



I.C.T 1900 SERIES

PROGRAMMING AIDS AUTOCODES

The 1900 series of equipment is backed by a comprehensive array of autocodes which are available for both commercial and scientific purposes. Each of these autocodes has distinct characteristics enabling the total system to provide programming efficiency over a wide range of applications.

The following autocodes are available:

COMMERCIAL LANGUAGES

PLAN

COBOL

I.C.T RAPIDWRITE

PROGRAM GENERATOR

SCIENTIFIC LANGUAGES

FORTRAN

ALGOL

MAC

THE PROGRAMMING LANGUAGES

A programming language enables a programmer to state his requirements in a symbolic manner using alphabetic names and characters instead of numeric references only. In some languages (e.g. COBOL) this use of alphabetic names enables the program to be written in comprehensible English. A program written in accordance with a program language is known as a source program; a Compiler or an Assembler Program is employed by the 1900 to translate the source program in order to produce the machine code (or object) program.

The following advantages are derived from using such a language:—

Programs can be written in less time. The amount of writing (and similar clerical work) is reduced, and also therefore the chance of error with a consequent reduction of testing time. Program maintenance is simplified.

The computer procedure is more easily understood by persons not trained in machine code.

Autocodes can often be used on different types of computers and thus permit the exchange of ideas and programs among computer users. The compiler will detect many programming errors.

When writing a program in an autocode, the programmer does not usually have the same control over his program as one who uses the machine code, but the advantages listed above considerably outweigh this fact. Some program languages are intended for use on one type of machine only, and these usually give the programmer a much closer control over the final program. In the 1900 system this function is performed by PLAN.

PLAN is the basic programming language of the 1900 series. It includes comprehensive input/output aids. The source program is converted by a translator/assembler program.

Program segments written in PLAN can be combined with segments written in other languages, and in particular PLAN will be used in association with COBOL and FORT-RAN.

COBOL is a common business language which is used internationally in association with many computers. It comes under the category of a full autocode; in some cases a large number of machine instructions are generated from one statement in the source program.

I.C.T RAPIDWRITE is a commercial autocode based upon COBOL, but uses special pre-printed cards which enable the programmer to build up his procedure on the lines of a flow chart with moveable blocks. Again conversion is performed by means of a translator/compiler.

PROGRAM GENERATOR is a powerful programming language approximating to basic English. It has been designed for use in writing programs having commercial, rather than scientific applications.

The source program is written as a series of statements of which there are three types: Directives, Format and Procedural. The language provides facilities for the handling of all standard peripheral devices and for the collection and distribution of data.

PROGRAMMING AIDS AUTOCODES

FORTRAN is an automatic language of considerable power and flexibility designed to assist the programming of problems of a mathematical or scientific nature. The source program is written as a series of statements having a general resemblance to either algebraic formulae or English language commands.

Arithmetic operations to be carried out on data are indicated to the compiler by statements comprising expressions of unlimited complexity, but employing the five basic operations: addition, subtraction, multiplication, division and exponentiation. These operations are supplemented by a number of routines, including trigonometric, hyperbolic and logarithmic functions, which are called into the program on demand. The language provides facilities for the handling of all standard peripherals.

ALGOL is an automatic programming language suitable for programming mathematical and scientific problems. Superficially ALGOL is similar to FORTRAN in that it utilises the same five arithmetic operations, and can call on a range of standard mathematical functions. In addition, it is also possible to declare Boolean quantities, which take only the values 'true' or 'false' and are operated upon by various logical operations.

In spite of a superficial resemblance to FORTRAN, ALGOL has a totally different approach to storage allocation and subroutine communication.

MAC is an autocode for scientific and mathematical applications; it enables programs to be written using a notation similar to standard arithmetic notation. MAC also includes a series of simple instructions for evaluating trigonometrical and logarithmic functions.

ASSEMBLY PROCEDURE

Each of the autocodes in the 1900 Programming System has its own translator/compiler; however, conversion is not made directly into the machine code, but into a semi-compiled form. The full procedure is as follows:

Phase 1

A program can be divided into a number of parts or segments, each of which will be compiled separately using the appropriate translator/compiler.

Phase 2

The semi-compiled segments are combined by means of a special purpose program known as the CONSOLIDATOR. PLAN segments may be combined with segments written in other languages, and also at this stage it will be possible to incorporate library sub-routines.

The output from the CONSOLIDATOR is the final 'object program' with all cross references between segments consolidated and 'leader' information prepared for use when the program is loaded to store for running.

Use of Sub-routines

In the source program there are facilities for automatically incorporating library sub-routines. Sub-routines are generally held on magnetic tape or disc in semi-compiled form with an appropriate leader. When a sub-routine is called for in the source program, the CONSOLIDATOR arranges for the sub-routine to be included in the object program during phase two of program assembly.

Input/Output

The programmer may state his input/output requirements by calling a series of standard sub-routines which

will then be incorporated into the object program by the CONSOLIDATOR. The sub-routines deal with all details of data handling, editing, and conversion, apart from the actual physical transfers which are controlled by Executive — one source program instruction is sufficient to initiate any peripheral transfer.

Users of a computer store of 8,192 words or more may also take advantage of the comprehensive facilities offered by a MAGNETIC TAPE HOUSEKEEPING package.

Routines are also available to facilitate the handling of records on Magnetic Disc and Card Files. Such records may be sequential or random. In addition users of computers having a minimum configuration of either 8,192 words of storage and four magnetic tape decks or 16,384 words and three tape decks, may choose to use the COMMERCIAL INPUT/OUTPUT package instead of the normal sub-routines. This package enables the programmer to state his requirements in tabular form and simplifies the task of programming.

This specification is subject to modification

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