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L. Wheaton Smith



BENDIX

G-15

AUTOMATIC

PROGRAMMING SYSTEMS

BENDIX G-15

AUTOMATIC PROGRAMMING SYSTEMS

A powerful performer in an almost unlimited range of applications, the Bendix G-15 has established itself as the leading *complete* low-cost digital computer system in the nation.

One of the keys to the early, widespread acceptance of the G-15 has been its powerful, flexible machine language and command structure. For instance, a modified two-address system permits minimum access coding. Another time-saver: arbitrary-precision multiplication and division halts these operations as soon as the required degree of accuracy is obtained. And special arithmetic registers permit double-precision accuracy... obtained with the same ease as single precision answers.

Augmenting these internal characteristics—helping to make the Bendix G-15 an even more flexible data processor for an ever-widening range of applications—is an extensive library of automatic programming systems.

Designed to take advantage of Bendix G-15 design and operational characteristics, these programming systems make this low-cost computer easier to use...in a wide range of scientific and business applications. They also:

SIMPLIFY PROBLEM SOLVING
SAVE TIME IN PROGRAM PREPARATION
REDUCE PROBLEM-SOLVING COSTS

INTERCARD

*Scientific Computing System
Utilizing Punched Card Input/Output*

A high-speed floating-point assembly routine, Intercard accepts a mnemonic-code language, which is automatically translated into a machine-language program. Memory locations for both commands and data are automatically assigned.

The initial program is prepared on punched cards, with data and commands recorded in decimal form. The G-15 converts the decimal notation to binary and records the program on magnetic tape, simultaneously punching out binary-notation cards. These and the data cards are then read into the computer... then executed under control of Intercard's assembly routine. Results are printed on the tabulator.

An automatic program verification check is made as the binary program is read into the computer from magnetic tape.

EXAMPLE: Using its simplified mnemonic code, here is how INTERCARD would be used to solve the same INTERCOM problem: $\frac{a^2 - bc}{d}$. Again a, b, c and d are stored in memory positions 1100, 1101, 1102 and 1103 respectively, with operations being performed in the accumulator, which also provides temporary storage of the results.

$$\frac{a^2 - bc}{d}$$

OPERATION	ADDRESS	COMMENTS
RA	1101	Clear accumulator and add b
MY	1102	Multiply b (in accumulator), by c
SR	1104	Store bc
RA	1100	Clear accumulator and add a
MY	2400	Square contents of accumulator
SU	1104	Subtract bc from a ²
DV	1103	Divide a ² - bc (in accumulator) by d
SR	1108	Store result in 1108
PRT	1108 04	Print out contents of 1108

AUTOCARD

*For Punched Card
Processing of Business Problems*

An interpretive system which accepts simplified mnemonic, alphanumeric programs, Autocard provides for automatic, flexible control of a wide range of input/output equipment, including magnetic tape, card punches and tabulators.

The programmer uses an alphanumeric name to identify the addresses of both symbolic commands and constants. During the assembly run, actual memory locations are assigned...the symbolic commands converted to machine language...and the resultant program punched out on cards. Read into the computer, this program is executed under the control of the Autocard executive routine.

Especially useful for business data processing problems, Autocard makes use of the assembly run to pre-interpret the program. The result: a more efficient use of the inherent capabilities of the computer than is usually possible with interpretive systems...more efficient data processing for a broad range of commercial applications.

EXAMPLE: Here is how AUTOCARD might be used in a payroll application. Accepting punched card data, the program calls for the calculation of hourly rate times the number of hours worked and punches out the gross pay.

$$\text{HOURLY RATE X HOURS} = \text{GROSS PAY}$$

O	P	R	ADDRESS	E	P	I	NAME	COM
1	2	3	5 6 7 8	11	12	15	18 19 20 21	
L	O	C	0 8 0 0					Location of ins
S	F	L	0 9 1 5					Set format line
R	D	C	1 2 1 5				E N T 1	Read data card
W	C	O						Wait card oper
C	A		1 2 0 0					Clear and add
T	Z	E	E N T 2					Transfer on ze
C	A		1 2 1 0		2			Hourly rate
M	L		1 2 1 1		1			Hours
S	R		1 2 1 2		2			Amount
P	P	D	1 2 1 5					Punch calculat
T	R	A	E N T 1					Transfer to rea
R	B	L	0 0 0 5				E N T 2	Ring bell for er
H	L	T	H L T				H A L T	End of job

POGO

DAISY

INTERCARD

AUTOCARD

TERCOM 1000

AUTOPOINT 24

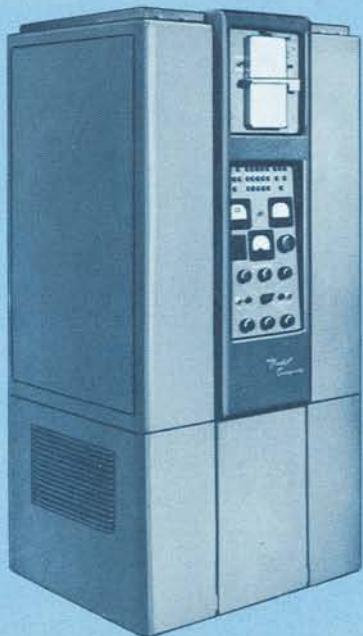
MAISIE

FLIPPER

ALGO

GROSS PAY

INSTRUCTIONS	SEQ. NO.			
	77	78	79	80
Instruction	0	0	0	1
...	0	0	0	2
...	0	0	0	3
...	0	0	0	4
...	0	0	0	5
...	0	0	0	6
...	0	0	0	7
...	0	0	0	8
...	0	0	0	9
...	0	0	1	0
...	0	0	1	1
...	0	0	1	2
...	0	0	1	3



ALGO ALGEBRAIC COMPILER

Simplified Programming in Universal Mathematical Language

Accepting a Bendix G-15 representation of ALGOL—the powerful international algebraic language—ALGO focuses the speed and power of the G-15 on any algebraically stated problem.

A true mathematical equation solver, ALGO allows engineers and scientists to state their problems for computer solution in natural mathematical terms. Translation of these terms into a machine program is assigned to the computer, which also automatically controls input/output, computation and data handling. No previous knowledge of computers or programming is required to prepare an ALGO program.

Especially valuable for complex, one-shot scientific and engineering problems, ALGO is specifically designed to take advantage of the computing power and flexibility of the G-15. Most important, it provides valuable savings in programming time...and greatly simplifies problem solving.

EXAMPLE: Here is an illustration of the time-and-cost-saving significance of ALGO, as applied to the following equation:

$$\text{PROBLEM: } I = \frac{E}{\sqrt{R^2 + (6.2832 FL - 1/6.2832 FC)^2}}$$

(For values of R F & L as specified. For values of E ranging from 100 to 300 in increments of 50. For values of C ranging from .00002 to .000021 in increments of .000001)

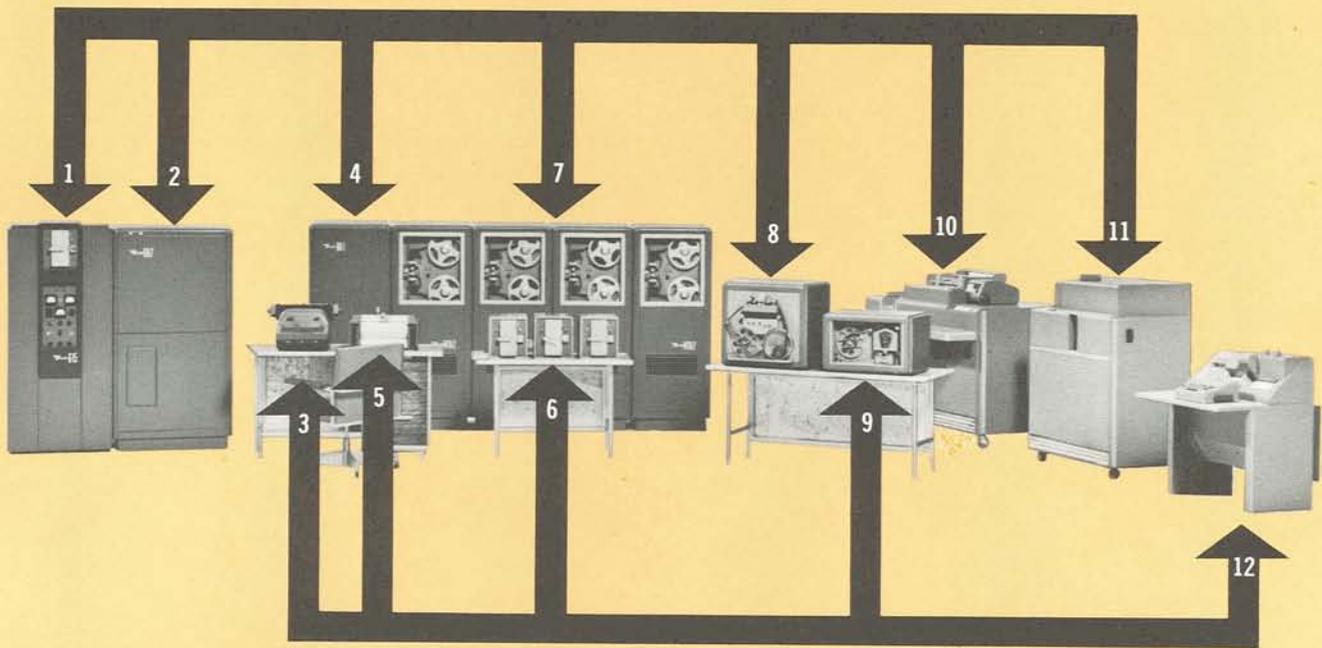
```
COMPLETE BEGIN Ⓢ
  ALGO R = 10 Ⓢ
PROGRAM: F = 60 Ⓢ
  L = .2 Ⓢ
  FOR E = 100(50)300 BEGIN Ⓢ
  FOR C = .00002(.0000001).000021 BEGIN Ⓢ
  I = E/SQRT(R ↑ 2 + (6.2832 * F * L - (1/(6.2832 * F * C))) ↑ 2) Ⓢ
  PRINT (FL) = E Ⓢ
  PRINT (FL) = C Ⓢ
  PRINT (FL) = I Ⓢ
  END Ⓢ
```

*For more detailed information
concerning ALGO, see Bulletin T-21*

OTHER PROGRAMMING SYSTEMS

Supplementing these four important Bendix automatic programming developments is a full complement of general, interpretive, compiler and service routines. Among them are POGO—a fixed-point compiler which accepts a simplified command language, producing paper tape machine-language programs which may be used again and again. AUTOPOINT 24—a set of arithmetic and scaling subroutines and a service routine—eliminates many troublesome details of coding and scaling.

Interpretive systems which broaden the use-base of the G-15 include Intercom 101, 102, 103 and 107; and DAISY 201 and 202. Providing a simplified method of inverting matrices and of solving simultaneous equations is MAISIE. FLIPPER makes it possible to automatically convert a paper tape prepared off-line into a machine-language tape for entry to the computer.



SYSTEMS SUPPORT IN DEPTH

In addition to these powerful general-purpose automatic programming systems, Bendix and its users EXCHANGE organization have developed for the G-15 a library of over 700 special-purpose routines and subroutines, covering problems in nearly every field of computational endeavor.

And a large staff of Bendix programming specialists is continually developing new routines, new automatic programming systems...developing new ways to make Bendix computers even more effective, more versatile.

These pre-tested systems and routine packages—added to the wide-range input/output facilities of the Bendix G-15—have made it a system of unmatched application flexibility, in the fields of data processing, research, engineering and on-line data reduction and control.

And the G-15 can be easily adapted to match growing computational workloads. Thus, beginning with a low-cost basic G-15 system, an installation can be developed into a powerful medium-scale system, including punched card, punched tape, tabulator and magnetic tape. Special accessories include a digital differential analyzer, code conversion and graphic output units.

Whether your computation represents business data processing or scientific problem-solving, you will find the G-15 an economical solution. Backed by a nationwide team of system, applications and maintenance specialists, the Bendix G-15 warrants your considered investigation.

- 1 *Model G-15 Digital Computer*
- 2 *Model CA-2 Punched Card and Tabulator Coupler*
- 3 *Model AT-1 Alphanumeric Typewriter*
- 4 *Model DA-1 Digital Differential Analyzer*
- 5 *Model PA-3 Graph Plotter*
- 6 *Model PR-1 Auxiliary Photoelectric Paper Tape Reader*
- 7 *Model MTA-2 Magnetic Tape Units*
- 8 *Model PR-2 Multi-Code Paper Tape Reader*
- 9 *Model PTP-1 Paper Tape Punch*
- 10 *Tabulator/Printer*
- 11 *Card Reader/Punch*
- 12 *Model CA-1 Punched Card Coupler*

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