item is the receiving item, alignment by decimal point and any necessary zero-filling takes place as necessary, except where zeroes are replaced because of editing requirements.

      1. When a signed numeric item is the receiving item, the sign of the sending item is placed in the receiving item. Conversion of the representation of the sign takes place as necessary. If the sending item is unsigned, a positive sign is generated for the receiving item.

      2. When an unsigned numeric item is the receiving item, the absolute value of the sending item is moved and no operational sign is generated for the receiving item.

      3. When a data item described as alphanumeric is the sending item, data is moved as if the sending item were described as an unsigned numeric integer.

   c. When a receiving field is described as alphabetic, justification and any necessary space-filling takes place as defined. If the size of the sending item is greater than the size of the receiving item, the excess characters are truncated on the right after the receiving item is filled.

5. Any move that is not an elementary move is treated exactly as if it were an alphanumeric to alphanumeric elementary move, except that there is no conversion of data from one form of internal representation to another. In such a move, the receiving area will be filled without consideration for the individual elementary or group items contained within either the sending or receiving area, except as noted in the OCCURS clause.

6. If literal-1 is SPACE, QUOTE or ZERO, then identifier-2 is entirely filled with the figurative constant.
7. In a non-numeric move, the data is moved left to right.

EXAMPLE:

```
0360  MAIN-MOVE-ROUTINE.
0361      MOVE SPACES TO PRINT-LINE.
0362      MOVE FIRST-NAME TO P-FIRST-NAME.
0363      MOVE LAST-NAME TO P-LAST-NAME.
0364      MOVE ORDER (W-INDEX) TO P-ORDER.
0365      MOVE ZEROS TO AMT-1, AMT-2, AMOUNT-3.
0366      MOVE SPACES TO FIRST-NAME  LAST-NAME.
```

MULTIPLY lets you multiply numeric data items and set the value of an item equal to the result.

FORMAT:

```
                {literal-1}              {literal-2}
MULTIPLY        {identifier-1}  BY       {identifier-2}
```

[**GIVING** identifier-3] [**ROUNDED**]

[, ON **SIZE ERROR** imperative-statement]

RULES:

1. Each indentifier must be an elementary numeric item, except identifier-3 which may be an elementary numeric edited item.
2. Each literal must be a numeric literal.
3. The resultant product must not contain more than 18 digits.
4. An identifier can only reference an elementary item.
5. Each operand can contain an operational sign and an implied decimal point.
6. Operands are aligned according to implied decimal points.
7. ROUNDED performs a test to see if right truncation will occur and, if it will, adjusts the result by adding 1 if the truncated digit is 5 or greater.
8. ON SIZE ERROR performs a test to see if overflow has occurred and, if it has, executes the imperative-statement.

EXAMPLE:

```
0399  CALCULATION-ROUTINE.
0400      MULTIPLY WAGE-RATE BY REGULAR-HRS GIVING
0401          GROSS-PAY ROUNDED ON SIZE ERROR GO TO
              P-ERR.
0402      MULTIPLY WAGE-RATE BY OVERTIME-HOURS.
```

OPEN lets you initiate the processing of both input and output files.

FORMAT:

```
        {I-O    }
        {INPUT  }
OPEN    {OUTPUT} file-name
```

RULES:

1. A file must be opened before it can be read, written or closed.
2. The OPEN statement does not cause a data transfer to or from the file.
3. In the output SEQUENTIAL ACCESS mode, if the file does not exist, it is created.
4. In the RANDOM ACCESS mode, the file must already exist.
5. The I-O (INPUT-OUTPUT) option applies to DISK files only.

EXAMPLE:

```
0700  BEGIN.
0701      OPEN OUTPUT NEW-PAYROLL-MASTER-FILE.
0702      OPEN INPUT OLD-PAYROLL-MASTER-FILE.
0703      OPEN OUTPUT LISTING.
```

PERFORM lets you depart from the normal sequence of procedures in order to execute one statement, or a sequence of statements, and then return to the normal sequence.

FORMAT 1:

```
                                  {THROUGH}
PERFORM procedure-name-1 [ {THRU} procedure-name-2]
```

FORMAT 2:

```
PERFORM procedure-name-1 [{THRU} procedure-name-2]
                                    {integer-1}
                                    {identifier-1} TIMES
```

FORMAT 3:

```
PERFORM procedure-name-1 [{THRU} procedure-name-2]
                                          {OR  }
                         UNTIL condition-1 {AND} condition-2
```

RULES:

1. Each identifier represents a numeric elementary item described in the Data Division. In format 2, identifier-1 must be described as a numeric integer.
2. The words THRU and THROUGH are equivalent.
3. When the PERFORM statement is executed, control is transferred to the first statement of the procedure named procedure-name-1. This transfer of control occurs only once for each execution of a PERFORM statement. For those cases where a transfer of control to the named procedure does take place, an implicit transfer of control to the next executable statement following the PERFORM statement is established as follows:
   a. If procedure-name-1 is a paragraph-name and procedure-name-2 is not specified, then the return is after the last statement of procedure-name-1.
   b. If procedure-name-1 is a section-name and procedure-name-2 is not specified, then the return is after the last statement of the last paragraph in procedure-name-1.
   c. If procedure-name-2 is specified and it is a paragraph-name, then the return is after the last statement of the paragraph.
   d. If procedure-name-2 is specified and it is section-name, then the return is after the last statement of the last paragraph in the section.
4. There is no necessary relationship between procedure-name-1 and procedure-name-2 except that a consecutive sequence of operations is to be executed beginning at the procedure named procedure-name-1 and ending with the execution of the procedure named procedure-name-2. In particular, GO TO and PERFORM statements may occur between procedure-name-1 and the end of procedure-name-2. If there are two or more logical paths to the return point, then procedure-name-2 may be the name of a paragraph consisting of the EXIT statement, to which all of these paths must lead.
5. If control passes to these procedures by means other than a PERFORM statement, control will pass through the last statement of the procedure to the next executable statement as if no PERFORM statement mentioned these procedures.

6. The PERFORM statements operate as follows with rule 5 above, applying to all formats:

   a. Format 1 is the basic PERFORM statement. A procedure referenced by this type of PERFORM statement is executed once and then control passes to the next executable statement following the PERFORM statement.

   b. Format 2 is the PERFORM...TIMES. The procedures are performed the number of times specified by integer-1 or by the initial value of the data item referenced by identifier-1 for that execution. If, at the time of execution of a PERFORM statement, the value of the data item referenced by identifier-1 is equal to zero or is negative, control passes to the next executable statement following the PERFORM statement. Following the execution of the procedures the specified number of times, control is transferred to the next executable statement following the PERFORM statement.

      During execution of the PERFORM statement, references to identifier-1 cannot alter the number of times the procedures are to be executed from that which was indicated by the initial value of identifier-1.

   c. Format 3 is the PERFORM...UNTIL. The specified procedures are performed until the condition specified by the UNTIL phrase is true. When the condition is true, control is transferred to the next executable statement after the PERFORM statement. If the condition is true when the PERFORM statement is entered, no transfer to procedure-name-1 takes place, and control is passed to the next executable statement following the PERFORM statement.

7. If a sequence of statements referred to by a PERFORM statement includes another PERFORM statement, the sequence of procedures associated with the included PERFORM must itself either be totally included in, or totally excluded from, the logical sequence referred to by the first PERFORM. Thus, an active PERFORM statement, whose execution point begins within the range of another PERFORM statement, must not allow control to pass to the exit of the other active PERFORM statement; furthermore, two or more such active PERFORM statements may not have a common exit.

8. A PERFORM statement that appears in a section that is not an independent segment can have within its range, in addition to any declarative sections whose execution is caused within that range, only one of the following:

   a. Sections and/or paragraphs wholly contained in one or more non-independent segments.

   b. Sections and/or paragraphs wholly contained in a single independent segment.

9. A PERFORM statement that appears in an independent segment can have within its range, in addition to any declarative sections whose execution is caused within that range, only one of the following:

   a. Sections and/or paragraphs wholly contained in one or more non-independent segments.

   b. Sections and/or paragraphs wholly contained in the same independent segment as the PERFORM statement.

EXAMPLE:

```
0750  PERFORM CALCULATE-PAY THRU PARA-END.
0751  PERFORM MAIN-PROGRAM.
0791  PERFORM CHECK-ROUTINE 5 TIMES.
0799  PERFORM TEST-ROUTINE UNTIL CODE-1 > T-CODE.
0800  PERFORM PARA-1 THRU PARA-2
0801     UNTIL A = B or X = Y AND Z = W.
```

READ makes available the next logical record from an open file.

FORMAT:

```
                          {AT END}
READ file-name RECORD     {INVALID KEY} imperative-statement
```

RULES:

1. A file must be OPENed before it can be read.
2. The AT END statement must be used for SEQUENTIAL files and is executed at the end of the file.
3. The INVALID KEY statement must be used with RANDOM files and if executed, the data in the user area is unspecified.
4. The number of the requested record in a RANDOM file must be placed in the RELATIVE KEY before the READ statement is executed.
5. When reading variable length delimited files, the record area should be cleared to spaces before each read because the data in the user record area to the right of the last valid character of the input item is unspecified, i.e., whatever data was there from before the read will be there.
6. When reading variable length delimited files, the TAB (09H) characters created by some text editors are not expanded to avoid conflict with packed decimal (COMP-3) data type. If tab characters are used, they can be expanded by CP/M's PIP command using the "T" option before processing by COBOL programs.

EXAMPLE:

```
0800  READ-ROUTINE.
0801      MOVE SPACE TO PAYROLL-RECORD.
0802      READ OLD-PAYROLL-MASTER-FILE
0803          AT END GO TO OLD-EOJ-ROUTINE.
0900  READ-RANDOM.
      *   if you wanted record 100 in a random file
0901      MOVE 100 to KEY3-RECORD-NUMBER.
0902      READ IN-RANDOM-FILE
0903          INVALID KEY DISPLAY "INVALID KEY".
```

REWRITE replaces a record existing in a disk file.

FORMAT:

REWRITE record-name [**INVALID** KEY imperative-statement]

RULES:

1. The file must have been opened in the I-O mode.
2. The record-name must be the name of a logical record in the FILE SECTION of the DATA DIVISION.
3. The REWRITE statement must have been preceded by a successful READ statement in the SEQUENTIAL ACCESS MODE as it is this logical record that is replaced.
4. The INVALID KEY clause must be used for RANDOM files.
5. For files accessed in RANDOM access mode, the record logically replaces the record specified by the contents of the RELATIVE KEY data item associated with the file.

EXAMPLE:

```
      *  IN-FILE is the file name and IN-REC is a record name
      *  for the file
0097  SEQ-REWRITE.
0098     READ IN-FILE RECORD AT END GO TO EOJ.
0099     MOVE NEW-DATA TO IN-REC.
0100     REWRITE IN-REC.
0200  RANDOM-REWRITE.
0201     MOVE 100 TO KEY-REL.
0202     REWRITE NEW-REC INVALID KEY GO TO ERROR.
```

STOP causes permanent or temporary suspension of the execution of the object program.

FORMAT:

```
          {literal}
STOP      {RUN}
```

RULES:

1. All files should be closed before a STOP RUN statement is issued.
2. The STOP RUN statement must be the last statement executed in the program as the operating system takes control after execution.
3. The literal is displayed on the console device and waits for a code followed by a carriage return to be entered as follows:

   C < CR > = continue
   E < CR > = exit to operating system.

EXAMPLE:

```
0900   END-OF-JOB. STOP RUN.
0500   ERR. STOP "SIZE ERROR ENTER C TO CONTINUE".
```

SUBTRACT lets you subtract one numeric data item from another and set the value of an item equal to the result.

FORMAT:

```
                {literal-1}                {literal-2}
SUBTRACT        {identifier-1} FROM        {identifier-2}
```

[GIVING identifier-3] **[ROUNDED]**

[, ON **SIZE ERROR** imperative-statement]

RULES:

1. Each identifier must refer to an elementary numeric item, except identifier-3 which may refer to an elementary numeric edited item.
2. The composite of operands must not contain more than 18 digits.
3. An identifier can only reference an elementary item.
4. Each operand can contain an operational sign and an implied decimal point.
5. Operands are aligned according to implied decimal points.
6. ROUNDED performs a test to see if right truncation will occur and, if it will, adjusts the result by adding 1 if the truncated digit is 5 or greater.
7. ON SIZE ERROR performs a test to see if overflow has occurred and, if it has, executes the imperative-statement.

EXAMPLE:

```
0870   SUBTRACT TAXES FROM GROSS-PAY GIVING NET-PAY
0871       ROUNDED ON SIZE ERROR GO TO TAX-ERR-ROUTINE.
```

WRITE releases a record to an output file and allows for vertical positioning if the output device is a printer.

FORMAT:

```
                                          {PAGE        }
                                          {      LINE  }
WRITE record-name [BEFORE ADVANCING       {integer LINES}]
```

WRITE record-name [**INVALID** KEY imperative-statement]

RULES:

1. The record-name must be the name of a logical record in the FILE SECTION of the DATA DIVISION.
2. The reserved word PAGE issues a standard form feed (OCH) control character to the device driver.
3. Integer LINES issues the specified number of carriage return line feeds.
4. The INVALID KEY clause must be used for RANDOM files.
5. The requested record number must be placed in the RELATIVE KEY before writing to a RANDOM file.

EXAMPLE:

```
0900  P-ROUTINE.
0901      WRITE PRINT-LINE BEFORE ADVANCING 2 LINES.
0902      MOVE SPACES TO PRINT-LINE.
0903      WRITE PRINT-LINE BEFORE ADVANCING PAGE.
1000  WRITE-RANDOM.
1001      MOVE 1000 TO KEY3.
1002      WRITE D-RANDOM-OUT
1003          INVALID KEY DISPLAY "INVALID KEY".
1050  SEQ. WRITE.
1051      WRITE D-REC.
```

7 ERROR CODES AND MESSAGES

COMPILER ERROR MESSAGES

During compilation, all error codes are output to a disk work file (W3.WRK). At the end of each COBOL Division, the compiler checks for any fatal errors and terminates the compile if any have been found. At the end of compilation, a report is displayed and is available for redisplay using the program ERRORS if needed:

A > ERROR <CR> .

Using the CP/M feature CTRL-P, the error messages can also be sent to the printer as they are displayed. Also, CTRL-S can be used to stop and start the report.

All of the compiler error messages are contained on a file named W5.CBL and can be changed by the user. For example, you may want to have your error messages displayed in German or some other language. These messages can be more than one line and upper-case or lower-case. See error code number 003 below for an example.

Note: The Level codes are F for Fatal (no object code generated) and W for Warning Possible Error. Also, (not shown below) each line is preceded by the source program's actual line number.

SEQ. NO.	COL.	ERROR NO.	LEVEL	TEXT
9999	70	001	F	SYNTAX ERROR
		002	F	NOT A COBOL WORD
		003	F	SYNTAX ERROR OR PERIOD MISSING FROM PRIOR LINE
		004	F	FILE NOT SELECTED IN THE I-O SECTION
dataname		005	F	OCCURS LIMITED TO ONE LEVEL
dataname		006	F	SUBSCRIPTED ITEMS CANNOT BE REDEFINED
dataname		007	F	PICTURE ITEMS MUST BE ELEMENTARY
dataname		008	F	EDITED PICTURE CONTAINS ILLEGAL COMBINATIONS
dataname		009	F	MAX RECORD LENGTH OF 4095 EXCEEDED
dataname		010	F	ELEMENTARY ITEM DOES NOT HAVE PICTURE CLAUSE
dataname		011	F	ILLEGAL REDEFINES DUE TO INCORRECT REFERENCE
		012	F	SUBSCRIPT ERROR
		013	F	ILLEGAL COMBINATION OF CHARACTERS IN PICTURE
		014	F	DUPLICATION OF PREVIOUS NAME IS ILLEGAL
		015	F	ENVIRONMENT DIVISION MISSING
		016	F	FD MUST CONTAIN A LABEL RECORD CLAUSE
		017	F	VALUE OF FILE-ID MISSING
		018	F	SUBSCRIPT LITERAL CONTAINS ILLEGAL VALUE

	019	F	USAGE CONFLICT
	020	F	OCCURS CLAUSE IS ILLEGAL AT 01 LEVEL
	021	F	VALUE IS ILLEGAL WITH OCCURS CLAUSE
	022	F	VALUE IS ILLEGAL FOR REDEFINED ITEMS
	023	F	ILLEGAL CHARACTER IN WORD
dataname	024	F	MUST HAVE RELATIVE KEY
dataname	025	F	MUST BE IN WORKING-STORAGE
	026	F	KEY NOT ELEMENTARY
dataname	027	F	RELATIVE KEY MUST BE PIC 9(7)
dataname	028	F	PARAGRAPH NAME IS NOT DEFINED
dataname	029	F	PARAGRAPH NAME IS NOT ALTERABLE
	030	F	TOO MANY FILES SELECTED
	031	F	NEED MORE MEMORY OR REDUCE SIZE OF LABELS
	032	F	CORRECT ALL ERRORS AND RECOMPILE
	033	F	MISSING DIVISION STATEMENT
	034	F	TOO MANY PARAGRAPH NAMES
	035	F	TOO MANY FORWARD REFERENCES
	037	F	01-10 AND 77 LEVELS ONLY
dataname	038	F	IS NOT DEFINED
	039	F	AREA B MUST START WITH " ON CONTINUED LITERAL
	040	F	ILLEGAL HEXADECIMAL CHARACTER
	041	F	ILLEGAL FILE-ID "U:FILE"
	042	F	ASCII (DISPLAY) DATA TYPE REQUIRED
	043	F	RANDOM FILES MUST USE INVALID KEY CLAUSE
	044	F	RESERVED WORD NOT YET IMPLEMENTED
	045	F	VALUE/PICTURE SIGN ERROR
	046	F	COPY CANNOT ALSO COPY
	047	F	COPY FILE NAME TOO LONG
	048	F	COULD NOT FINE REDEFINED ITEM NAME
	049	F	LITERAL OVER 120 CHARACTERS LONG
	050	W	LITERAL TRUNCATED RIGHT END
	051	W	MORE THAN 30 CHARACTERS IN A WORD
	052	F	LITERAL LONGER THAN PICTURE
	053	W	REDEFINED AREA ADJUSTED
	054	W	EDITED PICTURE MODIFIED
	055	W	TWO RECORDS IN A FILE HAVE DIFFERENT SIZES
	056	W	COLUMN 5 OR 7 TREATED AS COMMENTS
	057	W	LINE NUMBER OUT OF SEQUENCE
	058	W	RANDOM FILE CANNOT BE DELIMITED
	059	W	PERIOD IS MISSING AFTER PREVIOUS WORD
	060	F	DECIMAL POINT SIZES DIFFERENT
	061	W	PRINTER CANNOT BE DELIMITED
	062	F	VALUE EXCEEDS 5 DIGITS FOR COMP
	063	F	ILLEGAL VALUE FOR COMP
	064	F	ILLEGAL CURRENCY SIGN
	065	F	COPY FILE-NAME MISSING
	066	W	ALL LITERAL LIMITED TO 1 BYTE
	067	F	ZERO MISSING IN BLANK WHEN ZERO
	068	F	BLANK WHEN ZERO NOT ALLOWED AT GROUP LEVEL

069	F	BLANK WHEN ZERO MUST BE ASCII DISPLAY
070	F	BLANK WHEN ZERO FOR NUMERIC ONLY
071	F	JUSTIFIED MUST BE ELEMENTARY DATA ITEM
072	F	JUSTIFIED CANNOT BE NUMERIC OR EDITED
073	W	ADDRESS EXCEEDS CURRENT CPM BASE ADDRESS
074	F	MORE THAN 255 LINKAGE ITEMS
075	F	USING WITH NO LINKAGE SECTION
076	F	IF/UNTIL NESTED CONDITIONAL ARE ILLEGAL
077	F	RESERVED WORD "SENTENCE" IS MISSING
078	F	ONLY PRINTER FILES CAN HAVE OMITTED
079	F	MORE THAN ONE LABEL RECORDS CLAUSE
080		SUCCESSFUL COMPILE MEMORY AVAILABLE
081	F	MEMORY OVERFLOW REDUCE PROGRAM SIZE look at MEMORY size clause under OBJECT-COMPUTER.
082	F	ADVANCING FOR PRINTER FILES ONLY
083	F	REDEFINES AT 01 LEVEL IN FILE SECTION IS ILLEGAL
084	F	COMP AND COMP-3 CANNOT CONTAIN EDIT SYMBOLS
085	F	PROGRAM NAME
086		USER LINE ERR
087		LINE NO LVL TEXT
088		ENTER<CR>FOR NEXT LINE
089		ERROR MESSAGE NEXT LINE:

RUN TIME AND COMPILE TIME ERROR MESSAGES

The RUN time package will display the unit and file-name following the error codes. The following codes are also used in the STATUS keys when specified.

90 No additional information
91 Error in extending the file
92 End of disk data — disk is full
93 File not open
94 No more directory space — disk is full
95 File cannot be found
96 File already open
97 Reading unwritten data in random access
98 Rewrite without prior read in I-O MODE
99 Reading an output file or writing to an input file
100 ERROR MESSAGE NOT IN TABLE
101 SUBSCRIPT ERROR value exceeds 65K.
102 BOUNDARY ERROR program fell through last paragraph.

Note: The RUN time package must be the one distributed with the current version of the compiler.

APPENDIX I SAMPLE PROGRAMS

Listing No. 1 — Sequentially Read a Fixed Length File

```
0001  IDENTIFICATION DIVISION.
0002  PROGRAM-ID.
0003    T6RF.
0004*   THIS PROGRAM READS A FIXED LENGTH FILE
        SEQUENTIALLY
0005  ENVIRONMENT DIVISION.
0006  CONFIGURATION SECTION.
0007  SOURCE-COMPUTER.
0008    COMMODORE-64.
0009  OBJECT-COMPUTER.
0010    COMMODORE-64.
0011  INPUT-OUTPUT SECTION.
0012  FILE-CONTROL.
0013    SELECT FILE1 ASSIGN TO DISK
0014      ORGANIZATION IS SEQUENTIAL
0015      ACCESS MODE IS SEQUENTIAL
0016      FILE STATUS IS STATUS-KEY.
0017  DATA DIVISION.
0018  FILE SECTION.
0019  FD FILE1
0020    LABEL RECORDS ARE STANDARD
0021    VALUE OF FILE-ID IS NAME-OF-FILE
0022    BLOCK CONTAINS 1 RECORD
0023    DATA RECORDS ARE I-RECORD.
0024  01 I-RECORD.
0025    02 SEQ PIC 9999.
0026    02 REC1 PIC IS X(160).
0027  WORKING-STORAGE SECTION.
0028  01 STATUS-KEY PIC XX.
0029  01 NAME-OF-FILE PIC X(14)
0030    VALUE "A:TESTF.WRK".
0031  PROCEDURE DIVISION.
0032  BEGIN.
0033    DISPLAY "ENTER INPUT FILE NAME".
0034    DISPLAY NAME-OF-FILE WITH NO ADVANCING
0035    ACCEPT NAME-OF-FILE
0036    OPEN INPUT FILE1.
0037  BEGIN2.
0038    MOVE SPACE TO I-RECORD.
0039    MOVE SPACE TO STATUS-KEY.
0040    READ FILE1
0041      AT END
0042      GO TO EOJ.
```

```
0043      DISPLAY I-RECORD
0044      DISPLAY STATUS-KEY.
0045      GO TO BEGIN2.
0046    EOJ.
0047      DISPLAY STATUS-KEY
0048      CLOSE FILE1.
0049      DISPLAY STATUS-KEY.
0050      STOP RUN.
0051    END PROGRAM T6RF.
```

Listing No. 2 — Read and Rewrite Fixed Length Records

```
0001    IDENTIFICATION DIVISION.
0002    PROGRAM-ID.
0003      T6IOF.
0004*   THIS PROGRAM READS THEN REWRITES FIXED
          LENGTH RECORDS.
0005    ENVIRONMENT DIVISION.
0006    CONFIGURATION SECTION.
0007    SOURCE-COMPUTER.
0008      COMMODORE-64.
0009    OBJECT-COMPUTER.
0010      COMMODORE-64.
0011    INPUT-OUTPUT SECTION.
0012    FILE-CONTROL.
0013      SELECT FILE1 ASSIGN TO DISK
0014        ORGANIZATION IS SEQUENTIAL
0015        ACCESS MODE IS SEQUENTIAL.
0016    DATA DIVISION.
0017    FILE SECTION.
0018    FD FILE1
0019      LABEL RECORDS ARE STANDARD
0020      VALUE OF FILE-ID IS IN-OUT-FILE
0021      DATA RECORDS ARE I-O-RECORD.
0022    01 I-O-RECORD.
0023      02 SEQ PIC 9999.
0024      02 REC1 PIC IS X(160).
0025    WORKING-STORAGE SECTION.
0026    01 IN-OUT-FILE PIC X(14)
0027         VALUE "A:TESTF.WRK".
0028    01 X1 PIC 9999
0029         VALUE 1001.
0030    PROCEDURE DIVISION.
```

```
0031  BEGIN.
0032    DISPLAY "ENTER FILE NAME".
0033    DISPLAY IN-OUT-FILE WITH NO ADVANCING.
0034    ACCEPT IN-OUT-FILE.
0035    OPEN I-O FILE1.
0036    MOVE SPACE TO I-O-RECORD.
0037  BEGIN2.
0038    READ FILE1
0039      AT END
0040      GO TO EOJ.
0041    DISPLAY SEQ.
0042    DISPLAY "IN" WITH NO ADVANCING.
0043    MOVE X1 TO SEQ.
0044    ADD 1 TO X1.
0045    DISPLAY SEQ.
0046    REWRITE I-O-RECORD.
0047    DISPLAY "OUT" WITH NO ADVANCING.
0048    GO TO BEGIN2.
0049  EOJ.
0050    CLOSE FILE1.
0051    STOP RUN.
0052  END PROGRAM T6IOF.
```

Listing No. 3 — Create a File of Variable Length

```
0001   IDENTIFICATION DIVISION.
0002   PROGRAM-ID.
0003     T6WD.
0004*  THIS PROGRAM CREATES A FILE OF VARIABLE
0005*  LENGTH (DELIMITED) RECORDS. MOST TEXT EDITORS
       *  CREATE THIS TYPE OF FILE. EACH RECORD ENDS
       *  WITH A CARRIAGE RETURN AND LINE FEED.
0005   ENVIRONMENT DIVISION.
0006   CONFIGURATION SECTION.
0007   SOURCE-COMPUTER.
0008     COMMODORE-64.
0009   OBJECT-COMPUTER.
0010     COMMODORE-64.
0011   INPUT-OUTPUT SECTION.
0012   FILE-CONTROL.
0013     SELECT FILE1 ASSIGN TO DISK
0014       ORGANIZATION IS SEQUENTIAL
0015       ACCESS MODE IS SEQUENTIAL.
       *  the next statement tells the compiler each record is to be
       *  delimited (separated) by or ended with a carriage return
       *  and line feed.
0016       RECORD DELIMITER IS STANDARD.
0017   DATA DIVISION.
0018   FILE SECTION.
0019   FD FILE1
0020     LABEL RECORDS ARE STANDARD
0021     VALUE OF FILE-ID IS OUT-FILE
0022     DATA RECORDS ARE O-RECORD.
0023   01 O-RECORD.
0024     02 SEQ PIC 9999.
0025     02 REC1 PIC IS X(156).
0026     02 SEQ2 PIC 9999.
0027   WORKING-STORAGE SECTION.
0028   01 OUT-FILE PIC X(14)
0029       VALUE IS "A:TESTB.WRK".
0030   01 X1 PIC 9999
0031       VALUE 0001.
```

```
0032  01 PAD.
0033     02 FILLER PIC X(30)
0034        VALUE SPACE.
0035     02 FILLER PIC X(30)
0036        VALUE SPACE.
0037     02 FILLER PIC X(30)
0038        VALUE SPACE.
0039     02 FILLER PIC X(30)
0040        VALUE SPACE.
0041     02 FILLER PIC X(30)
0042        VALUE SPACE.
0043     02 FILLER PIC X(05)
0044        VALUE "AAAAA".
0045  PROCEDURE DIVISION.
0046  BEGIN.
0047     DISPLAY "ENTER OUTPUT FILE NAME".
0048     DISPLAY OUT-FILE WITH NO ADVANCING.
0049     ACCEPT OUT-FILE.
0050     MOVE SPACE TO O-RECORD.
0051     OPEN OUTPUT FILE1.
0052     DISPLAY "OPEN".
0053     MOVE PAD TO REC1.
0054  BEGIN2.
0055     MOVE X1 TO SEQ.
0056     MOVE X1 TO SEQ2.
0057     ADD 1 TO X1.
0058     DISPLAY O-RECORD.
0059     WRITE O-RECORD
0060     IF X1 = 011
0061        GO TO EOJ.
0062     GO TO BEGIN2.
0063  EOJ.
0064     CLOSE FILE1.
0065     STOP RUN.
0066  END PROGRAM T6WD.
```

Listing No. 4 — Read a Variable Length File

```
0001   IDENTIFICATION DIVISION.
0002   PROGRAM-ID.
0003     T6RD.
0004*  THIS PROGRAM READS A VARIABLE LENGTH
       (DELIMITED) FILE.
       * this kind of file is created by most text editors. Each
       * record in the file is terminated with a carriage return and
       * line feed.
0005   ENVIRONMENT DIVISION.
0006   CONFIGURATION SECTION.
0007   SOURCE-COMPUTER.
0008     COMMODORE-64.
0009   OBJECT-COMPUTER.
0010     COMMODORE-64.
0011   INPUT-OUTPUT SECTION.
0012   FILE-CONTROL.
0013     SELECT FILE1 ASSIGN TO DISK
0014       ORGANIZATION IS SEQUENTIAL
0015       ACCESS MODE IS SEQUENTIAL
       * the next statement tells the compiler the records will end
       * with a carriage return and line feed.
0016       RECORD DELIMITER IS STANDARD.
0017   DATA DIVISION.
0018   FILE SECTION.
0019   FD FILE1
0020     LABEL RECORDS ARE STANDARD
0021     VALUE OF FILE-ID IS IN-FILE
0022     DATA RECORDS ARE I-RECORD.
0023   01 I-RECORD.
0024     02 SEQ PIC 9999.
0025     02 REC1 PIC IS X(160).
0026   WORKING-STORAGE SECTION.
0027   01 IN-FILE PIC X(14)
0028       VALUE "A:TESTB.WRK".
0029   PROCEDURE DIVISION.
0030   BEGIN.
0031     DISPLAY "ENTER INPUT FILE NAME".
0032     DISPLAY IN-FILE WITH NO ADVANCING.
0033     ACCEPT IN-FILE.
0034     OPEN INPUT FILE1.
```

```
0035  BEGIN2.
0036*   the next statement is necessary because the delimited
0036*   read only transfers data into the record area and if short,
0036*   the data from prior reads will be in the record area on the
0036*   right end.
0036      MOVE SPACE TO I-RECORD.
0037      READ FILE1
0038        AT END
0039        GO TO EOJ.
0040      DISPLAY I-RECORD.
0041      GO TO BEGIN2.
0042  EOJ.
0043      CLOSE FILE1.
0044      STOP RUN.
0045  END PROGRAM T6RD.
```

Listing No. 5 — Read and Rewrite Variable Length Records

```
0001  IDENTIFICATION DIVISION.
0002  PROGRAM-ID.
0003    T6IOD.
0004*   THIS PROGRAM READS THEN REWRITES VARIABLE
        LENGTH RECORDS.
0005  ENVIRONMENT DIVISION.
0006  CONFIGURATION SECTION.
0007  SOURCE-COMPUTER.
0008    COMMODORE-64.
0009  OBJECT-COMPUTER.
0010    COMMODORE-64.
0011  INPUT-OUTPUT SECTION.
0012  FILE-CONTROL.
0013    SELECT FILE1 ASSIGN TO DISK
0014      ORGANIZATION IS SEQUENTIAL
0015      ACCESS MODE IS SEQUENTIAL
0016      RECORD DELIMITER IS STANDARD.
0017  DATA DIVISION.
0018  FILE SECTION.
0019  FD FILE1
0020    LABEL RECORDS ARE STANDARD
0021    VALUE OF FILE-ID IS I-O-FILE-NAME
0022    DATA RECORDS IS A-RECORD.
```

```
0023  01 A-RECORD.
0024     02 SEQ PIC 9999.
0025     02 REC1 PIC IS X(160).
0026  WORKING-STORAGE SECTION.
0027  01 X1 PIC 9999
0028        VALUE 2001.
0029  01 I-O-FILE PIC X(14)
0030        VALUE IS "A:TESTB.WRK".
0031  PROCEDURE DIVISION.
0032  BEGIN.
0033     DISPLAY "ENTER I-O FILE NAME".
0034     DISPLAY I-O-FILE-NAME WITH NO ADVANCING.
0035     ACCEPT I-O-FILE-NAME.
0036     OPEN I-O FILE1.
0037  BEGIN2.
0038     MOVE SPACE TO A-RECORD.
0039     READ FILE1
0040        AT END
0041        GO TO EOJ.
0042     MOVE X1 TO SEQ.
0043     ADD 1 TO X1.
0044     DISPLAY SEQ.
0045     REWRITE A-RECORD.
0046     GO TO BEGIN2.
0047  EOJ.
0048     CLOSE FILE1.
0049  DISPLAY "RENUMBERING COMPLETE".
0050     STOP RUN.
0051  END PROGRAM T6IOD.
```

Listing No. 6 — Read a Variable Length File, Output to the Printer

```
0001   IDENTIFICATION DIVISION.
0002   PROGRAM-ID. TST-PRT.
       *  This sample program reads in a variable length file
       *  and outputs it to the printer.
0003   ENVIRONMENT DIVISION.
0004   CONFIGURATION SECTION.
0005   SOURCE-COMPUTER. COMMODORE-64.
0006   OBJECT-COMPUTER. COMMODORE-64.
0008   INPUT-OUTPUT SECTION.
0009   FILE-CONTROL.
0010     SELECT FILE1 ASSIGN TO DISK
0011     RECORD DELIMITER IS STANDARD.
       *  the next line is for printers and/or printer-files.
0012     SELECT FILE2 ASSIGN TO PRINTER.
0013   DATA DIVISION.
0014   FILE SECTION.
0015   FD  FILE1
0016     LABEL RECORDS ARE STANDARD
0017     VALUE OF FILE-ID IS IN-FILE1-NAME
0018     DATA RECORD IS TESTB.
0019   01 TESTB PIC X(80).
0020   FD  FILE2
0021     LABEL RECORDS ARE STANDARD
0022     VALUE OF FILE-ID IS OUT-FILE2-NAME
0023     DATA RECORD IS PRINT-LINE.
0024   01 PRINT-LINE PICTURE IS X(132).
0025   WORKING-STORAGE SECTION.
       *  the input file-name can be a cobol source file to be listed
       *  on the printer. this file-name can be changed at run time
       *  see line 0030-0032.
0026   01 IN-FILE1-NAME PIC X(14) VALUE "A:T01.CBL".
       *  in line 0027 "printer" is the key word to send output to the
       *  physical printer.
       *  any other file-name sends output to the named disk file.
       *  this option of either printing or sending output to the
       *  printer can be made at run time. see lines 0033-0035.
```

```
0027  01 OUT-FILE2-NAME PIC X(14) VALUE "PRINTER".
0028  PROCEDURE DIVISION.
0029  BEGIN.
0030     DISPLAY "ENTER INPUT FILE".
0031     DISPLAY IN-FILE1-NAME WITH NO ADVANCING.
0032     ACCEPT IN-FILE1-NAME.
0033     DISPLAY "ENTER PRINTER FILE".
0034     DISPLAY OUT-FILE2-NAME WITH NO ADVANCING.
      *  no need to re-enter the word "printer" just hit    cr
0035  ACCEPT OUT-FILE2-NAME.
0036     OPEN INPUT FILE1.
0037     OPEN OUTPUT FILE2.
0038     MOVE SPACES TO PRINT-LINE.
0039  PARA-3.
0040     MOVE SPACE TO TESTB.
0041     READ FILE1 AT END GO TO EOJ.
0042     MOVE TESTB TO PRINT-LINE.
0043     WRITE PRINT-LINE BEFORE ADVANCING 1 LINE.
0044     GO TO PARA-3.
0045  EOJ.
0046     MOVE SPACES TO PRINT-LINE.
0047     WRITE PRINT-LINE BEFORE ADVANCING PAGE.
0048     CLOSE FILE1.
0049     CLOSE FILE2.
0050     STOP RUN.
0051  END PROGRAM TST-PRT.
```

Listing No. 7 — Write Random Fixed Length Records to a File Previously Created Using a Sequential Fixed Length Write Program

```
0001   IDENTIFICATION DIVISION.
0002   PROGRAM-ID.
0003     T8WR.
0004*  THIS PROGRAM WRITES RANDOM FIXED LENGTH
0004*  RECORDS TO A FILE THAT HAS BEEN CREATED USING
0004*  A SEQUENTIAL FIXED LENGTH WRITE PROGRAM TO
0004*  ALLOCATE THE REQUIRED FILE SPACE.
0005   ENVIRONMENT DIVISION.
0006   CONFIGURATION SECTION.
0007   SOURCE-COMPUTER.
0008     COMMODORE-64.
0009   OBJECT-COMPUTER.
0010     COMMODORE-64.
0011   INPUT-OUTPUT SECTION.
0012   FILE-CONTROL.
0013     SELECT FILE1 ASSIGN TO DISK
0014       ORGANIZATION IS
0015       RELATIVE
0016       ACCESS MODE IS RANDOM
0017       RELATIVE KEY IS KEY-1.
0018   DATA DIVISION.
0019   FILE SECTION.
0020   FD FILE1
0021     LABEL RECORDS ARE STANDARD
0022     VALUE OF FILE-ID IS OUT-FILE
0023     DATA RECORDS ARE O-RECORD.
0024   01 O-RECORD.
0025     02 SEQ PIC 9999.
0026     02 REC1 PIC IS X(160).
0027   WORKING-STORAGE SECTION.
0028   01 OUT-FILE PIC X(14)
0029        VALUE "A:TESTF.WRK".
0030   01 KEY-1 PIC 9(7) COMP-3.
0031   01 XX-KEY PIC 9(4) VALUE 1.
0032   PROCEDURE DIVISION.
0033   BEGIN.
0034     DISPLAY "ENTER OUTPUT FILE NAME".
0035     DISPLAY OUT-FILE WITH NO ADVANCING.
0036     ACCEPT OUT-FILE.
0037     OPEN OUTPUT FILE1.
```

```
0038  BEGIN2.
0039      MOVE SPACE TO O-RECORD.
0040      MOVE 0001 TO XX-KEY.
0041      DISPLAY "ENTER RECORD NUMBER 0001".
0042      ACCEPT XX-KEY.
0043      IF XX-KEY IS NOT NUMERIC
0044          GO TO BEGIN2.
0045      IF XX-KEY = 9999
0046          GO TO EOJ.
0047      MOVE XX-KEY TO KEY-1.
0048      MOVE XX-KEY TO SEQ.
0049      DISPLAY "ENTER DATA FOR RECORD".
0050      ACCEPT REC1.
0051      WRITE O-RECORD
0052          INVALID KEY
0053          DISPLAY "INVALID KEY" GO TO BEGIN2.
0054      DISPLAY O-RECORD.
0055      GO TO BEGIN2.
0056  EOJ.
0057      CLOSE FILE1.
0058      DISPLAY "EOJ".
0059      STOP RUN.
0060  END PROGRAM T8WR.
```

Listing No. 8 — Read Random Fixed Length Records

```
0001  IDENTIFICATION DIVISION.
0002  PROGRAM-ID.
0003      T8RR.
0004*     THIS PROGRAM WRITES RANDOM FIXED LENGTH
          RECORDS
0005  ENVIRONMENT DIVISION.
0006  CONFIGURATION SECTION.
0007  SOURCE-COMPUTER.
0008      COMMODORE-64.
0009  OBJECT-COMPUTER.
0010      COMMODORE-64.
0011  INPUT-OUTPUT SECTION.
0012  FILE-CONTROL.
0013      SELECT FILE1 ASSIGN TO DISK
0014          ORGANIZATION IS
0015          RELATIVE
0016          ACCESS MODE IS RANDOM
0017          RELATIVE KEY IS KEY-1.
```

```
0018  DATA DIVISION.
0019  FILE SECTION.
0020  FD FILE1
0021     LABEL RECORDS ARE STANDARD
0022     VALUE OF FILE-ID IS IN-FILE
0023     DATA RECORDS ARE I-RECORD.
0024  01 I-RECORD.
0025     02 PART-NUMBER PIC 9999.
0026     02 ITEM-DESCRIPTION PIC IS X(160).
0027  WORKING-STORAGE SECTION.
0028  01 IN-FILE PIC X(14)
0029        VALUE "A:TESTF.WRK".
0030  01 KEY-1 PIC 9(7) COMP-3.
0031  01 XX-KEY PIC 9(4).
0032  PROCEDURE DIVISION.
0033  BEGIN.
0034     DISPLAY "ENTER INPUT FILE NAME".
0035     DISPLAY IN-FILE WITH NO ADVANCING.
0036     ACCEPT IN-FILE.
0037     OPEN INPUT FILE1.
0038     DISPLAY "OPEN".
0039  BEGIN2.
0040     MOVE SPACE TO I-RECORD.
0041     MOVE 0001 TO XX-KEY.
0042     DISPLAY "ENTER RECORD NUMBER 0001"
0043     ACCEPT XX-KEY.
0044     IF XX-KEY IS NOT NUMERIC
0045        GO TO BEGIN2.
0046     IF XX-KEY = 9999
0047        GO TO EOJ.
0048     MOVE XX-KEY TO KEY-1.
0049     READ FILE1
0050        INVALID KEY
0051        DISPLAY "INVALID KEY" GO TO BEGIN2.
0051*  don't display on invalid key as data is unspecified.
0052     DISPLAY I-RECORD.
0053     GO TO BEGIN2.
0054  EOJ.
0055     CLOSE FILE1.
0056     DISPLAY "EOJ".
0057     STOP RUN.
0058  END PROGRAM T8RR.
```

Listing No. 9 — Read and Rewrite Fixed Length Records in Random Mode

```
0001  IDENTIFICATION DIVISION.
0002  PROGRAM-ID.
0003    T8IOR.
0004*   THIS PROGRAM READS THEN REWRITES FIXED
        LENGTH RECORDS
0005*   IN RANDOM MODE.
0006  ENVIRONMENT DIVISION.
0007  CONFIGURATION SECTION.
0008  SOURCE-COMPUTER.
0009    COMMODORE-64.
0010  OBJECT-COMPUTER.
0011    COMMODORE-64.
0012  INPUT-OUTPUT SECTION.
0013  FILE-CONTROL.
0014    SELECT FILE1 ASSIGN TO DISK
0015      ORGANIZATION IS
0016      RELATIVE
0017      ACCESS MODE IS RANDOM
0018      RELATIVE KEY IS KEY-1.
0019  DATA DIVISION.
0020  FILE SECTION.
0021  FD FILE1
0022    LABEL RECORDS ARE STANDARD
0023    VALUE OF FILE-ID IS I-O-FILE
0024    BLOCK CONTAINS 1 RECORD
0025    DATA RECORDS ARE A-RECORD.
0026  01 A-RECORD.
0027    02 SEQ PIC 9999.
0028    02 REC1 PIC IS X(160).
0029  WORKING-STORAGE SECTION.
0030  01 I-O-FILE PIC X(14)
0031       VALUE "A:TESTF.WRK".
0032  01 KEY-1 PIC 9(7) COMP-3.
0033  01 XX-KEY PIC 9(4)
0034       VALUE 1.
0035  PROCEDURE DIVISION.
```

```
0036  BEGIN.
0037      DISPLAY "ENTER I-O FILE NAME"
0038      DISPLAY I-O-FILE WITH NO ADVANCING.
0039      ACCEPT I-O-FILE.
0040      OPEN I-O FILE1.
0041  BEGIN2.
0042      MOVE SPACE TO A-RECORD.
0043      MOVE 1 TO XX-KEY.
0044      DISPLAY "ENTER RECORD NUMBER 0001".
0045      ACCEPT XX-KEY.
0046      IF XX-KEY IS NOT NUMERIC
0047          GO TO BEGIN2.
0048      IF XX-KEY = 9999
0049          GO TO EOJ.
0050      MOVE XX-KEY TO KEY-1.
0051      READ FILE1
0052          INVALID KEY
0053          DISPLAY "READ INVALID KEY" GO TO BEGIN2.
0054      DISPLAY A-RECORD.
0055      DISPLAY "ENTER NEW DATA".
0056      ACCEPT REC1.
0057      REWRITE A-RECORD
0058          INVALID KEY
0059          DISPLAY "REWRITE INVALID KEY".
0060      DISPLAY A-RECORD.
0061      GO TO BEGIN2.
0062  EOJ.
0063      CLOSE FILE1.
0064      DISPLAY "EOJ".
0065      STOP RUN.
0066  END PROGRAM T8IOR.
```

Listing No. 10 — Examples of Calling and Called Programs

```
0001  IDENTIFICATION DIVISION.
0002  PROGRAM-ID.
0003    T20.
0004*  THIS PROGRAM CALLS PROGRAM T20A WHICH IN
0005*  TURN CALLS PROGRAM T20B.
0006  ENVIRONMENT DIVISION.
0007  CONFIGURATION SECTION.
0008  SOURCE-COMPUTER.
0009    COMMODORE-64.
0010  OBJECT-COMPUTER.
      *  The following memory statement is necessary for memory
      *  mapping as it marks the upper boundary address (16383).
      *  The data from this program loads from the bottom-up and
      *  from the top-down. Free space, if any, is somewhere
      *  between the top address and the starting address.
0011    8080-CPU MEMORY SIZE 16383 CHARACTERS.
0012  DATA DIVISION.
0013  WORKING-STORAGE SECTION.
0014  01 M1.
0015    02 M1-2.
0016    03 M1-3 PIC XXX.
0017    02 M1-4 PIC 99.
0018    02 M1-5 PIC 99V99 COMP VALUE 11.11.
0019    02 M1-6 PIC 999999V99 COMP-3 VALUE 012345.78.
0020    02 M1-7 PIC $99,999.99
0021  01 M2 PIC S9V9999 VALUE 0.6143.
0022  01 M3 PIC X(10) VALUE "A:T20A".
0023  01 M4 PIC X(120).
0024  01 M5 PIC X(20) JUSTIFIED.
0025  PROCEDURE DIVISION.
0026  BEGIN.
0027    DISPLAY "START T20".
0028    MOVE ALL "A" TO M4.
0029    CALL "T20A" USING M1, M2, M3, M4, M5.
0030    DISPLAY "EOJ-T20".
0031    STOP RUN.
0032  END PROGRAM T20.
```

```
0001   IDENTIFICATION DIVISION.
0002   PROGRAM-ID.
0003     T20A.
0004*  THIS PROGRAM IS CALLED BY T20 AND IN
0005*  TURN CALLS PROGRAM T20B.
0006   ENVIRONMENT DIVISION.
0007   CONFIGURATION SECTION.
0008   SOURCE-COMPUTER.
0009     COMMODORE-64.
0010   OBJECT-COMPUTER.
       *  The following memory statement is necessary. It must be
       *  at least 1 byte higher than the previous programs ending
       *  address (16383 + 1 = 16384) in this example.
0011     8080-CPU MEMORY BEGINNING 16384 ENDING 20000.
0012   DATA DIVISION.
0013   WORKING-STORAGE SECTION.
0014   01 L3 PIC X(10) VALUE "A:T20A".
0015   LINKAGE SECTION.
0016   01 M1.
0017     02 M1-2.
0018     03 M1-3 PIC XXX.
0019     02 M1-4 PIC 99.
0020     02 M1-5 PIC 99V99 COMP.
0021     02 M1-6 PIC 999999V99 COMP-3.
0022     02 M1-7 PIC $99,999.99
0023   01 M2 PIC S9V9999.
0024   77 M3 PIC X(10).
0025   77 M4 PIC X(120).
0026   77 M5 PIC X(20) JUSTIFIED.
0027   PROCEDURE DIVISION.
0028*   no period after the word division when using using
0029     USING M1, M2, M3, M4, M5.
0030   BEGIN.
0031     DISPLAY "THIS IS T20A".
0032     DISPLAY M3.
0033     DISPLAY M4.
0034     CALL "T20B" USING L3.
0035     CANCEL "T20B".
0036   EOJ1.
0036     EXIT PROGRAM.
0037   EOJ.
0038     STOP RUN.
0039   END PROGRAM T20A.
```

```
0001  IDENTIFICATION DIVISION.
0002  PROGRAM-ID.
0003    T20B.
0004*  THIS PROGRAM IS CALLED BY T20A AND EXITS BACK
0005*  TO IT. NOTE HOW THE MEMORY IS ALLOCATED.
0006  ENVIRONMENT DIVISION.
0007  CONFIGURATION SECTION.
0008  SOURCE-COMPUTER.
0009    COMMODORE-64.
0010  OBJECT-COMPUTER.
      *  The following memory statement is necessary to control
      *  the memory mapping of this third program module. It
      *  starts at address 20001 just one byte higher than the
      *  previous programs ending address.
0011    8080-CPU MEMORY BEGINNING 20001 ENDING 24000.
0012  DATA DIVISION.
0013  FILE SECTION.
0014  WORKING-STORAGE SECTION.
0015  01 L1 PIC X(10) VALUE SPACE.
0016  LINKAGE SECTION.
0017  01 L3 PIC X(10).
0018  PROCEDURE DIVISION
0019    USING L3.
0020  BEGIN.
0021    DISPLAY "THIS IS T20-B".
0022    DISPLAY L3.
0023  EOJ1.
0024    EXIT PROGRAM.
0025  EOJ.
0026    STOP RUN.
0027  END PROGRAM T20B.
```

Listing No. 11 — Chain to Execute the Next Program Using CP/M's Submit

```
0001   IDENTIFICATION DIVISION.
0002   PROGRAM-ID.
0003     TSUBMIT.
0004*  THIS PROGRAM CHAINS TO EXECUTE THE NEXT
0005*  PROGRAM USING CP/M's SUBMIT WHEN THE NEXT
       PROGRAM IS NOT TYPE (.OBJ)
0006   ENVIRONMENT DIVISION.
0007   CONFIGURATION SECTION.
0008   SOURCE-COMPUTER.
0009     COMMODORE-64.
0010   OBJECT-COMPUTER.
0011     COMMODORE-64.
0012   INPUT-OUTPUT SECTION.
0013   FILE-CONTROL.
0014     SELECT FILE1 ASSIGN TO DISK
0015       RECORD DELIMITER IS STANDARD.
0016   DATA DIVISION.
0017   FILE SECTION.
0018   FD FILE1
0019     LABEL RECORDS ARE STANDARD
0020     VALUE OF FILE-ID IS "A:$$$.SUB"
0021     DATA RECORDS ARE NEXT-PROGRAM.
0022   01 NEXT-PROGRAM PIC X(16).
0023   WORKING-STORAGE SECTION.
0024   01 W-NEXT-PROGRAM.
0025     02 NAME-SIZE PIC X VALUE " "07" ".
0026     02 NAME PIC X (7) VALUE "ED TEXT".
0027     02 STOPPER PIC 99 COMP VALUE ZERO.
0028   PROCEDURE DIVISION.
0029   BEGIN.
0030     OPEN OUTPUT FILE1.
0031     MOVE W-NEXT-PROGRAM TO NEXT-PROGRAM
0032     WRITE NEXT-PROGRAM.
0033     CLOSE FILE1.
0034     STOP RUN.
0035   END PROGRAM TSUBMIT.
```

Listing No. 12 — Call an Assembly Language Program used to Transfer Files from CP/M to PTDOS.

```
0001  IDENTIFICATION DIVISION.
0002  PROGRAM-ID. TRANSFER.
      *  This program calls an assembly language program call
      *  "trans". It is used to transfer files from CP/M to PTDOS a
      *  unix like operating system.
0003  ENVIRONMENT DIVISION.
0004  CONFIGURATION SECTION.
0005  SOURCE-COMPUTER. COMMODORE-64.
0006  OBJECT-COMPUTER. COMMODORE-64.
      *  the following is the actual ending address for this
      *  program. the assembly language program is orged just
      *  after it.
0007    MEMORY SIZE 16383 CHARACTERS.
0008  INPUT-OUTPUT SECTION.
0009  FILE-CONTROL.
0010    SELECT FILE1 ASSIGN TO INPUT DISK
0011       ORGANIZATION IS SEQUENTIAL.
0012       ACCESS MODE IS SEQUENTIAL.
0013  DATA DIVISION.
0014  FILE SECTION.
0015  FD FILE1
0016    LABEL RECORDS ARE STANDARD
0017    VALUE OF FILE-ID IS IN-FILE-NAME
0018    BLOCK CONTAINS 1 RECORD
0019    DATA RECORDS ARE TESTA.
0020  01 TESTA.
0021    02 REC1 PICTURE IS X(256).
0022  WORKING-STORAGE SECTION.
0023  01 ANSWER PIC X VALUE "Y".
0024  01  IN-FILE-NAME PIC X(14) VALUE "A:TXX.CBL       ".
0025  01  OUT-FILE-NAME PIC X(10) VALUE "TXX/1      ".
0026  01  TRANSFER-TYPE PIC 9 VALUE 1.
0027  01  TRANSFER-FUNCTION PIC X VALUE "1".
0028  01  TRANSFER-ERROR PIC XX VALUE "00".
0029  PROCEDURE DIVISION.
0030  BEGIN.
0031    DISPLAY "ENTER INPUT CP/M FILE NAME "IN-FILE-
        NAME.
```

```
0032      ACCEPT IN-FILE-NAME.
0033      OPEN INPUT FILE1.
0034      DISPLAY "ENTER OUTPUT PTDOS FILE NAME"
          OUT-FILE-NAME.
0035      ACCEPT OUT-FILE-NAME.
0036      DISPLAY "ENTER FILE TRANSFER TYPE".
0037      DISPLAY "1 = FIXED  2 = CRLF-CR (½)?".
0038      ACCEPT TRANSFER-TYPE.
0039      MOVE 1 TO TRANSFER-FUNCTION.
0040      CALL "TRANS" USING OUT-FILE-NAME
0041        TRANSFER-TYPE TRANSFER-FUNCTION TRANSFER-
          ERROR
0042        TESTA.
0043      IF TRANSFER-ERROR NOT EQUAL "00"
0044        DISPLAY "PTDOS OPEN ERROR" TRANSFER-ERROR
0045        STOP RUN.
0046  BEGIN2.
0047      MOVE SPACE TO TESTA.
0048      READ FILE1 AT END GO TO EOJ.
0049      MOVE 3 TO TRANSFER-FUNCTION.
0050      CALL "TRANS" USING OUT-FILE-NAME
0051        TRANSFER-TYPE TRANSFER-FUNCTION TRANSFER-
          ERROR
0052        TESTA.
0053      IF TRANSFER-ERROR = "00" GO TO BEGIN2.
0054      DISPLAY "PTDOS WRITE ERROR".
0055      STOP RUN.
0056  EOJ.
0057      CLOSE FILE1.
0058      MOVE 2 TO TRANSFER-FUNCTION.
0059      CALL "TRANS" USING OUT-FILE-NAME
0060        TRANSFER-TYPE TRANSFER-FUNCTION TRANSFER-
          ERROR
0061        TESTA.
0062      DISPLAY "ANOTHER FILE (Y/N)?"
0063      ACCEPT ANSWER.
0064      IF ANSWER = "Y" GO TO BEGIN.
0065      STOP RUN.
0066  END PROGRAM TRANSFER.
```

```
0001  ;  THIS PROGRAM IS "TRANS"
0002  ;  IT IS AN ASSEMBLY LANGUAGE PROGRAM THAT IS
0003  ;  CALLED BY THE PRIOR COBOL PROGRAM NAMED
0004  ;  TRANSFER. IT TRANSFERS CP/M FILES TO PTDOS A
0005  ;  UNIX LIKE OPERATING SYSTEM.
0006  ;  IT IS AN EXAMPLE OF AN ASSEMBLY LANGUAGE
      ;  CALLED PROGRAM
0007  ;  after this program is assembled, the .HEX file must
      ;  be converted to an .OBJ file. use the program
      ;  called CONVHEX to do the conversion.
0008  RELOC EQU O   ;4200H FOR TRS-80
0009  ;  SET UP AS FOLLOWS
0010  ;    BO        LOAD PTDOS
0011  ;   *S         GO TO SOLOS
0012  ;    BO        LOAD CP/M FROM LIFEBOAT 32K
0013  ;
0014   COPY PTDEFS   ;THIS FILE CONTAINS THE PTDOS
       DEFINITIONS
0015   ORG 16384 + RELOC
0016   XEQ START ;necessary for ptdos assembler
0017  START EQU $ ;ENTRY FROM COBOL PROGRAM
0018   SHLD SAV1 ;OUT-FILE-NAME
0019   LXI H,O
0020   DAD SP
0021   SHLD SAVSP
0022   LXI SP,STACK   ;SET UP THE STACK
0023   CALL GETP
0024   LHLD SAV3   ;TRANSFER-FUNCTION
0025   MOV A,M   ;GET CODE
0026   CPI '1'   ;OPEN?
0027   JZ OPEN
0028   CPI '2'   ;CLOSE?
0029   JZ CLOSE
0030   CPI '3'   ;WRITE?
0031   JZ WRITE
0032  ;   ERROR TRANSFER FUNCTION NOT 1, 2, 3
0033  ERRT LXI D,3232H   ;22
0034  EXIT EQU $
0035   LHLD SAV4   ;TRANSFER-ERROR
0036   MOV M,D
0037   DCX H
0038   MOV M,E
0039   LHLD SAVSP
0040   SPHL
0041   RET
0042   GETP EQU $
```

```
0043    XCHG
0044    SHLD SAV2   ;TRANSFER-TYPE
0045    PUSH B
0046    POP H   ;POINTS TO TABLE TO ADDRESS LEFT END
0047    MOV E,M
0048    INX H
0049    MOVE D,M
0050    XCHG
0051    SHLD SAV3   ;TRANSFER-FUNCTION
0052    XCHG
0053    INX H
0054    MOV E,M
0055    INX H
0056    MOV D,M
0057    XCHG
0058    SHLD SAV4   ;TRANSFER-ERROR
0059    XCHG
0060    INX H
0061    MOV E,M
0062    INX H
0063    MOV D,M
0064    LXI H,255
0065    MOV A,E
0066    SUB L
0067    MOV L,A
0068    MOV A,D
0069    SBB H
0070    MOV H,A
0071    SHLD SAV5   ;LEFT END OF RECORD TO BE OUTPUT
0072    RET
0073   OPEN EQU $
0074    LHLD SAV1   ;OUT-FILE-NAME   RIGHT END
0075    LXI D,ONAME + 9
0076    MVI, C,10
0077   OP1 EQU $
0078    MOV A,M
0079    STAX D
0080    DCX H
0081    DCX D
0082    DCR C
0083    JNZ OP1
0084   ;   the next 9 lines is a ptdos open function
0085    MVI A,40H   ;OPEN CREATE IF NECESSARY
0086    LXI D,OBUFF
0087    LXI H,ONAME
```

```
0088   CALL PSCAN
0089   JC ERROR
0090   JZ ERROR
0091   MOV A,E   ;FILE NUMBER
0092   CPI 255   ; – 1 for cpm
0093   JZ ERROR
0094   STA OFILENUMBER   ;ptdos uses file numbers
0095   LXI D,3030H   ;GOOD EXIT for the cobol program
0096   JMP EXIT
0097  ERROR EQU $
0098   MOV D,E
0099   MVI E,'9'
0100   JMP EXIT
0101  CLOSE EQU $ ;ptdos close function follows
0102   LDA OFILENUMBER
0103   CALL SYS
0104   DB EOFOP   ;END FILE
0105   JMP ERROR
0106   LDA OFILENUMBER
0107   CALL SYS
0108   DB CLOOP
0109   JMP $   ;NO ERRORS RETURNED ON CLOSE
0110   LXI D,3030H   ;good close message for the cobol program
0111   JMP EXIT
0112  WRITE EQU $
0113   LHLD SAV2   ;TRANSFER-TYPE
0120   MOV A,M
0121   CPI '2'   ;DROP THE LF'S
0122   JZ WT2
0123   CPI '1'
0124   JNZ ERRT   ;ERROR TRANSFER-TYPE CODE
0125   LHLD SAV5   ; LEFT-END
0126   XCHG
0127   LXI B,256
0128  WT1 EQU$   ;ptdos writer function follows
0129   LDA OFILENUMBER
0130   CALL SYS
0131   DB WBLOP   ;WRITE BLOCK
0132   JMP ERROR
0133   LXI D,3030H   ;GOOD WRITE for cobol program
0134   JMP EXIT
0135  WT2 EQU $   ;DROP THE LF'S
0136   LHLD SAV5
0137   LXI D,BUFF2
0138   LXI B,256
0139  WT2A EQU $
```

```
0140    MOV A,M
0141    CPI OAH   ;LF
0142    JZ WT2B
0143    CPI 1AH   ;CP/M's EOF FOR ASCII FILES
0144    JZ WT2C
0145    STAX D
0146    INX D
0147   WT2B EQU $
0148    INX H
0149    DCX B
0150    MOV A,C
0151    ORA B
0152   JNZ WT2A
0153    WT2C EQU $
0154    LXI H, BUFF2
0155    MOV A,E
0056    SUB L
0157    MOV E,A
0158    MOV A,D
0159    SUBB H
0160    MOV D,A
0161    PUSH D
0162    POP B   ;SIZE OF THIS WRITE FOR PTDOS
0163    XCHG
0164    JMP WT1
0165   SAV1 DW 0   ;OUT-FILE-NAME
0166   SAV2 DW 0   ;TRANSFER-TYPE
0167   SAV3 DW 0   ;TRANSFER-FUNCTION
0168   SAV4 DW 0   ;TRANSFER-ERROR
0169   SAV5 DW 0   ;OUTPUT RECORD
0170   SAVSP DW 0   ;STACK POINTER
0171    ;   all that follows is for ptdos
0172    DB '.' + 80H
0173    DW 04COH
0174    DB 0
0175   OBUFF DS 20
0176    DS 20
0177   STACK DW 0
0178   ONAME DS 10
0179    DB 0
0180   OFILENUMBER DB 0
0181   BUFF2 DS 256
0182   LAST DB 0
0183    END START   ;necessary for cpm assembler
```

APPENDIX II GLOSSARY

Abbreviated Combined Relation Condition
The combined condition that results from the explicit omission of a common subject or a common subject and common relational operator in a consecutive sequence of relation conditions.

Access Mode
The manner in which records are to be operated upon within a file.

Actual Decimal Point
The physical representation, using either of the decimal point characters period (.) or comma (,), of the decimal point position in a data item.

Alphabetic Character
A character that belongs to the following set of letters: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, and the space.

Alphanumeric Character
Any character in the computer's character set.

Alternate Record Key
A key, other than the prime record key, whose contents identify a record within an indexed file.

Arithmetic Expression
An arithmetic expression can be an identifier, a numeric elementary item, or a numeric literal. Such identifiers and literals are separated by arithmetic operators or two arithmetic expressions are separated by an arithmetic operator, or an arithmetic expression is enclosed in parentheses.

Arithmetic Operator
A single character, or a fixed two-character combination, that belongs to the following set:

Character	Meaning
+	addition
–	subtraction
*	multiplication
/	division
**	exponentiation

Ascending Key
A key upon the values of which data is ordered starting with the lowest value of key up to the highest value of key in accordance with the rules for comparing data items.

Assumed Decimal Point
A decimal point position which does not involve the existence of an actual character in a data item. The assumed decimal point has logical meaning but no physical representation.

At End Condition
1. During the execution of a READ statement for a sequentially accessed file.
2. During the execution of a RETURN statement, when no next logical record exists for the associated sort or merge file.

Block
A physical unit of data that is normally composed of one or more logical records. For mass storage files, a block may contain a portion of a logical record. The size of a block has no direct relationship to the size of the file within which the block is contained or to the size of the logical record(s) that are either continued within the block or that overlap the block. The term is synonymous with physical record.

Called Program
A program which is the object of a CALL statement.

Calling Program
A program which executes a CALL to another program.

Character
A basic indivisible unit of the language.

Character Position
A character position is the amount of physical storage required to store a single standard data format character described as usage is DISPLAY.

Character-string
A sequence of contiguous characters which form a COBOL word, a literal, a PICTURE character-string, or a comment-entry.

Class condition
The proposition, for which a truth value can be determined, that the content of an item is wholly alphabetic or is wholly numeric.

Clause
A clause is an ordered set of consecutive COBOL character-strings whose purpose is to specify an attribute of an entry.

COBOL Character Set
The complete COBOL character set consists of the 51 characters listed below:

Character	Meaning
0,1,....9	digit
A,B,....Z	letter
	space (blank)
+	plus sign
–	minus sign (hypen)
*	asterisk
/	slash
=	equal sign
$	currency sign
,	comma
;	semicolon
.	period (decimal point)
"	quotation mark
(	left parenthesis
)	right parenthesis
>	greater than symbol
<	less than symbol

COBOL Word
(See Word)

Collating Sequence
The sequence in which the characters that are acceptable in a computer are ordered for purposes of sorting, merging, and comparing.

Column
A character position within a print line. The columns are numbered from 1, by 1, starting at the leftmost character position of the print line and extending to the rightmost position of the print line.

Combined Condition
A condition that is the result of connecting two or more conditions with the 'AND' or the 'OR' logical operator.

Comment-Entry
An entry in the Identification Division that may be any combination of characters from the COBOL character set.

Comment Line
A source program line represented by an asterisk in the indicator area of the line and any character from the computer's character set in area A and area B of that line. The comment line serves only for documentation in a program. A special form of comment line represented by a slash (/) in the indicator area of the line and any characters from the computer's character set in area A and area B of that line causes page ejection prior to printing the comment.

Compile time
The time at which a COBOL source program is translated, by a COBOL compiler, to a COBOL object program.

Compiler Directing Statement
A statement, beginning with a compiler directing verb, that causes the compiler to take specific action during compilation.

Computer-Name
A system-name that identifies the computer upon which the program is to be compiled or run.

Condition
A status of a program at execution time for which a truth value can be determined. Where the term 'condition' (condition-1, condition-2, ...) appears in these language specifications in or in reference to 'condition' (condition-1, condition-2, ...) of a general format, it is a conditional expression consisting of either a simple condition or a combined condition consisting of the syntactically correct combination of simple conditions, logical operators, and parentheses, for which a truth value can be determined.

Condition-Name
A user-defined word assigned to a specific value, set of values, or range of values, within the complete set of values that a conditional variable may possess.

Condition-Name Condition
The proposition, for which truth value can be determined, that the value of a conditional variable is a member of the set of values attributed to a condition-name associated with the conditional variable.

Conditional Expression
A simple condition or a complex condition specified in an IF, or PERFORM statement.

Conditional Statement
A conditional statement specifies that the truth value of a condition is to be determined and that the subsequent action of the object program is dependent on this truth value.

Conditional Variable
A data item one or more values of which has a condition-name assigned to it.

Configuration Section
A section of the Environment Division that describes overall specifications of source and object computers.

Connective
A reserved word that is used to:

1. Associate a data-name, paragraph-name, condition-name, or text-name with its qualifier.
2. Link two or more operands written in a series.
3. Form conditions.

Contiguous Item
Items that are described by consecutive entries in the Data Division, and that bear a definite hierarchic relationship to each other.

Counter
A data item used for storing numbers or number representations in a manner that permits these numbers to be increased or decreased by the value of another number, or to be changed or reset to zero or to an arbitrary positive or negative value.

Currency Sign
A character '$' of the COBOL character set.

Currency Symbol
The character defined by the CURRENCY SIGN clause in the SPECIAL-NAMES paragraph. If no CURRENCY SIGN clause is present in a COBOL source program, the currency symbol is identical to the currency sign.

Current Record
The record which is available in the record area associated with the file.

Current Record Pointer
A conceptual entity that is used in the selection of the next record.

Data Clause
A clause that appears in a data description entry in the Data Division and provides information describing a particular attribute of a data item.

Data Description Entry
An entry in the Data Division that is composed of a level-number followed by a data-name, if required, and then followed by a set of data clauses, as required.

Data Item
A character or a set of contiguous characters (excluding in either case literals) defined as a unit of data by the COBOL program.

Data-Name
A user-defined word that names a data item described in a data description entry in Data Division. When used in the general formats, 'data-name' represents a word which can neither be subscripted, nor indexed unless specifically permitted by the rules for that format.

Debugging Line
A debugging line is any line with 'D' in the indicator area of the line.

Declaratives
A set of one or more special purpose sections, written at the beginning of the Procedure Division, the first of which is preceded by the key word DECLARATIVES and the last of which is followed by the key words END DECLARATIVES. A declarative is composed of a section header, followed by a USE compiler directing sentence, followed by a set of zeros, and one or more associated paragraphs.

Declarative-Sentence
A compiler-directing sentence consisting of a single USE statement terminated by the separator period.

Delimiter
A character or a sequence of contiguous characters that identify the end of a string of characters and separates that string of characters from the following string of characters. A delimiter is not part of the string of characters that it delimits.

Descending Key
A key of values upon which data is ordered starting with the highest value of key down to the lowest value of key, in accordance with the rules for comparing data items.

Digit Position
A digit position is the amount of physical storage required to store a single digit. This amount may vary depending on the usage of the data item describing the digit position.

Division
A set of zero, one or more sections of paragraphs, called the division body, that are formed and combined in accordance with a specific set of rules. There are four (4) divisions in a COBOL program: Identification, Environment, Data, and Procedure.

Division Header
A combination of words followed by a period and a space that indicates that beginning of a division. The division headers are:

IDENTIFICATION DIVSION.
ENVIRONMENT DIVISION.
DATA DIVISION.
PROCEDURE DIVISION [USING data-name-1...].

Dynamic Access
An access mode in which specific logical records can be obtained from or placed into a mass storage file in a non-sequential manner (see Random Access) and obtained from a file in a sequential manner (see Sequential Access), during the scope of the same OPEN statement.

Editing Character
A single character or a fixed two-character combination belonging to the following set:

Character	Meaning
B	space
0	zero
+	plus
–	minus
CR	credit
DB	debit
Z	zero suppress
*	check protect
$	currency sign
,	comma
.	period (decimal point)
/	slash

Elementary Item
A data item that is described as not being further logically subdivided.

End of Procedure Division
The physical position in a COBOL source program after which no further procedures appear.

Entry
Any descriptive set of consecutive clauses terminated by a period and written in the Identification Division, Environment Division, or Data Division of a COBOL source program.

Environment Clause
A clause that appears as part of an Environment Division entry.

Execution Time
(See Object Time).

Extended Mode
The state of a file after execution of an OPEN statement, with the EXTEND phrase specified, for that file and before the execution of a CLOSE statement for that file.

Figurative Constant
A compiler generated value referenced through the use of certain reserved words:

- ZERO, ZEROS, or ZEROES represent one or more occurrences of the character zero (0).
- SPACE or SPACES represent one or more occurrences of the character space (blank).
- QUOTE or QUOTES represent one or more occurrences of the character quote (").
- HIGH-VALUE or HIGH-VALUES represent one or more occurrences of the character FF Hexadecimal.
- LOW-VALUE or LOW-VALUES represent one or more occurrences of the character 00 Hexadecimal.
- ALL "literals" represent one or more occurrences of the single non-numeric literal character.

EXAMPLE:

```
0001  MOVE ALL "X" TO CUSTOMER-NAME.
0002  IF CUSTOMER-NAME IS EQUAL TO ALL "X"
0003     GO TO PRT-ALIGNMENT.
0004  MOVE HIGH-VALUE TO OUT-RECORD.
```

File
A collection of records.

File Clause
A clause that appears as part of a File description (FD).

FILE-CONTROL
The name of an Environment Division paragraph in which the data files for a given source program are declared.

File Description Entry
An entry in the File Section of the Data Division that is composed of the level indicator FD, followed by a file-name, and then followed by a set of file clauses as required.

File-Name
A user-defined word that means a file described in a file description entry or a sort-merge file description entry within the File Section of the Data Division.

File Organization
The permanent logical file structure established at the time that a file is created.

File Section
The section of the Data Division that contains file description entries and sort-merge file description entries together with their associated record descriptions.

Format
A specific arrangement of a set of data.

Group Item
A named contiguous set of elementary or group items.

High Order End
The leftmost character of a string of characters.

I-O-CONTROL
The name of an Environment Division paragraph in which object program requirements for specific input-output techniques, rerun points, sharing of same areas by several data files, and multiple file storage on a single input-output device are specified.

I-O-MODE
The state of a file after execution of an OPEN statement, with the I-O phrase specified, for that file and before the execution of a CLOSE statement for that file.

Identifier
A data-name, followed as required, by the syntactically correct combination of qualifiers, subscripts, and indices necessary to make unique reference to a data item.

Imperative Statement
A statement that begins with an imperative verb and specifies an unconditional action to be taken. An imperative statement may consist of a sequence of imperative statements.

Index
A computer storage position or register, the contents of which represent the identification of a particular element in a table.

Index Data Item
A data item in which the value associated with an index-name can be stored in a form specified by the implementor.

Index-Name
A user-defined word that names an index associated with a specific table.

Indexed Data-Name
An identifier that is composed of a data-name, followed by one or more index-names enclosed in parentheses.

Indexed File
A file with indexed organization.

Indexed Organization
The permanent logical file structure in which each record is identified by the value of one or more keys within that record.

Input File
A file that is opened in the input mode.

Input Mode
The state of a file after execution of an OPEN statement, with the INPUT phrase specified for that file, and before the execution of a CLOSE statement for that file.

Input-Output File
A file that is opened in the I-O mode.

Input-Output Section
The section of the Environment Division that names the files and the external media required by an object program which also provides information required for transmission and handling of data during execution of the object program.

Integer
A numeric literal or a numeric data item that does not include any character positions to the right of the assumed decimal point. Where the term 'integer' appears in general formats, integer must not be a numeric data item, and must not be signed or zero, unless explicitly allowed by the rules of that format.

Invalid Key Condition
A condition, at object time, caused when a specific value of the key associated with an indexed or relative file is determined to be invalid.

Key
A data item which identifies the location of a record, or a set of data items which serve to identify the ordering of data.

Key of Reference
The key, either prime or alternate, currently being used to access records within an indexed file.

Key Word
A reserved word whose presence is required when the format in which the word appears is used in a source program.

Language-Name
A system-name that specifies a particular programming language.

Level Indicator
Two alphabetic characters that identify a specific type of file or a position in hierarchy.

Level-Number
A user-defined word which indicates the position of a data item in the hierarchical structure of a logical record or which indicates special properties of a data description entry. A level-number is expressed as a one or two digit number. Level-numbers in the range 1 through 49 indicate the position of a data item in the hierarchical structure of a logical record. Level-numbers in the range 1 through 9 may be written either as a single digit or as a zero followed by a significant digit. Level-numbers 66, 77 and 88 identify special properties of a data description entry.

Library-Name
A user-defined word that names a COBOL library that is to be used by the compiler for a given source program compilation.

Library Text
A sequence of character-strings and/or separators in a COBOL library.

Line Number
An integer that denotes the vertical position of a line on a page.

Linkage Section
The section in the Data Division of the called program that describes data items available from the calling program. These data items may be referred to by both the calling and called program.

Literal
A character-string whose value is implied by the ordered set of characters comprising the string.

Logical Operator
One of the reserved words AND, OR or NOT. In the formation of a condition, both or either of AND and OR can be used as logical connectives. NOT can be used for logical negation.

Logical Record
The most inclusive data item. The level-number for a record is 01.

Low Order End
The rightmost character of a string of characters.

Mass Storage
A storage medium on which data may be organized and maintained in both a sequential and nonsequential manner.

Mass Storage File
A collection of records that is assigned to a mass storage medium.

Mnemonic-Name
A user-defined word that is associated in the Environment Division with a specified implementor-name.

Native Character Set
The implementor-defined character set associated with the computer specified in the OBJECT-COMPUTER paragraph.

Native Collating Sequence
The implementor-defined collating sequence associated with the computer specified in the OBJECT-COMPUTER paragraph.

Negated Simple Condition
The 'NOT' logical operator immediately followed by a simple condition.

Next Executable Sentence
The next **sentence** to which control will be transferred after execution of the current statement is complete.

Next Executable Statement
The next **statement** to which control will be transferred after execution of the current statement is complete.

Next Record
The record which logically follows the current record of a file.

Noncontiguous Items
Elementary data items, in the Working-Storage and Linkage Section, which bear no hierarchic relationship to other data items.

Nonnumeric Item
A data item whose description permits its contents to be composed of any combination of characters taken from the computer's character set. Certain categories of nonnumeric items may be formed from more restricted character sets.

Nonnumeric Literal
A character-string bounded by quotation marks. The string from 1 to 120 characters may include any character in the computer's character set. To represent a single quotation mark character within a nonnumeric literal, two contiguous quotation marks must be used. A second set of quotation marks (") can be used to bound hexadecimal values. Each hexadecimal value can be separated by a comma. Hexadecimal characters are from the set 0-9 and A-F.

EXAMPLE:

```
      * note the following 2 lines would display ABC
0051    DISPLAY "ABC".
      * the following is a hexadecimal literal for ABC
0050  GRAPHICS. DISPLAY " "41,42,43" ".
      * the following line would display a single quotation
      * mark because of the imbedded pair of quotation marks.
0052    DISPLAY " " " ".
0053    DISPLAY "LONG LINE CONTINUES TO NEXT LINE
0054-  " QUOTE IN COL 10 & - IN COL 5 IS NECESSARY".
```

Numeric Character
A character that belongs to the following set of digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Numeric Item
A data item whose description restricts its contents to a value represented by characters chosen from the digits '0' through '9'; if signed, the item may also contain a '+', '–', or other representation of an operational sign.

Numeric Literal
A literal containing from 1 to 18 numeric characters that can also have either a decimal point, or an algebraic sign, or both. The decimal point must not be the rightmost character, nor can it be to the immediate left of a minus sign. The algebraic sign, if present, must be the leftmost character. A numeric literal cannot be bounded by quotation marks.

EXAMPLE:

```
      *  numeric literals
0060  MATH.      ADD 1 TO TOTAL-ITEMS.
0061             ADD 3.75 TO AMT-SAVED.
```

OBJECT-COMPUTER
The name of an Environment Division paragraph in which the computer environment, within which the object program is executed, is described.

Object of Entry
A set of operands and reserved words, within a Data Division entry, that immediately follows the subject of the entry.

Object Program
A set or group of executable machine language instructions and other material designed to interact with data to provide problem solutions. In this context, an object program is generally the machine language result of the operation of a COBOL compiler on a source program. Where there is no danger of ambiguity, the word 'program' alone may be used in place of the phrase 'object program'.

Object Time
The time at which an object program is executed.

OCCURS Clause
When describing data which is repeated, the use of the OCCURS clause eliminates the need for separate entries. Whenever the data-name which is the subject of an OCCURS clause is used as an operand, it must be subscripted.

IF SEAT-AVAIL-CODE (39) = "Y" . . .

The example above indicates that reference is being made to seat 39 (the 39th occurrence of this entry). The (39) is the subscript.

Open Mode
The state of a file after execution of an OPEN statement for that file and before the execution of a CLOSE statement for that file. The particular open mode is specified in the OPEN statement as either INPUT, OUTPUT, I-O or EXTEND.

Operand
Whereas the general definition of operand is 'that component which is operated upon', for the purposes of this publication, any lowercase word (words) that appears in a statement or entry format may be considered to be an operand and, as such, is an implied reference to the data indicated by the operand.

Operational Sign
An algebraic sign, associated with a numeric data item or a numeric literal, to indicate whether its value is positive or negative.

Optional Word
A reserved word that is included in a specific format only to improve the readability of the language and whose presence is optional to the user when the format in which the word appears is used in a source program.

Output File
A file that is opened in either the output mode or extend mode.

Output Mode
The state of a file after execution of an OPEN statement, with the OUTPUT or EXTEND phrase specified for that file and before the execution of a CLOSE statement for that file.

Page
A vertical division of a report representing a physical separation of report data, the separation being based on internal reporting requirements and/or external characteristics of the reporting medium.

Paragraph
In the Procedure Division, a paragraph-name followed by a period and a space and by zero, one, or more sentences. In the Identification and Environment Divisions, a paragraph header followed by zero, one, or more entries.

Paragraph Header
A reserved word, followed by a period and a space that indicates the beginning of a paragraph in the Indentification and Environment Divisions. The permissible headers are:

In the Identification Division:
PROGRAM-ID.
AUTHOR.
INSTALLATION.
DATE-WRITTEN.
DATE-COMPILED.
SECURITY.

In the Environment Division:
SOURCE-COMPUTER.
OBJECT-COMPUTER.
SPECIAL-NAMES.
FILE-CONTROL.
I-O-CONTROL.

Paragraph Name
A user-defined word that identifies and begins a paragraph in the Procedure Division.

Phrase
A phrase is an ordered set of one or more consecutive COBOL character-strings that form a portion of a COBOL procedural statement or of a COBOL clause.

Prime Record Key
A key whose contents uniquely identify a record within an indexed file.

Procedure
A paragraph or group of logically successive paragraphs, or a section or group of logically successive sections, within the Procedure Division.

Procedure-Name
A user-defined word which is used to name a paragraph or section in the Procedure Division. It consists of a paragraph-name or a section-name.

Program-Name
A user-defined word that identifies a COBOL source program.

Punctuation Character
A character that belongs to the following set:

Character	Meaning
,	comma
;	semicolon
.	period (decimal point)
"	quotation mark
(	left parenthesis
)	right parenthesis
=	equal sign

Random Access
An access mode in which the program-specified value of a key data item identifies the logical record that is obtained from, deleted from, or placed into a relative or indexed file.

Record
(See Logical Record).

Record Area
A storage area allocated for the purpose of processing the record described in a record description entry in the File Section.

Record Description Entry
The total set of data description entries associated with a particular record.

Record Key
A key, either the prime record key or an alternative record key, whose contents identify a record within an indexed file.

Record-Name
A user-defined word that names a record described in a record description entry in the Data Division.

REDEFINES Clause
This clause allows you to give a name to a field which crosses from one elementary item into the next. In the FILE SECTION, REDEFINES may not be used on the 01 level. To redefine an entire record, you only need to name the new record in the DATA RECORDS clause to implicitly redefine it. For correct format, nothing should come between data-name-1 and the REDEFINES clause.

Reference Format
A format that provides a standard method for describing COBOL source programs.

Relation Character
A character that belongs to the following set:

Character	Meaning
>	greater than symbol
<	less than symbol
=	equal to

Relation Condition
The proposition, for which a truth value can be determined, that the value of an arithmetic expression or data item has a specific relationship to the value of another arithmetic expression or data item.

Relational Operator
A reserved word, a relation character, or group of consecutive reserved words, or a group of consecutive reserved words and relation characters used in the construction of a relation condition. The permissible operators and their meaning are:

Relational operator	Meaning
IS [NOT] GREATER THAN IS [NOT] >	Greater than or not greater
IS [NOT] LESS THAN IS [NOT] <	Less than or not less than
IS [NOT] EQUAL TO IS [NOT] =	Equal to or not equal to

Relative File
A file with relative organization

Relative Key
A key whose contents identify a logical record in a relative file.

Relative Organization
The permanent logical file structure in which each record is uniquely identified by an integer value greater than zero, which specifies the record's logical ordinal position in the file.

Reserved Word
A COBOL word specified in the list of words which may be used in COBOL source programs, but which must not appear in the programs as user-defined words or system-names.

Routine-Name
A user-defined word that identifies a procedure written in a language other than COBOL.

Section
A set of zero, one, or more paragraphs or entries, called a section body, the first of which is preceded by a section header. Each section consists of the section header and the related section body.

Section Header
A combination of words followed by a period and a space that indicates the beginning of a section in the Environment, Data and Procedure Division.

In the Environment and Data Divisions, a section header is composed of reserved words followed by a period and a space. The permissible section headers are:

In the Environment Division:
CONFIGURATION SECTION.
INPUT-OUTPUT SECTION.

In the Data Division:
FILE SECTION.
WORKING-STORAGE SECTION.
LINKAGE SECTION.

In the Procedure Division, the section header is composed of a section-name, the reserved word SECTION, a segment-number (optional), followed by a period and a space.

Section-Name
A user-defined word which names a section in the Procedure Division.

Segment-Number
A user-defined word which classifies sections in the Procedure Division for purposes of segmentation. Segment-numbers may contain only characters '0', '1', ..., '9'. A segment-number may be expressed as either a one or two digit number.

Sentence
A sequence of one or more statements, the last of which is terminated by a period followed by a space.

Separator
A punctuation character used to delimit character-strings.

Sequential Access
An access mode in which logical records are obtained from or placed into a file in a consecutive predecessor-to-successor logical record sequence determined by the order of records in the file.

Sequential File
A file with sequential organization.

Sequential Organization
The permanent logical file structure in which a record is identified by a predecessor-successor relationship established when the record is placed into the file.

Sign Condition
The proposition, for which a truth value can be determined, that the algebraic value of a data item or an arithmetic expression is either less than, greater than, or equal to zero.

Simple Condition
Any single condition chosen from the set:

relation condition
class condition
condition-name condition
sign condition

Source-Computer
The name of an Environment Division paragraph in which the computer environment, within which the source program is compiled, is described.

Source Program
Although it is recognized that a source program may be represented by other forms and symbols, in this document, it always refers to a syntactically correct set of COBOL statements beginning with an Identification Division and ending with the end of the Procedure Division. In contexts where there is no danger of ambiguity, the word 'program' alone may be used in place of the phrase 'source program'.

Special Character
A character that belongs to the following set:

Character	Meaning
+	plus sign
–	minus sign
*	asterisk
/	slash
=	equal sign
$	currency sign
,	comma
;	semicolon
.	period (decimal point)
"	quotation mark
(	left parenthesis
)	right parenthesis
>	greater than symbol
<	less than symbol

Special-Character Word
A reserved word which is an arithmetic operator or a relation character.

Special-Names
The name of an Environment Division paragraph in which implementor-names are related to user specified mnemonic-names.

Special Registers
Compiler generated storage areas whose primary use is to store information produced in conjunction with the user of specific COBOL features.

Standard Data Format
The concept used in describing the characteristics of data in a COBOL Data Division under which the characteristics or properties of the data are expressed in a form oriented to the appearance of the data on a printed page of infinite length and breadth, rather than a form oriented to the manner in which the data is stored internally in the computer, or on a particular external medium.

Statement
A syntactically valid combination of words and symbols written in the Procedure Division beginning with a verb.

Subject of Entry
An operand or reserved word that appears immediately following the level indicator or the level-number in a Data Division entry.

Subprogram
(See Called Program).

Subscript
An integer whose value identifies a particular element in a table. The subscript must be, or represent, an integer. The subscript may be a literal or a data-name. If the subscript is a data-name, the value stored in the data-name field must be an integer.

This value can cross record boundaries (4095) for large tables (30K-40K+) in working-storage by having a series of tables and referencing the first one with a subscript value which points to an item in the second, third, ... table. However, if the subscript value is such that it crosses a record boundary and no table follows, then there is no error indication and the results are unspecified.

EXAMPLE:

```
0001   WORKING-STORAGE.
0002   01   TABLE.
0003     02 FILLER PIC X(9) VALUE "JANUARY   ".
0004     02 FILLER PIC X(9) VALUE "FEBRUARY  ".
0005     02 FILLER PIC X(9) VALUE "MARCH     ".
0006     02 FILLER PIC X(9) VALUE "APRIL     ".
0007     02 FILLER PIC X(9) VALUE "MAY       ".
0008     02 FILLER PIC X(9) VALUE "JUNE      ".
0009     02 FILLER PIC X(9) VALUE "JULY      ".
0010     02 FILLER PIC X(9) VALUE "AUGUST    ".
0011     02 FILLER PIC X(9) VALUE "SEPTEMBER".
0012     02 FILLER PIC X(9) VALUE "OCTOBER   ".
0013     02 FILLER PIC X(9) VALUE "NOVEMBER  ".
0014     02 FILLER PIC X(9) VALUE "DECEMBER  ".
0015   01   M-TBL REDEFINES TABLE.
0016     02 MONTH OCCURS 12 TIME PIC IS X(9).
0017   PROCEDURE DIVISION.
0018   DATA-PARA.
0019     MOVE MONTH (MONTH-NO) TO PRT-MONTH-NAME.
0020*
0021*  other examples.
0022*
1234     MOVE ITEM TO TABLE (7).
1235     MOVE TABLE (7) TO PRINT-ITEM-SEVEN.
1236     MOVE 007 TO INDEX-1.
1237     MOVE TABLE (INDEX-1) TO PRINT-ITEM-SEVEN.
1238     MOVE ZEROS TO TABLE (3000).
1239     MOVE SPACES TO PRINT-LINE.
     ************** important ****************************
1240*  If both BIN-1 and X1 are binary data types, then at RUN
1240*  time the math is 20 times faster than decimal.
1241     ADD BIN-1 TO X1.
1242     IF ITEM (X1) IS EQUAL TO SPEED GO TO FAST.
1243     MOVE ALL "A" TO PRINT-LINE.
```

Subscripted Data-Name
An identifier that is composed of a data-name followed by one or more subscripts enclosed in parentheses. Here are the rules for parentheses:

- An opening parenthesis must be preceded by a space and a closing parenthesis must be followed by a space.
- No spaces are allowed within a set of parentheses.

System-Name
A COBOL word which is used to communicate with the operating environment.

Table
A set of logically consecutive items of data that are defined in the Data Division by means of the OCCURS clause.

Table Element
A data item that belongs to the set of repeated items comprising a table.

Text-Name
A user-defined word which identifies library text.

Text-Word
Any character-string or separator, except space, in a COBOL library.

Truth Value
True or False represents the result of an evaluated condition.

Unary Operator
A plus (+) or a minus (−) sign, which precedes a variable or a left parenthesis in an arithmetic expression and which has the effect of multiplying the expression of +1 or −1 respectively.

User-Defined Words
A COBOL word that must be supplied by the user to satisfy the format of a clause or statement. A word contains not more than 30 characters from the set A-Z, 0-9, and −. A user-defined word cannot begin or end with a hyphen (-) and must contain at least one alphabetic character.

Variable
A data item whose value may be changed by execution of the object program. A variable used in an arithmetic expression must be a numeric elementary item.

Verb
A word that expresses an action to be taken by a COBOL compiler or object program.

Word
A character-string of not more than 30 characters which forms a user-defined word, a system-name, or a reserved word.

Working-Storage Section
The section of the Data Division that describes working storage data items, composed either of noncontiguous items or of working storage records or of both.

77-Level-Description-Entry
A data description entry that describes a noncontiguous data item with the level-number 77.

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