

software age

NOVEMBER 1968

LIBRARY
STATE TECHNICAL INSTITUTE
AT MEMPHIS



C- 38128&STAS5983 M
STATE TECH INST
5983 MACON COVE
MEMPHIS TN 38128

TRW® opportunities in Los Angeles

REAL TIME PROGRAMMERS

Systems Group of TRW INC. is interviewing at the Fall Joint Computer Conference in San Francisco, December 9 through 11 for Real Time Programmers.

If you are interested in joining a dynamic team of Programmers supporting the nation's major space and defense programs, TRW Systems Group has a challenging career opportunity for you. We will apply your experience in Real Time Systems on exciting and challenging new programs. Send us your resume, and we will make arrangements to meet you at FJCC in San Francisco.

TRW's ultra-modern professionally equipped computer facilities are located at TRW Space Park in suburban Los Angeles, just south of International Airport, in smog free Redondo Beach on the Pacific Ocean.

TRW also needs these disciplines for Los Angeles, Houston and Washington, D.C.

- Scientific Applications Programmers
- Systems Programmers
- Design Automation Programmers
- Business Applications Programmers

Please submit your resume to:

H. D. WONG

Professional Placement
Room 6101-K

TRW Systems Group, One Space Park,
Redondo Beach, California 90278

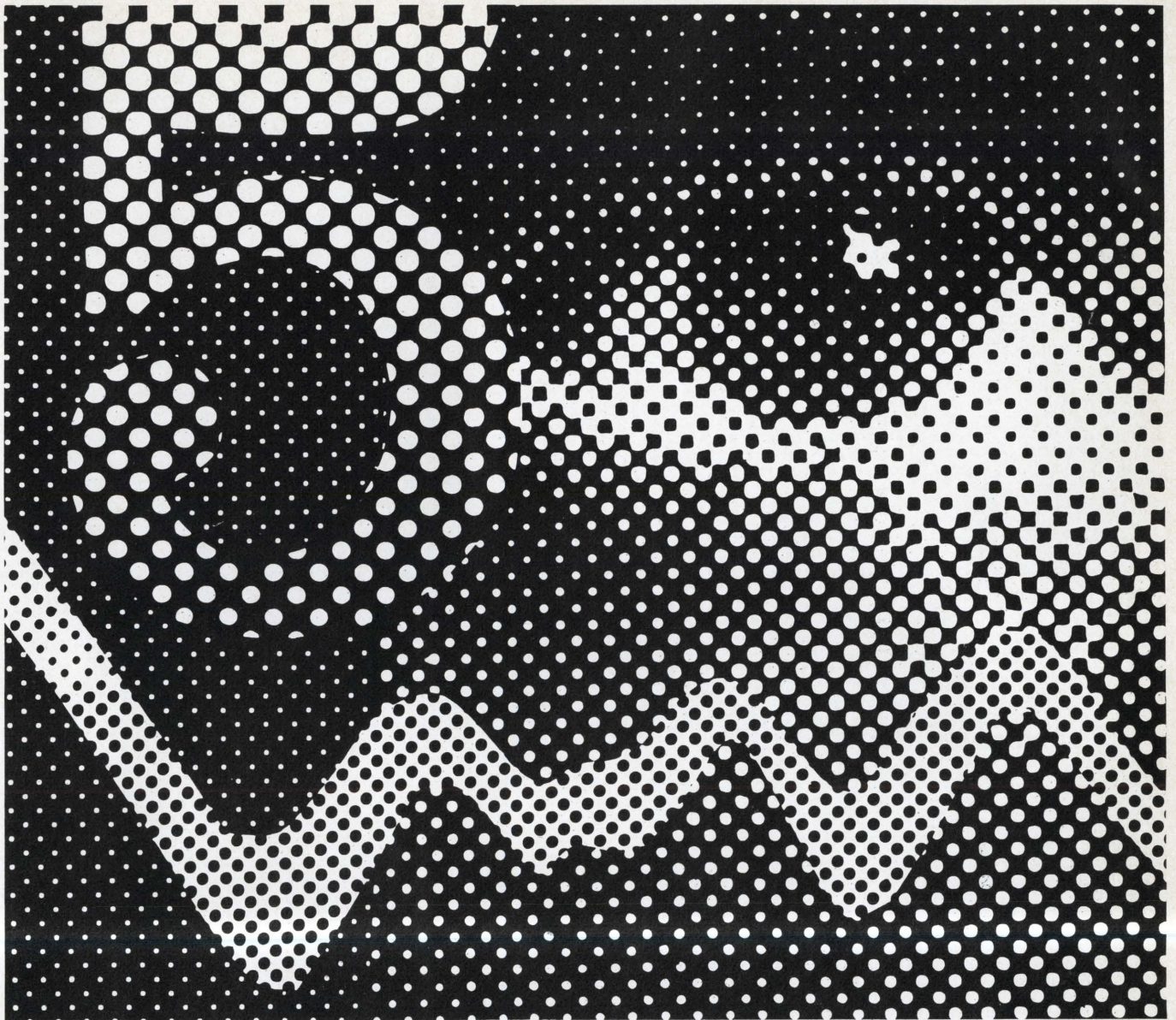
or call collect—(213) 679-8711 Ext. 65113

TRW®

An equal opportunity employer

TRW Systems Group is a major operating unit of TRW INC. (Formerly Thompson Ramo Wooldridge Inc.), where more than 75,000 people at over 250 locations around the world are applying advanced technology to electronics, space, defense, automotive, aircraft and selected commercial and industrial markets.

To apply directly, submit your resume to H. D. Wong as designated above. If you attend FJCC drop your resume in the TRW box at the SOFTWARE AGE Resume Center at the St. Francis Hotel in San Francisco. A local interview will be arranged.



RCA has big plans for the 1970's. Isn't it time you talked to us during the FJCC?

If you want something to show for your abilities in the next decade, and you're an EDP specialist, we're clearly your kind of place. We are fully committed to a program of unlimited expansion in computer technology and related fields.

It won't be a relaxing trip. You'll run into questions nobody even knows how to ask today. You'll do a lot of tough digging for answers.

The project groups you'll join are the right size for creative work. Your ideas will be asked for, listened to, worked on. As you can imagine, visibility like this leads to advancement.

You'll find RCA's broad range of

technologies a definite advantage. For this means experts are available for counselling on almost any problem.

If you are connected with the computer industry in any way we want to talk to you.

We are looking for engineers and programmers in all areas of computer technology including scientific, military and commercial applications.

We have Corporate Staff openings for analysts and programmers. Engineers are needed in the computer design, peripheral equipment design, switching and logic, and research areas.

Marketing and sales openings are

numerous and varied for experienced people.

To arrange an interview at the convention hotel call **Mr. T. A. Beckett** at **(415) 771-1400**.

If you can't see us during the convention write to him at RCA Staff Employment, Dept. FJ-2B, Building 2-4, Camden, New Jersey 08102. We are an equal opportunity employer.

RCA



**Come on in,
the climate's great
at Northrop
in Southern Calif.**

As one of the nation's largest multi-divisional aerospace corporations, we need high calibre computer professionals to design and implement new applications for third generation computer systems.

Our centralized Data Processing organization is a unified department with computing services being provided for all Northrop Divisions as well as Northrop's wholly owned subsidiaries.

Many professional growth opportunities and challenging assignments are available for the following:

PROGRAMMER — Business and Scientific experience in 7090/40 and 360/40, 50 or 65.

SENIOR PROGRAMMER ANALYSTS — Prefer BS degree with experience in 7090/94, 360 OS, DOS, or TOS.

*For a local interview call Mark Johnson
at 982-7433 December 9, 10, 11
or drop your resume off
at the Software Age resume center
at the St. Francis or send your resume to
Engineering Center Personnel Office
3901 W. Broadway, Hawthorne, Calif.*

NORTHROP CORPORATION

An equal opportunity employer

software age

NOVEMBER, 1968

Vol. 2—No. 10

Copyright 1968, PRESS-TECH, Inc.

CONTENTS	PAGE
S/A's Special Resume Form	6
An Algorithm for Carrier Reassignment William S. Hipp	8
How Good Are Private Computer Schools W. Roger Moore	16
Middle Management Seminars Solve Communications Gap	Irving Goldstein 32
An Automatic Test System	David M. Goodman 42
Trouble-Tran Adventures for Fun and Profit	52
The Marketplace	58
New Products	60
S/A Confidential Inquiry Form	65
Index to Advertisers	66

Publisher	H. L. Rothra
Associate Publisher	David W. French
Advertising Manager	Norman Jacobs
Production Manager	Guy D. Merola
Advertising Production	Betsy Pavkovich
Director of Circulation	Howard Rogers
Circulation Manager	Judith Arnopolin

Circulation of this issue more than 110,000

**SOFTWARE AGE is published monthly
by PRESS-TECH, Inc.
(312) 869-1244**

1020 Church Street, Evanston, Illinois 60201. Subscription free to qualified readers. Others, \$10/yr. Individual copies, \$1. Foreign subscriptions, \$15/yr.

Main Sales Office: Norman Jacobs (Adv. Mgr.) or Norman Brodsky, 1020 Church Street, *Evanston, Illinois* 60201—Telephone (312) 869-1244. Gerald Green, 60 E. 42nd, *New York, N. Y.*—Telephone (212) 697-5356. Richard Faust, 9800 S. Sepulveda Blvd., *Los Angeles, California* 90045—Telephone (213) 776-0100. *Boston, Massachusetts* 02021—Telephone (617) 542-1466. Richard D. Clemmer, 4900 Red Fox Drive, Annandale, Virginia 22003 (*Washington, D. C.*)—Telephone (202) 461-9792. Richard Faust, *Palo Alto, California*—Telephone (415) 327-8340.

CONTROLLED CIRCULATION POSTAGE PAID
AT MADISON, WISCONSIN

Can an EDP man attending FJCC find that better job without letting the world know he's looking? SURE HE CAN!

Participating Companies

Ampex Corp.
Auerbach Corp.
Bendix Corp., Kansas City Div.
Blue Cross-Blue Shield
Career Center
Collins Radio Co.
Computer Applications, Inc.
Computer Personnel Consultants
Computer Usage Co., Inc.
CNA/Financial
Continental Illinois National Bank
Control Data Corp.
General Electric Co.
Honeywell, Inc. Data Electronic Data Processing
Hughes Aircraft Co., Aerospace Div.
Hughes Aircraft Co., Fullerton
IBM Corp.
Interstate Staffing Inc.
ITT Federal Electric Corp.
Jet Propulsion Laboratory
Johnson & Johnson
Lockheed-Electronics Co.
McDonnell Douglas Corp.
Mellonics Systems Development Div.
Litton Systems, Inc.
Montgomery Ward Data Center
National Cash Register Co.
National Cash Register Co., Electronics Div.
National Manpower Register
North American Rockwell, Autonetics Div.
Northrop Corp.
Pratt & Whitney Aircraft
Raytheon Co., Equipment Div.
RCA
Sikorsky Aircraft
Source EDP
System Development Corp.
TRW Systems Group
Univac
Vitro Laboratories
Xerox Corp.

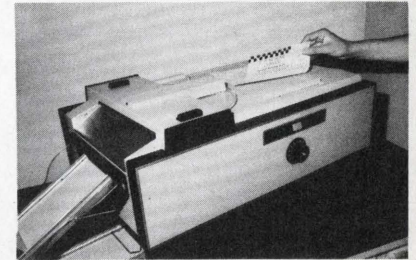
Read how SOFTWARE AGE Magazine's FREE exclusive Resume Center protects your privacy . . . speeds your search . . . costs you nothing!



1. You Hand Pick the Companies. Fill out the special resume form at the Center, listing your hotel, room and local telephone number, or bring your own resumes. 45 companies in all areas and fields will be represented in the Resume Center. A free copy of SOFTWARE AGE will be given you so that you may study the ads of the participating companies.



3. You Hand Deposit Your Resume. Next, you'll drop your resume in the lock box of the company you're interested in. Only the company interviewer has the key.



2. Free Resume Duplication Service. Our Remington R-2 operators will photocopy the special resume or your own one page resume FREE of charge and return ALL copies to you.

4. You Make Your Own Appointment, Your Own Arrangements. If the company interviewer is interested in you, he will leave a message at your hotel or at home for you to give him a call. You will set up the interview with him at your convenience. All arrangements are made by you and the company. No one else. There's no middleman, and no fee to anyone. You or the company.

software age resume center

San Francisco, St. Francis Hotel, Union Square

Noon to 7 P.M., Monday, Dec. 9

9 A.M. to 7 P.M., Tuesday, Dec. 10 — 9 A.M. to 3 P.M., Wednesday, Dec. 11

The first non-profit central clearing house of job opportunities, managed by a publication. SOFTWARE AGE Magazine, 1020 Church St., Evanston, Ill. 60201
Norman Jacobs, Advertising Director

S/A RESUME CENTER

Special Resume Form

For Use at

The St. Francis Hotel, San Francisco, December 9-10-11, 1968

Do not use this form to answer advertisements in this issue. See page 65

BE SURE TO CHECK YOUR HOTEL FOR MESSAGES

NAME
HOTEL
TELEPHONE NUMBER
ROOM NUMBER
BEST TIME TO CALL

JOB DESIRED: _____

List computer hardware knowledge (names of systems, tape, disk, terminals, etc.): _____

Programming specialties and years of experience (commercial, scientific, theoretical, experimental, analog, etc.): _____

Systems programming on which you have had development experience (compilers, assemblers, executives, monitors, O.S., etc. Indicate for what computer): _____

Programming languages used and extent of experience (COBOL, FORTRAN, etc.): _____

Applications programmed (aerospace, banking, insurance, math subroutines, compilers, etc.): _____

Systems analysis experience (card design, flow charting, operation analysis, etc.): _____

EDP management experience (include years and number of people reporting to you): _____

SALARY: _____ **DATE OF AVAILABILITY:** _____
(current) (desired)

EDUCATION: Indicate major as well as degree unless self-explanatory.

Degrees	_____	_____	_____
Years	_____	_____	_____
Schools	_____	_____	_____

EMPLOYMENT: Indicate present employment and previous jobs below.

Employer	_____	_____	_____
City	_____	_____	_____
Years	_____ to _____	_____ to _____	_____ to _____
Title or Function	_____	_____	_____

Name _____ Age _____

Home Address _____ Home Phone _____

_____ (city) _____ (state) _____ (ZIP code) U.S. Citizen? _____

Security Clearance _____ Location Preference _____

Marital Status _____

Military Status _____

BE SURE YOU HAVE NOTED YOUR HOTEL, ROOM AND TELEPHONE NUMBER IN THE BOX—UPPER RIGHT CORNER OF THIS PAGE

software age

MAGAZINE

1020 CHURCH ST., EVANSTON, ILL. 60201

TEAR OUT THIS RESUME PAGE AND BRING IT TO THE S/A RESUME CENTER
 The St. Francis Hotel—Union Square, San Francisco
 Noon, Monday, December 9—3 P.M., Wednesday, December 11

This is a special resume form to be used only if you plan on being in San Francisco during the FJCC Show. Fill out the reverse side and bring it with you to the S/A RESUME CENTER, December 9-11, The St. Francis Hotel, San Francisco, Calif.

COMPANIES PARTICIPATING IN THE S/A RESUME CENTER

	Page		Page
<input type="checkbox"/> Ampex Corp.	44	<input type="checkbox"/> Johnson & Johnson	27
(Redwood City, California)		(Sherman, Texas; Chicago, Illinois; New Brunswick, New Jersey)	
<input type="checkbox"/> Auerbach Corp.	41	<input type="checkbox"/> Lockheed-Electronics Co.	
(Philadelphia, Pennsylvania)		(Los Angeles, California)	
<input type="checkbox"/> Bendix Corp., Kansas City Div.	45	<input type="checkbox"/> McDonnell Douglas Corp.	12
(Kansas City, Missouri)		(St. Louis, Missouri; Santa Monica, California)	
<input type="checkbox"/> Blue Cross-Blue Shield	35	<input type="checkbox"/> Mellonics Systems Development Div. Litton Systems, Inc.	51
(Chicago, Illinois)		(Sunnyvale, California)	
<input type="checkbox"/> Career Center	63	<input type="checkbox"/> Montgomery Ward Data Center	22
(New York, New York)		(Chicago, Illinois)	
<input type="checkbox"/> CNA/Financial		<input type="checkbox"/> National Cash Register Co.	57
(Chicago, Illinois)		(Dayton, Ohio)	
<input type="checkbox"/> Collins Radio Co.	13	<input type="checkbox"/> National Cash Register Co., Electronics Div.	19
(Dallas, Texas)		(Hawthorne, California)	
<input type="checkbox"/> Computer Applications, Inc.	53	<input type="checkbox"/> National Manpower Register	23
(New York, New York)		(New York, New York)	
<input type="checkbox"/> Computer Personnel Consultants	10	<input type="checkbox"/> North American Rockwell, Autonetics Div.	59
(Chicago, Illinois)		(Anaheim, California)	
<input type="checkbox"/> Computer Usage Co., Inc.	37	<input type="checkbox"/> Northrop Corp.	4
(Mt. Kisco, New York)		(Hawthorne, California)	
<input type="checkbox"/> Continental Illinois National Bank	21	<input type="checkbox"/> Pratt & Whitney Aircraft	18
(Chicago, Illinois)		(East Hartford, Connecticut)	
<input type="checkbox"/> Control Data Corp.	47	<input type="checkbox"/> Raytheon Co., Equipment Div.	4th Cover
(Minneapolis, Minnesota)		(Waltham, Massachusetts)	
<input type="checkbox"/> General Electric Co., Information Service Dept.	39	<input type="checkbox"/> RCA	3, 25
(Bethesda, Maryland)		(Camden, New Jersey; Cherry Hill, New Jersey)	
<input type="checkbox"/> General Electric Co., Information Systems Equip. Div. .	39	<input type="checkbox"/> Sikorsky Aircraft	31
(Phoenix, Arizona)		(Stratford, Connecticut)	
<input type="checkbox"/> Honeywell, Inc., Electronic Data Processing Div. .	3rd Cover	<input type="checkbox"/> Source EDP	64
(Waltham, Massachusetts)		(Chicago, Illinois; Dallas, Texas; Detroit, Michigan; Los Angeles, California; Minneapolis, Minnesota; New York, New York; San Francisco, California)	
<input type="checkbox"/> Hughes Aircraft Co., Aerospace Div.	15	<input type="checkbox"/> System Development Corp.	33
(Culver City, California)		(Santa Monica, California)	
<input type="checkbox"/> Hughes Aircraft Co.	28	<input type="checkbox"/> TRW Systems Group	2nd Cover
(Fullerton, California)		(Redondo Beach, California)	
<input type="checkbox"/> IBM Corp.	49	<input type="checkbox"/> Univac	
(Gaithersburg, Maryland)		(Philadelphia, Pennsylvania)	
<input type="checkbox"/> Interstate Staffing		<input type="checkbox"/> Xerox Corp.	29
(Philadelphia, Pennsylvania)		(Rochester, New York)	
<input type="checkbox"/> ITT Federal Electric Corp.	26		
(Cocoa Beach, Florida)			
<input type="checkbox"/> Jet Propulsion Laboratory	55		
(Pasadena, California)			

* If you would like a free subscription to SOFTWARE AGE Magazine, place a copy of your resume in the subscription box.

TOTAL for duplicating -----

FIGURE I

EQUIVALENT TRANSPORTATION MATRIX

	<i>b</i>	4	5	12	13	13	14	15	15	18	18	24	25	29	32	33	45	47		
<i>a</i>	<i>i</i>	4	8	8	2	4	7	3	5	4	3	8	4	1	8	8	6	8	<i>S'ai</i>	<i>Lai</i>
2	6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
10	5	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	2
10	9	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	2
11	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
11	6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
11	5	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
20	8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
23	7	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
23	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
23	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
31	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
33	3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
34	8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	1
	<i>Sai</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	<i>Uiτ</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		

TABLE I

SCHEDULE OF LOADINGS

LOADING POINT (<i>i</i>)	LOADING DATE (<i>a</i>)	DELIVERY POINT (<i>j</i>)
1	9/23	4
2	9/04 9/23	8 8
3	10/03	6
4	9/11 10/01	8 8
5	9/10 9/10 9/11	2 4 5
6	9/02 9/11	4 7
7	9/23	1
8	9/08 9/15 10/04	3 8 8
9	9/10 9/10	3 4

FIGURE II

Maximize

$$X_{4,1} + X_{4,2} + X_{6,1} + X_{6,2} + X_{7,1} + X_{7,2} \dots + X_{15,9} + X_{15,10} = z$$

Subject to:

$$X_{4,1} + X_{4,2} \dots + S'ai_1 = 2$$

$$X_{6,1} + X_{6,2} \dots + S'ai_2 = 1$$

$$\dots + X_{15,9} + X_{15,10} \dots + S'ai_{15} = 1$$

$$X_{4,1} \dots + X_{6,1} \dots + X_{7,1} \dots + Sbj_1 = 1$$

$$X_{4,2} \dots + X_{6,2} \dots + X_{7,2} \dots + Sbj_2 = 1$$

$$\dots + X_{13,12} \dots + Sbj_{12} = 1$$

_____ An Algorithm
 _____ for Rapid
 _____ Reassignment
 _____ of Motor
 _____ Freight Carriers

William S. Hipp
 Supervisor
 Seismic Applications
 Houston Data Center
 Control Data Corporation

SYNOPSIS: An algorithm is proposed for rapid solution of a carrier reassignment problem. Given a shipment schedule, the reassignment problem is: find the minimum number of carriers needed to complete the schedule, where reassignment of a carrier after completion of its initial assignment is allowed.

TABLE II
DISTANCES IN TIME
EQUIVALENTS
(t_{ij})

$i \backslash j$	1	2	3	4	5	6	7	8
1	6	2	6	2	5	5	2	1
2	7	2	7	2	6	5	3	1
3	12	6	12	16	11	12	15	16
4	6	2	6	3	5	6	3	1
5	6	3	5		4	6	3	1
6	6	2	6	2	5	6	3	1
7	6	2	6	2	5	5	2	1
8	10	13	10	13	9	18	13	13
9	5	8	5	8	4	15	8	8

TABLE III
SCHEDULE OF ARRIVALS

DELIVERY POINT (j)	ARRIVAL DATE (b)
1	9/29
2	9/13
3	9/15 9/18
4	9/04 9/13 9/18 9/25
5	9/15
6	10/15
7	9/14
8	9/05 9/12 9/24 10/02 10/13 10/17

TABLE IV

a	i	L_{ai}	b	j	U_{bj}
2	6	1	4	4	1
4	2	1	5	8	1
8	8	1	12	8	1
10	5	2	13	2	1
10	9	2	13	4	1
11	4	1	14	7	1
11	6	1	15	3	1
11	5	1	15	5	1
20	8	1	18	4	1
23	7	1	18	3	1
23	2	1	24	8	1
23	1	1	25	4	1
31	4	1	29	1	1
33	3	1	32	8	1
34	4	1	33	8	1
			45	6	1
			47	8	1

■ **Introduction.** This paper outlines a direct computational procedure for extremely rapid solution of the re-assignment problem in which it is desired to minimize the number of carriers required to meet a fixed schedule. The method takes advantage of a unique formulation of the problem presented by Dantzig and Fulkerson and originally intended for resolution by the simplex algorithm.

Development of practicable scheduling models for use in small and medium size computers has been hindered in many instances by storage limitations where special transportation codes are involved, or by time considerations where linear programming systems are used. The procedure described here provides a solution time which must be considered instantaneous in terms of conventional techniques. Significantly, program requirements are minimal allowing maximum utilization of core for the problem matrix.

The Problem. Assume a schedule of product movement such that we have a number of loading points (i) at which carriers are to be loaded for deliveries at points (j), Table I. Distances in units of time

between all shipping and receiving points are known (these may include corresponding loading and unloading times), Table II. All carriers are considered to be interchangeable so that complete freedom of movement exists between all loading and receiving points. The schedule of product movement is expressed in unit carrier loads so that each delivery must be followed by a return to some loading point. The problem is to determine a pattern of carrier assignment such that the given schedule of product movement may be accomplished with the minimum number of carriers.

Formulation. From Tables I and II determine a schedule of arrival times as shown in Table III. Ordering the loading and delivery schedules by date, we derive Table IV where

L_{ai} = the number of carriers loading at i at time a

U_{bj} = the number of carriers unloading at j at time b

and defining

X_{aibj} = the number of carriers reassigned from delivery point j at time b for reloading at point i at time a .

We now construct a rectangular array of spaces, each row being identified by a unique combination of loading point and date, and, similarly, each column by delivery point and date as in Figure I. The inequalities

$$(1) \sum_{a,i} X_{aibj} \leq U_{bj}$$

$$(2) \sum_{b,j} X_{aibj} \leq L_{ai}$$

where

$$(3) X_{aibj} \geq 0$$

are satisfied for all possible schedules since the total number of reassignments from j at b can never be greater than the total number of carriers, U_{bj} , unloading at j at time b . Nor can the total number of reassignments to i at a exceed the number of carriers loading at i at time a . In each case, however, it can be less.

An equivalent transportation problem can now be generated by the introduction of non-negative slack variables, S_{ai} and S_{bj} , representing, respectively, the number of carriers which initiate their individual schedules at time a and loading point i , and end their individual schedules at delivery point j and time b . Rewriting (1) and (2) in the form of equalities we have

In Chicago, we don't work with people or companies we don't know.

Sounds kind of snobbish, doesn't it? But on second thought it makes a lot of sense. *Personal* contact with both seeker and sought is a basic method at CPC, and if it seems old fashioned in an era of computerized "match ups" . . . then we're old fashioned. At CPC your resume is a beginning, no more. We want to know *you* . . . your capabilities and aspirations. There is no question that there's a *right* place for you in the

computer field . . . a place where you can realize your full potential in terms of satisfaction *and* money. But to you personally, this strong demand means little until you take advantage of the broad view of the market available to you from CPC. Your professional future is too important to risk with anything short of a dedicated knowledgeable coun-

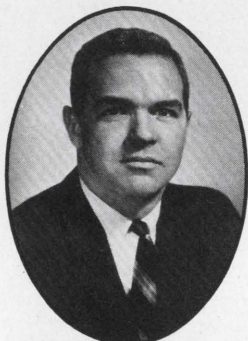
sellor—the only kind you'll find at CPC. Very simply, we're more careful, more thorough, in our placements. We're very sure to bring the *right people* in touch with the right position. We're very careful to waste *nobody's* time . . . including our own. Isn't CPC the kind of organization you'd like to know more about?

You may have an immediate need; if so, we can help you find the right career among many current CPC openings in sales, sales management, data processing management, systems analysis, and others. If you'd like to know where you stand . . . and where you should stand at this stage of your career . . . we can tell you, and we will.

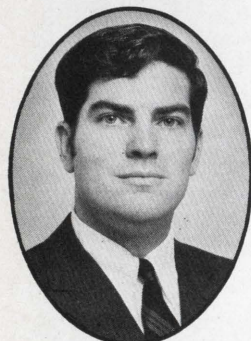
OLD FASHIONED METHODS PAY OFF IN SOLID CAREERS



Mike Potts
marketing/data
processing management



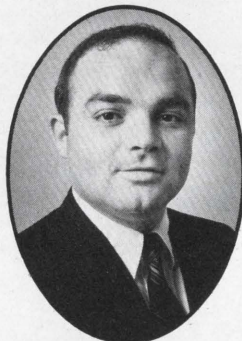
Bill Geary
systems and
operations management



Bill Leinbach
systems analysis/
software specialists



Al Macdonald
management consulting/
operations research



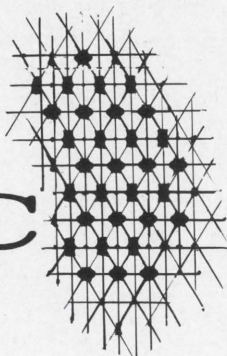
Bill Alton
programming/operations/
field engineering

SEE YOU IN SAN FRANCISCO

We'll talk in Chicago anytime. You may wish to send first for our Confidential Salary Survey. If so, just call or write **Bill Geary** for a free copy. If you're heading west in December, our paths will cross in San Francisco. You can call the CPC Suite in San Francisco at EX 2-3473 anytime from December 7 through the end of the Fall Joint Computer Conference. We'll be there for one reason only—to meet

with *you*. Do include CPC if you participate in the *Software Age* Resume Center . . . but more important, do stop in, if only for a few minutes, and let us get to know you personally. It may be an old fashioned way. . . but it works.

CPC



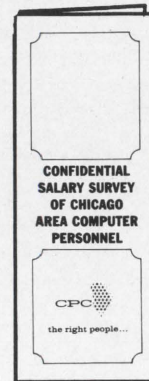
CALL 312-641-1790

COMPUTER PERSONNEL CONSULTANTS, INC.

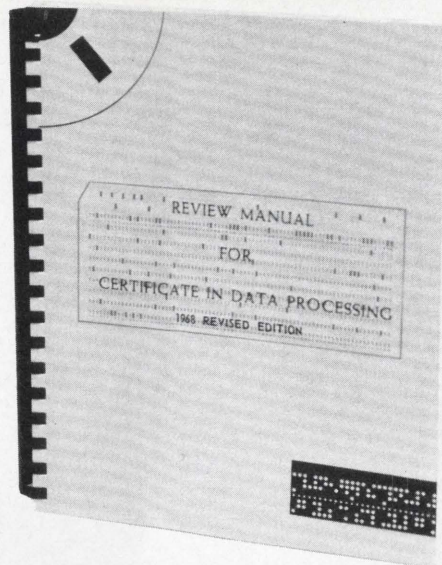
SUITE 3000, 230 NORTH MICHIGAN AVENUE, CHICAGO, ILLINOIS 60601

AGENCY LICENSED • ALL INQUIRIES CONFIDENTIAL • CLIENT COMPANIES PAY FEES

For more information, circle No. 30 on the Reader Service Card



PREPARE
FOR THE
1969
CERTIFICATE
IN
DATA PROCESSING
EXAMINATION!



LEARN
SYSTEM/360 PROGRAMMING
ASSEMBLER LANGUAGE
RPG

1969 REVISED EDITION

Review Manual for Certificate in Data Processing 1969-Revised Edition By: Thomas J. Cashman CDP

ACCLAIMED throughout the country as the best single reference in preparing for the CDP EXAMINATION. INVALUABLE to persons employed in or associated with the field of Data Processing. The 1969 Revised Edition contains over 300 pages of valuable information.

CONTENTS: AUTOMATIC DATA PROCESSING EQUIPMENT: Computer components and functions, data representation, EBCDIC, zoned decimal and packed decimal format, data flow, channels, buffering, secondary storage, access times etc.— **COMPUTER PROGRAMMING and SOFTWARE SYSTEMS**—instruction formats, subroutines, sorting, programming systems, Fortran, Algol, Cobol, PL/1, etc.—**DATA PROCESSING MANAGEMENT** — feasibility studies, real-time systems, file organization, system controls, work measurement etc. **QUANTITATIVE METHODS**—basic accounting concepts, cost accounting, mathematics, statistics, Glossary of data processing terms. Only \$7.95

Introductory & Advanced Textbooks For System/360 RPG Programming

By: Dennis A. Fletcher and Thomas J. Cashman

NOW AVAILABLE: The first student textbooks written on this rapidly expanding programming language. All exercises, problems, review questions, case studies and forms needed to learn RPG PROGRAMMING are included. Ideal for classroom use, in-plant training or home study.

VOLUME I INTRODUCTION — \$6.95

System/360 Hardware and concepts. Introduction to System/360 RPG, file description specifications, input specifications, calculation specifications, output-format specifications, review questions, exercises, case studies, discussion questions, sample problems.

VOLUME II ADVANCED CONCEPTS — \$3.95

RPG fixed program logic, branching, looping, subroutine programming, table lookup, multiple file processing, RPG core storage requirements, summary of RPG program indicators, RPG error check list, SYSTEM/360 EBCDIC code structure, review questions, exercises, case studies and sample problems.

Introduction To Computer Programming IBM System /360 Assembler Language

AT LAST! A simplified, yet comprehensive textbook on Assembler Language programming with emphasis on the commercial instruction set using DOS. Assembler language programming is illustrated by means of a series of "typical" programs.

Contents includes System/360 hardware and software, flow-charting and documentation, DTF's, input/output operations, comparing, addition, subtraction, multiplication, division, work areas, register usage, Hundreds of illustrations — numerous sample programs carefully explained to illustrate assembler language programming concepts and techniques.

Written By: Thomas J. Cashman, CDP, Long Beach City College, and Gary B. Shelly, Systems Programmer, Bell and Howell Electronic Instrumentation Group. Only — \$7.95

(Assembler Language text — Available November 15, 1968)

ORDER THESE TIMELY PUBLICATIONS TODAY!

ANAHEIM PUBLISHING COMPANY
131 West Broadway
Anaheim, California 92805 BILL ME CHECK ENCLOSED

Please Send:

_____ Copy(ies) of "Review Manual for Certificate in Data Processing" 1969 @ \$7.95 ea.
_____ Copy(ies) of Vol. I "IBM System/360 RPG Programming" @ \$6.95 ea.
_____ Copy(ies) of Vol. II "IBM System/360 RPG Advanced Concepts" @ \$3.95
_____ Copy(ies) of "System/360 Assembler Language" @ \$7.95 ea.
Plus Postage and handling 30¢ ea.—State Tax if appl.
Save: include check with order and we will pay postage & handling.

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
STREET CITY STATE ZIP

For more information, circle No. 31 on the Reader Service Card

We need the best problem-solvers in the business to work on the best variety of programs in the business.

At McDonnell Douglas, you'll have an opportunity to solve problems in fields ranging from real estate to nuclear propulsion, from hospital management to space logistics, from retailing to construction, from advanced aircraft to marketing research.

Our data facilities comprise several of the country's largest, most modern computer systems. They serve our own exciting business and scientific programs in aircraft and astronautics, as well as commercial Datadrome customers throughout business, industry, science, government and education.

To keep pace with our expanding activities, we need more top people: **scientific programmers, math modelers, digital computer analysts, business programmers, systems analysts, consultants, marketing representatives and sales engineers.**

If multi-project problem-solving is the kind of challenge you're looking for, just send the coupon, with your resume if available.

We have openings in St. Louis, Southern California, Washington, D.C., and New York.



Mail to: Mr. W. R. Wardle, Professional Employment, Box 14308, St. Louis, Mo., 63178
or: Mr. N. V. Kilgore, Professional Employment, 3000 Ocean Park Blvd., Santa Monica, Calif. 90406

Name _____

Home address _____

City & State _____ Zip Code _____ Phone _____

Education: BS _____ MS _____ PhD _____ Major Field _____
(date) (date) (date)

Primary experience area _____

Present position _____

Area choice: East Midwest West Best Opportunity

MCDONNELL DOUGLAS

An equal opportunity employer



$$(4) \sum_{a,i} X_{aibj} + S_{bj} = U_{bj}, S_{bj} \geq 0$$

$$(5) \sum_{b,j} X_{aibj} + S_{ai} = L_{ai}, S_{ai} \geq 0$$

Any carrier loading at point i , time a , must ultimately make a delivery at some point j , time b . Therefore,

$$\sum_{a,i} L_{ai} = \sum_{b,j} U_{bj}$$

Since

$$\sum_{a,i} S_{ai} + Z = \sum_{a,i} L_{ai}, Z \geq 0$$

$$\sum_{b,j} S_{bj} + Z = \sum_{b,j} U_{bj}, Z \geq 0$$

where

$$Z = \sum_{a,i} \sum_{b,j} X_{aibj}$$

it can be seen that to minimize the slacks, S_{ai} and S_{bj} , is to maximize the number of reassignments, X_{aibj} , thus minimizing the number of carriers required.

The blank spaces in the equivalent transportation matrix formed by the example problem in Figure I denote the area of physically permissible reassignments. That is, those X_{aibj} couples where

$$T_{ij} \leq a - b$$

When this condition is not met, the corresponding X_{aibj} variables are constrained to zero and need not enter into solution.

Thus, we have outlined a construction of the scheduling, or reassignment, problem which may be expanded in the fashion of a classical transportation set and solved as a linear programming problem. Using the coordinates of the X_{aibj} squares in Figure I for vector identification and tagging slacks by row and column numbers, the set may be expanded as in Figure II.

Solution of the sample problem obtained with a standard linear programming code is shown in Figure III. Since seventeen movements were specified and eight reassignments made, nine carriers will be required.

The simplex algorithm has the advantage of being extremely simple to apply, particularly when the problem is of transportation type. The difficulty is that as the transportation equivalent becomes larger the size of the linear form increases exponentially and, thus, the time required for solution. A 50 (i,j) x 50 (b,j) transportation equivalent easily expands to a linear form on the order of nine hundred variables and eighty constraint rows. A rather large linear programming problem



Collins' New Data Program Creating New Opportunities

Collins' C-8500 C-System gives users the first completely integrated system with virtually unlimited expansion capability.

This new concept in computer applications is creating exceptional career opportunities for: Programmers, Hardware Diagnostic Programmers, Circuit Design Engineers, Memory Design Engineers, Digital System Engineers, Digital Systems Analysts, Logic Design Engineers, Mechanical Engineers, Data Systems Analysts and Applied-Systems Analysts/Programmers.

Electrical and Mechanical Engineers, Physicists, Mathematicians, and those with degrees in other physical sciences (1 to 5 years experience) will find an outstanding

opportunity to learn and progress rapidly in the data field, even without previous data experience.

Please send resume in confidence to Manager of Professional Employment, Collins Radio Company, Dallas, Texas 75207; Cedar Rapids, Iowa 52406, or Newport Beach, California 92663.

an equal opportunity employer



	b	4	5	12	13	13	14	15	15	18	18	24	25	29	32	33	45	47		
a	i^T	4	8	8	2	4	7	3	5	4	3	8	4	1	8	8	6	8	S'_{ai}	L_{ai}
2	6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
4	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
8	8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
10	5	1	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	0
10	9	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	2	0
11	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
11	6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
11	5	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
20	8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
23	7	x	x	x	x	1	x	x	x	x	x	x	x	x	x	x	x	x	0	0
23	2	x	x	x	x	1	x	x	x	x	x	x	x	x	x	x	x	x	0	0
23	1	x	x	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	0
31	4	x	x	x	x	x	x	1	x	x	x	x	x	x	x	x	x	x	0	0
33	3	x	x	x	x	x	1	x	x	x	x	x	x	x	x	x	x	x	0	0
34	8	x	x	x	1	x	x	x	x	x	x	x	x	x	x	x	x	x	0	0
	S_{bj}	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1		
	U_{bj}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

FIGURE III
L/P SOLUTION

	b	4	5	12	13	13	14	15	15	18	18	24	25	29	32	33	45	47		
a	i^T	4	8	8	2	4	7	3	5	4	3	8	4	1	8	8	6	8	S'_{ai}	L_{ai}
2	6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
4	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
8	8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
10	5	1	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	0
10	9	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	2	0
11	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
11	6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
11	5	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
20	8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	0
23	7	x	x	x	x	x	x	1	x	x	x	x	x	x	x	x	x	x	0	0
23	2	x	x	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	0
23	1	x	x	x	1	x	x	x	x	x	x	x	x	x	x	x	x	x	0	0
31	4	x	x	x	x	x	x	x	x	1	x	x	x	x	x	x	x	x	0	0
33	3	x	x	x	x	x	x	x	x	1	x	x	x	x	x	x	x	x	0	0
34	8	x	x	x	x	1	x	x	x	x	x	x	x	x	x	x	x	x	0	0
	S_{bj}	0	0	0	0	0	1	1	1	0	0	0	1	1	1	1	1	1		
	U_{bj}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

FIGURE IV
SAMPLE SOLUTION

for a relatively small scheduling system.

The Method. An interesting, and in this case most pertinent, feature of the linear system described above is that the relative cost coefficients of all objective function variables equal one.

In a linear system where all relative cost coefficients of objective function variables equal unity, the basis for an optimum solution will always be one which contains the maximum number of elements.

Further, it can be shown that

The elements comprising such a basis will always be those present in linear combination (constraints) with the fewest number of other elements.

Scanning the expanded form to ascertain a basis meeting this condition is a rather inconvenient way to avoid the rigors of simplex computation. Instead, it is possible to select the appropriate variables directly from the equivalent transportation set represented in Figure I. It can be seen that the linear combinations generated in the constraint rows for any X_{aibj} will always be directly proportional to the number of permissible reassignments in the row (a,i) and column (b,j). Therefore, by alternately selecting variables in those rows and columns containing the fewest permissible reassignments we can proceed directly to an optimum solution.

Given the problem shown in Figure I, first ask if there are any rows

with only one permissible reassignment. There are none. Next ask the same question for all columns. Column twelve contains only one permissible reassignment at $X_{13,12}$. Assign the value of L_{a113} or S_{bj12} , whichever is smaller. Column thirteen also contains one permissible reassignment at $X_{13,13}$. Since L_{a113} is now zero, no further reassignments may be made in this row. Repeating the process for the condition of n permissible reassignments, $n = 1, 2, \dots, m$, where m equals the maximum number of permissible X_{aibj} 's in any row or column (or until all possible assignments have been made) we arrive at the solution in Figure IV. The two solutions will differ only among selection of degenerate variables. ■

PROGRAMMERS

Digital Computer Applications & Systems Engineers

Immediate growth-opportunities are available for:

- Real-Time Program Engineers
- Applications Program Engineers
- Test Evaluation Programmer/Analysts
- Simulation Programmers
- Design Automation Programmers
- Operating Systems Programmer/Analysts

Openings currently exist on the following types of programs:

- Correlation of Radar Data
- Image Motion Compensation of Synthetic Arrays
- Digital Autopilot Control
- Aircraft Navigation Control
- Air-to-Ground/Ground-to-Air Data Link
- Real-Time Command & Control
- Display & Control Devices
- Procedural Trainers
- Communications Satellite Control & Signal Processing
- Executive & Monitoring Systems

The hardware systems involved include:

- Miniaturized Airborne/Spaceborne Computers
- Adapted Commercial Computers
- Large-Scale, Multi-Process/Multi-Program Computers

These assignments require an accredited degree in Engineering, Physics or Mathematics. Openings are available at all experience levels.

U. S. CITIZENSHIP IS REQUIRED

Contact our representatives through the SOFTWARE AGE Resume Center at the St. Francis Hotel. Or, mail your resume to:

Mr. Robert A. Martin
Head of Employment



11940 W. Jefferson Blvd., Culver City, Calif. 90230

An equal opportunity employer—M & F



**JUST HOW
GOOD
ARE PRIVATE
COMPUTER SCHOOLS**

W. Roger Moore

Systems Analyst
Information Systems Sales and Service
General Electric Company
Cleveland, Ohio

During the past few years I have experienced and have been able to observe many things in the field of private computer education. I've seen the strong and weak points of curriculum; the qualifications of instructors; the honesty and credibility of sales and advertising; and, in fact, nearly all of the good and bad things encountered today by students of these schools. All these things are part of the total picture that the public seldom ever sees.

As a former Director of Education of one of these schools, I've been asked the question, from time to time, "Just how good are these computer schools?" For that reason, I submit this paper outlining my own personal views and observations on the matter.

■ Education is a very marketable item (particularly when it has to do with computers). The trouble is, many people that get lured into thinking they can make it in this field, can't afford to lose \$700 to \$1800 of their hard earned money. The missing ingredient in the computer school business seems to be either honesty or quality and sometimes both.

The terms "Data Processor", "EDP", "Tab operation", "Machine Accounting", and "control panel wiring" are quickly becoming a part of the past—if you don't believe it, just look at the Sunday want ads. The fact remains, though, that many private computer schools teach them today as the main part of their course. The reasons are obvious when you look at the rental costs of the various equipment involved. It's much less expensive to rent a couple of tabulating machines with a pile of control panels than it is to rent a computer. Additionally, it's quite impressive to the unsuspecting student to see all those wired panels and to think that some day he might be able to wire them. Of course, what he doesn't realize is that the demand for such knowledge is almost nil. It's like offering a TV repair course, with some television

repair theory, but having only radios to work with. Of course then, any attempts to advertise the course as being a TV repair course would be misleading.

Advertising of this kind unfortunately is used by many of these computer schools, but in addition they usually promise high salary jobs with a minimum amount of time and effort required of the student. This would be fine if it were true, but most likely it will take eight to ten years before the student will attain those kind of earnings, unless he has some practical experience and college to go along with this computer education.

Schools are also quick to advertise excerpts from Time Magazine, the Wall Street Journal, and others. These excerpts usually emphasize the shortage or great need for *qualified* people in the computer field. The schools seem to imply that a student need merely to complete the prescribed course and he will fulfill the qualifications sought after by the employers. This is not necessarily true. For one thing, the employer usually has a certain draft classification in mind, and in most cases he is looking for some college education in the persons background. Usually he's not interested in hiring

**you're a programmer . . .
or a systems analyst**

**at pratt & whitney aircraft
YOU COULD BE BOTH**

Now you can realize the best of both careers as a Systems-Programming Analyst in Business Information Systems at P&WA, world's leading producer of dependable jet engines. Here you will find boundless potential to develop into a real switch-hitting, broad-based talent.

The opportunities are manifold. Ours is one of the most advanced and sophisticated business information computer complexes in the country today. We have come as far as any. We will go further than most. Much of what you read about today as news in the industry, we have long since achieved.

At P&WA our Systems-Programming Analysts are exposed to virtually every phase of the business. A multiplicity of projects vary from simple card systems to complex on-line systems involving such projects as a Full Production Information System, Automated Financial Analysis and Reporting, and an Integrated Material Control System, including procurement, forecasting and scheduling. Tools include 360 models 20, 30, 40, and 50; tapes and random devices; data collection equipment; on-line facilities; DOS and OS.

Attractive openings exist at all levels for EDP professionals with up to five years experience. Preference will be given to applicants with recent experience using COBOL.

If this sounds like your kind of action, why not send your resume to Mr. H. M. Heldmann, Professional Placement, Office A-43, Pratt & Whitney Aircraft, East Hartford, Connecticut 06108. An equal opportunity employer.

Pratt & Whitney Aircraft

DIVISION OF UNITED AIRCRAFT CORPORATION

**U
A**

women because of shift work, or plant location, or total hours or manual labor. In many cases he simply isn't willing to take a chance with the person because of the multitude of unqualified private computer school graduates that have knocked at his or his friend's door.

After the misleading ad, a high pressure salesman may take over with his many gimmicks and angles. There could be only a couple of students signed up for this class but the salesman might say to his prospect "there's only one seat left . . . it could be taken at any time" and if the prospect is at all interested, he will sign.

Sometimes an aptitude test is given by the salesman either in the home or at the school. Here the salesman has a lot to gain if he can get his prospect through the test. The test is usually the IBM programmer's aptitude test or some watered down version of it. The standard test has 80 questions divided into three parts, each part being timed. The test is a very good one if administered properly, especially the first two parts. However, sometimes extra help or time is given, or the prospect is allowed to study the test before taking it, or is even permitted to retake it after going over his mistakes. If the prospect still fails, correct answers are sometimes filled in afterwards and arithmetic errors intentionally made in the students' favor. The most common practice used is the giving of higher letter grades than the scores warrant.

The salesman can easily get away with this too, since it would be almost impossible for the average individual to tie in a letter grade to his score without being able to first look it up. What makes this true are the facts that 1) the taker is not expected to finish the test, and 2) the score he receives on each part and the total must be compared against statistical results to obtain a meaningful grade (a straight percentile grade would not be significant).

Of course now, the watered down version, in effect, would produce the same end results. The prospect would most certainly not fail it. At any rate it's at this point that the great injustice really begins, because the person is led to believe that he has abilities of which he does not.

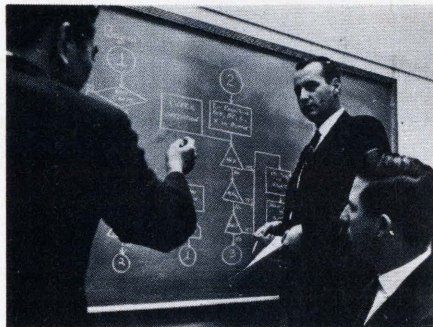
The only protection that one might take against this type of thing

NCR Los Angeles invites you to join the fast moving Century Series team

NCR, creator of the sophisticated and fast-selling Century Series computer systems, offers you immediate opportunity to work in new-generation technology. Join the men responsible for the industry's most advanced developments in high-speed thin-film memories, monolithic integrated circuitry, disc memory innovation, and automated production techniques. NCR Electronics Division is the largest commercial computer manufacturing facility in Southern California and one of the most advanced in the world. Benefits include a thoroughly professional environment, an excellent salary, non-defense stability, and fully paid life, hospital and medical plans for you and your dependents. Look into NCR now and accelerate your career.

SOFTWARE DEVELOPMENT SYSTEMS ANALYSIS ENGINEERS

Analysis and development of advanced systems specifications; consultation on systems design, hardware configuration, software trade-offs; analysis of competitive systems. Prefer applicants with BS degrees and 3-5 years' experience and ability to write and test functional specifications in such areas as very-high-speed memories, disc files, drum files, central processors employing large-scale integration, communications and time-sharing systems.



SOFTWARE SYSTEMS DESIGN

Develop operating, executive, utility and on-line systems for third- and fourth-generation advanced systems. Positions require a business or science degree and large-scale file computer or software development experience.

ENGINEERS

ELECTRONIC DEVELOPMENT ENGINEERS

Specification, design, checkout and documentation of digital and digital/analog equipment for use with on-line data processing and data communications systems. Requires BSEE and five years' related experience.

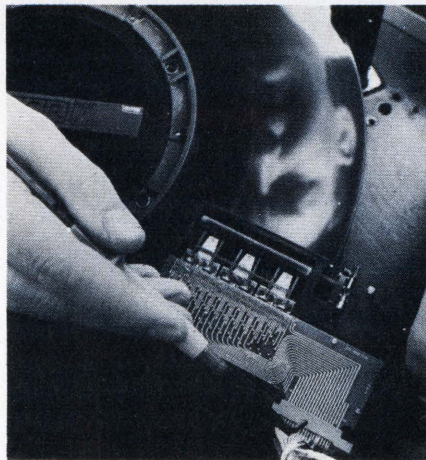


CIRCUIT DESIGN ENGINEERS

Will design and develop digital and analog semiconductor circuits, including discrete, integrated and hybrid types. Requires a BS/MSEE and two years' related experience.

MAGNETIC HEAD DESIGN ENGINEER

Will design and develop flying magnetic recording heads and the required prototype tooling. Requires BS or MS in EE, ME or physics plus three years' applicable experience. Knowledge of ferrite machining technology and ferrite heads desirable.



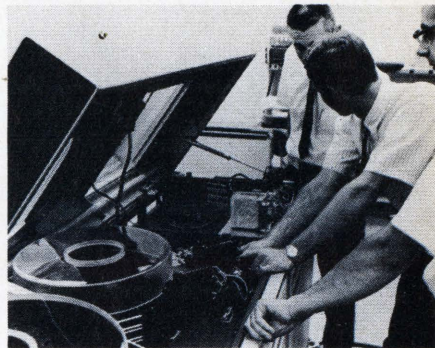
INDUSTRIAL ENGINEERS

Will develop manufacturing machining processes for various projects. Will be responsible for capital equipment analysis, fabrication tooling and initial production. Positions require BSIE and heavy mechanical/industrial engineering experience.



MATERIALS & PROCESS ENGINEERS

Will evaluate and select metallic or non-metallic materials, develop chemical or metallurgical processes, or prepare specifications for computer equipment. Requires BS or MS and 2 years' applicable experience.



CHEMICAL ENGINEERS

Positions are available for college trained engineers to assume responsibility for film plating, organic finish analysis, and production plating process functions. Successful candidates will possess a BS degree in chemical engineering, a knowledge of organic coatings, the ability to develop and direct a process laboratory, and 3 to 5 years' experience in electroplating of magnetic thin film materials or chemical process analysis.

RESEARCH ENGINEERS

Will be engaged in feasibility model development, or integrated circuit memory or high speed magnetic memory circuit design.

Requires scientific and/or engineering degree and adaptability to a multiplicity of applied research projects.

ARRANGE NOW FOR INTERVIEW AT FJCC
Confidential interviews will be held at the St. Francis Hotel during the Fall Joint Computer Conference in San Francisco, Dec. 9-11. To schedule an appointment, submit detailed resume including salary history to Steve Williams at the Division.



The National Cash Register Company
ELECTRONICS DIVISION
2873 W. El Segundo Blvd.
Hawthorne, California 90250
An equal-opportunity employer

**SYSTEMS
ANALYSTS**

**SYSTEMS
ENGINEERS**

Ashland

*If you are
programmed
for leadership*

PUSH HERE

ASHLAND OIL & REFINING CO. a leader in Petroleum Products and Chemicals — has challenging growth positions open for qualified professionals.

If you've got what it takes to lead a project team in the evaluation, design and development of computer applications . . . have a Bachelor's Degree and at least two years experience designing systems for large scale computers . . . you'll find you're moving up as you move in our rapidly expanding corporate headquarters EDP center.

Our computer center houses two System/360's; a 512K, 10 tape, 2314 disc Model 50; a 128K, 6 tape, 2314 disc Model 40, and misc. punched card equipment. We use the full Operating System and have adopted PL/1 as official programming language.

You can expect an attractive starting salary, a comprehensive benefit program and an uncommon opportunity to use your leadership, communication and planning skills in a stimulating, growth oriented, professional atmosphere.

Ashland is a dynamic and progressive city with excellent schools. Only minutes away, you'll find gracious suburban living — boating and fishing — and woodlands steeped in Indian lore, happy hunting grounds for sportsmen, campers, explorers. A short drive brings you to Huntington or other metropolitan areas. You'll find lots to do in an invigorating four seasons climate.

Please send resume in complete confidence to:

Ashland

Mr. G. F. Hiatt, Dept. SA-1168
Employment Manager
ASHLAND OIL & REFINING CO.
1409 Winchester Ave.
Ashland, Kentucky 41101

An Equal Opportunity Employer

**Professional
PROGRAMMERS — ENGINEERS — SENIOR SCIENTISTS
Nationwide • International**

Computer Careers Incorporated offers a truly unique service on a nationwide basis to the professional programmer, engineer, or senior scientist seeking personal advancement and career growth. Our professional staff is qualified by reason of actual working experience in your field to know and understand your background and to best serve your personal and career interests. Our carefully selected clients are outstanding leaders in the computer industry and directly related fields of industrial activity. Current openings include a wide range of assignments in the fields of digital hardware design, systems analysis and programming on a variety of software, management systems, scientific and commercial applications. May we suggest that you forward a confidential summary of your background and career objectives today, or contact Mr. Edward McLaren at 301-654-9225 for additional information. Client organizations assume payment of all fees.

COMPUTER CAREERS INCORPORATED

Suite 503—4720 Montgomery Lane—Bethesda, Maryland 20014
(A suburb of Washington, D. C.)

CONSULTANTS TO THE COMPUTER INDUSTRY

would be to take the legitimate aptitude tests provided by the various computer manufacturers and have them administered by completely impartial parties such as high school guidance counsellors or the state employment service. This would establish one's qualifications, however, be careful. Some people are simply better test takers than others. The grade may not truly indicate a potential ability or lack of ability in computer programming.

One seriously considering this field as a future occupation should take the aforementioned into consideration and ask himself the following questions:

Do I have—
a willingness toward change?
an eagerness to learn and try new things
an aptitude for using my mind?
a determination to see the job through?
the ability to think logically?
Am I an organizer?
Did I like algebra or especially geometry in school?
Do I like to solve problems?

If in most cases the answers were yes, and a better than average* aptitude exists, then one should most certainly pursue his ambition to become a programmer. If there are still doubts as to qualifications and just whether the person will even like this field, he might consider an inexpensive correspondence course before plunging headlong into it. This just might give him enough basic background for further education in the field or enough even to get him hired as a trainee programmer. At any rate, many "qualified" individuals are truly needed.

At this point it might be a good idea to take a look at just what these schools have or don't have to offer. Factors that should be considered are: facilities, curriculum, lab, faculty, reputation, student materials, placement, and costs.

Facilities. If a person were to visit these schools he most probably

* A poor or average grade, if truly indicative of aptitude, is not encouraging. A person with this kind of aptitude should look in other occupational directions since he must, in order to succeed in this field, be better than average. This profession, just like the medical profession, demands quality people. There is virtually little or no room for those who are not exceptional or at least better than average.

You and you and you and you and Continental Bank

We want you to inquire about a job that doesn't exist. It is a job for you to shape. In dimensions as large as your capabilities and ambitions.

The invitation comes from a bank interested in your skills in information processing, but no less in you the person, you the citizen.

THE PROFESSIONAL YOU

As a computer professional, you'll find things to your liking at Continental Bank. We rely heavily on data processing; we expect it to have even more influence on the Continental Bank of the '70s.

More than just a depository, the modern bank has become a financial research and processing institution. Continental's computer staff think of us in those terms, and importantly, so does our management. In many applications, our computers produce output which is utilized directly in one customer service or another. Our computer people, therefore, not only must know the bank's business but know our customers' businesses as well.

The extent of EDP activity at Continental is a telling measure of our commitment. It includes:

- The outstanding MIRA credit card authorization system, serving three states and employing more than 20 display stations.
- An on-line savings system used for both our own needs and those of other banks in the area.
- Thirty-five remote entry stations operated on a real time basis within the aforementioned systems.
- Five time-sharing terminals in current use, with dramatic expansion anticipated in this area.
- Three more on-line systems scheduled as early as next year.

- Fifteen operating computer systems, including four IBM 360/50's and both DOS and OS operating environments. We'll take delivery on IBM 360/65 equipment soon.
- More than 300 people in data processing, technical planning and related electronics positions.
- Further, plans are well along for expansion in operations research and management science, including development of a bank model and a generalized cash flow and financial analysis system for our customers.

If such plans sound ambitious, they're nicely suited to Chicago's largest bank.

THE OTHER YOU

We offer you more than a job and ask more of you than merely filling one. At Continental, you will be encouraged to participate, to be involved in your profession and in the needs and problems of the community. For such involvement is an essential aspect of the bank's existence.

THE INNER YOU

In Chicago, you'll find ample satisfaction for all of your appetites. The quality of the area's universities and other institutions of higher learning is world famous. And its social and cultural achievements deserve, if they do not receive, every bit as much recognition.

THE FUTURE YOU

Your future has been considered and cared for.

You will enjoy exceptional benefits; not only insurance and profit sharing, but a tuition refund program that underwrites your continuing education in your field or in related studies.

If you're ready to create a career and not just follow one, apply at the Resume Center. Or if you prefer, send a confidential resume to Robert L. Ganchiff, Personnel Division.

One of the world's great banks.

CONTINENTAL BANK

Continental Illinois National Bank and Trust Company of Chicago
231 South LaSalle Street, Chicago, Illinois 60690
ACM Corporate Member

You don't change a company the scope of Montgomery Ward with timid measures. You do it with a totally unique programming effort geared to serve a total management information system from 8 different areas simultaneously!

You do it with a battery of IBM 360/50's, 40's, 30's. With hardware that comprises one of the largest commercial 3rd generation installations in the nation!

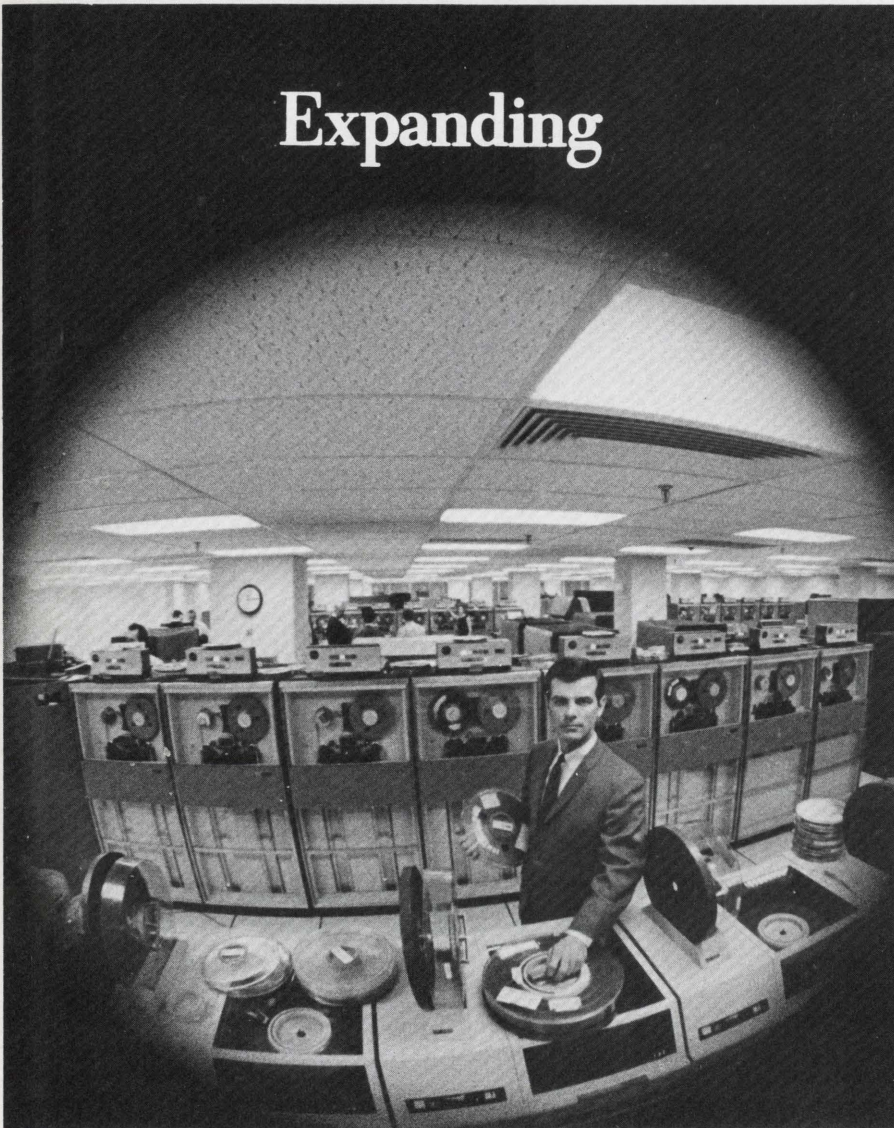
Most of all, you do it with peo-

ple. Young, restless, skilled people . . . including programmers and systems analysts with COBOL or BAL experience who recognize the potential in helping re-structure an entire system.

If you're a person who wants to get things done, there's no better place to turn your energies loose than right here. At the changing Montgomery Ward. Contact: M. K. Fenwick, Personnel Representative, Corporate Systems Division.

What's a merchandiser like Montgomery Ward doing with a computer complex like this?

Expanding



MONTGOMERY WARD

6th Floor, Data Center/140 S. State Street, Chicago, Illinois 60603
An Equal Opportunity Employer

would find some to be very luxurious with tropical plants, wall-to-wall carpeting, and offices with big beautiful walnut desks. On the other hand, he might find just the opposite. Don't be fooled by outward appearance, however. It often is an indicator that just the opposite exists regarding the quality of courses offered by the school. The key is to look for moderation but don't stop there.

Curriculum. A thorough investigation into the contents of the curriculum is an absolute necessity to the interested individual. He should, however, first find out as much as he can about the field before investigating the various curricula. He should start by looking in the newspaper want ads and the professional data processing magazines. He should talk to computer manufacturing representatives and members of local professional organizations like the Data Processing Managers Association (DPMA). In essence, he would find out as much as he possibly can about what kind of experience and knowledge is being sought after by the computer users. Armed with this knowledge he can go ahead now and make an intelligent analysis and comparison.

The curricula vary from school to school about as much as the physical locations and facilities do, but basically they should contain the following:

1. A short, but thorough introduction to data processing and computers (this should take no longer than from 2 to 4 hours).
2. A good strong presentation of computer logic and the language being taught (preferably COBOL).
3. A generous amount of lab time (at least one half of the course).
4. A sufficient amount of hands-on computer experience (at least five minutes per student per lab hour).
5. A minimum coverage of at least 10 sessions on disc and tape with at least one session per peripheral of hands-on experience.
6. A minimum of 5 case problems for students to program having at least 900 source language instructions all totaled.

Design your own job

and our computer system will help you find it

Real-time Data System: Now, for the first time you can literally specify the job you want and stand a good chance of finding it. Our real-time GE 265 computer system helps make this possible. Stored in its memory are hundreds of top positions expressly for professionals in the data processing industry.

63 Offices Nationwide with Remote Terminals Gather Job Openings The job data in our computer system is collected and continuously updated by our 63 affiliated offices who are in contact with literally thousands of employers. Their job is to insure that we have the best possible range of opportunity available for you.

A tremendous diversity of opportunity is available for computer professionals right now. We have open positions with industrial giants and many new, up-and-coming firms of which you are probably unaware. This entire service is employer sponsored . . . **there are never any costs to you of any kind.**

Computer Used as Tool: The computer alone is not the complete answer to the challenge of professional employment. We are all smart enough to realize that without the nation's top job developers and placement specialists, the best computer system in the country wouldn't be worth the electricity to run it. The most important feature of the NMR system is the fact that the only way that you can be considered for a position is for one of our professional placement managers to make the on line match and then to contact you to arrange potential interviews. All of this insures maximum **confidentiality** in your job search.

New Data Base for Computer Professionals: Because of the enormous success of our previous recruitment data base systems in other technical fields such as Electronics, and Chemical Process (jointly sponsored with the McGraw-Hill Publishing Company), and our program for the American Institute of Industrial Engineers, we are now opening a special service devoted exclusively to Data Processing professionals. So go ahead — design your own job. If it exists — and that may depend on how serious a job designer you are — we'll help you find it.

Attach this form to your resume. If you don't have one, drop us a line and we'll send you a Computer Registration Form.

COMPUTER JOB DESIGN FORM

SALARY DESIRED \$ _____ Your present salary: \$ _____

KIND OF COMPANY DESIRED
 Size: Large Medium Small Size immaterial
 Type: Predominantly commercial Predominantly government contractor Either
 Industry: Indicate two choices of industry you'd prefer to work in, such as data processing, electronics, government.
 (First choice): _____ (Second choice): _____

LOCATION DESIRED
 East Coast West Coast Midwest South Depends on Opportunity Other _____

POSITION DESIRED
 Commercial Scientific Programming Systems Design Systems Analysis
 MIS/OR Software Development Sales or Marketing Teaching Other _____

LEVEL DESIRED
 Executive Manager Staff member Technician Engineer

WHAT IS MOST IMPORTANT TO YOU?
 Salary advancement Professional challenge Congenial environment Other _____

ARE YOU A U.S. CITIZEN? Yes No

WHEN AVAILABLE Immediately Within one month Within three months

I AM Actively seeking a better position Only interested in "special" opportunities.

NR
MR NATIONAL MANPOWER REGISTER 635 Madison Avenue New York, N.Y. 10022

Programmers

SCIENTIFIC/COMMERCIAL



MOVE
UP
WITH
VITRO

Our computers have flown a lot of missions in our work in V/STOL systems definition. It's one of many jobs supporting our work in systems engineering, research and development. Our IBM 360/30-7090-360/40 facility provides operations research, analysis and prediction, information retrieval, and systems simulation in development of ASW fire control techniques, advanced torpedo design, underwater acoustics, acoustic imaging, oceanographic communications studies, and missile systems integration and management.

A degree in mathematics, physics, engineering or chemistry is necessary for scientific work; two years experience with a degree for commercial programming with knowledge of COBOL and/or assembly language coding.

Please send your resume to Mr. Harvey Weisberg, Employment Manager.

Vitro LABORATORIES

14000 Georgia Avenue • Silver Spring, Maryland 20910
(Suburb of Washington, D. C.)

An equal opportunity employer M&F

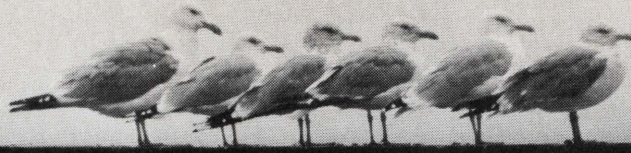
Many schools, however, offer inferior courses and therefore, the buyer should beware. He should beware of:

1. out-dated computer languages and techniques
2. obsolete equipment
3. unnecessary time spent on unit record equipment like key-punches, verifiers, reproducers, interpreters, and the like
4. lack of provisions for spending a reasonable amount of time on the computer, on discs, and on tape
5. the use of educational computers in place of full scale electronic computers
6. the use of small scale desk top computers or bookkeeping machines in place of the real thing
7. false implications that practical experience or lab includes program assembly and machine debugging

Lab. When choosing a computer education just keep in mind that hands on experience when learning how to program is perhaps the most important single factor that should be considered. Most students don't really learn programming until they've run and debugged their own programs on the equipment. So it should be of prime importance that the school either have its own computer or have liberal use of someone else's computer.

Also, I cannot emphasize enough the fact that COBOL should be stressed since it is offered by most computer manufacturers and is being used by more and more computer users every day. Actual experience on disc and tape should also be stressed. Monitoring systems, supervising systems, and operating systems should in addition be covered fully.

Faculty. The instructors in all of these schools are nearly always qualified to teach the courses offered. If they weren't, a school would very quickly get a bad reputation and wouldn't be able to hold its students. There are two very good ways that this can be checked; first through the Better Business Bureau, and second through the school's graduates. A school with nothing to hide or be ashamed of will usually be glad to give out several names



**Don't just sit there.
Take off...with RCA.**



If you don't think your progress is keeping pace with your potential come to RCA.

We'll give you a chance to get involved in hardware design, and work on a variety of important projects.

Salary? We offer rewards and advancement commensurate with your skills.

Write to us if you've had experience in language processors, operating systems, utility systems or communications systems.

We also have openings in Sales, Field Systems Support, Product Planning and Engineering.

Contact Mr. J. C. Riener, Dept. SW-7, RCA Information Systems Division, Bldg. 202-1, Cherry Hill, New Jersey 08101. We are an equal opportunity employer.

RCA



Palm trees. Apollo. And you?

Combine the best in electronics and good living with International Telephone and Telegraph Corporation.

The location is Cape Kennedy...vital world-center of space exploration, at the edge of Florida's Riviera.

The company is Federal Electric Corporation, prime contractor to NASA for Communications and Instrumentation Support Services at the John F. Kennedy Space Center where FEC handles all communications, ground measurements and calibration, computation, telemetry and timing that keep tabs on all Apollo vehicles from count-down, through orbital flight and landing.

As a programmer, you'll be computing the moon shot and all the vital assist factors that go into making the Apollo-Saturn launches a success. Your tools—for scientific, engineering and administrative support you can call upon two GE 635 multi-programmed digital computer systems with 16 magnetic tape units, 128K word storage, a 788K word drum and real-time input/output controllers on each system. Or, you can use an IBM 7010 computer system for financial management and an IBM 1050 connected to a separate IBM 1440-7010 computer system for a real-time 30K item inventory system.

If you'd like to be involved in space, while you and your family can indulge yourselves under palm trees...then FEC has the perfect climate for you. Please forward your resume to Employment Supervisor, Federal Electric Corporation, Suite 802, Cape Royal Building, Cocoa Beach, Florida 32931.

**FEDERAL ELECTRIC
CORPORATION**

A Plans for Progress Equal Opportunity Employer (m/f)

ITT

of successful graduates to interested individuals.

Reputation. Some very interesting questions that could be asked of these graduates, besides questions concerning instructor programming and teaching abilities, might go as follows:

1. How many students do you know that failed this school's computer course?
2. Were all the graduates from your class qualified to become programmers?
3. How honest were the salesmen or counsellors in presenting the true facts?
4. Did the school stand behind all of their promises?
5. Were there any students in your class that shouldn't have been there?
6. Did the school make an honest effort to place all qualified graduates?
7. Of those that were placed, did their employers recognize this school's computer course as being of any value?

By all means, while talking to school officials or the schools' graduates, an interested person should find out all about lab time and lab facilities. As mentioned before, this is the most important part of the course. He wouldn't want to pass up this opportunity.

Student Materials. An examination of student materials can sometimes be revealing. If the manuals are standard (being written and published by the computer manufacturer), then probably they will suffice. However, many schools compile their own manuals taking what they want from each official publication. Sometimes this is satisfactory, however, most manuals take from one to two years to put together and publish, thus allowing technology to pass them up. In these cases, more often than not, there is a tendency to over simplify or to be very basic. These specially produced manuals will very often emphasize unit record operations and control panel wiring instead of computer programming. Very often this is an indication of the kind of course that's going to be taught.

Placement. Most of these schools offer a placement service which is usually free. A salesman may mislead prospective students into be-

In the small world of computer companies, you work with computers to improve computers.

There's nothing wrong with that. But there is something infinitely better. And that's the wide, wide world of Johnson & Johnson.

Here you'll work with 3rd generation IBM/360 s exclusively to improve finance systems, cost and inventory control, distribution and manufacturing operations. And, most important, yourself.

Our broad-ranging diversity gives you more challenging work. And far greater chance to move ahead rapidly. If you are the man you think you are, you'll be heading up your own projects, be on the management level in no time at all.

What's more, we have choice openings in many different areas and locations. You're free to pick the one you're interested in. And whichever you select, don't worry about money. Our side of the fence is greener. In more ways than one.

Johnson & Johnson
An Equal Opportunity Employer

Corporate Staff

J. R. (Mike) Longua, 501 Georgian Street, New Brunswick, New Jersey

Manufacturing

G. L. Shott, 4949 West 65th Street, Chicago, Illinois

Manufacturing

R. L. (Larry) Dudley, Box 5000, Sherman, Texas

Distribution Center

John Kane, 4100 Bayshore Highway, Menlo Park, California

analysts and
programmers: the
grass is greener on
the johnson & johnson
side of the fence.

See us at the Fall Joint Computer Conference

PROGRAMMERS FOR SOUTHERN CALIFORNIA

Go where there's
room to grow!

At Hughes, you'll be able to work in large-scale, real-time operational Command & Control and Management Information Systems.

Assignments are in beautiful, suburban Orange County in Southern California.

Growth opportunities exist for:

Real-Time Operational Programmers • Software/Hardware Interface & Design Requirements Specialists
• Assembler/Compiler Language Programmers • Diagnostic Programmers • Systems Analysts • System Test Specialists • Management Information Systems Specialists.

For additional information on these exciting openings and to arrange for a personal interview appointment, please airmail your resume to:

MR. D. K. HORTON
HUGHES-FULLERTON
P. O. Box 3310
Fullerton, Calif. 92634



U. S. Citizenship is required • An equal opportunity employer — M & F

lieving that this service guarantees them a job when they graduate. This, of course is not true and besides that, these kinds of promises are prohibited by law in many states.

The fact remains, that if a student does not end up near the top of his class, irrespective of the school he attends, he should not expect much in the way of placement. He should just remember that the employer still has the choice in the matter and more often than not will only want to talk to the top people in the class.

Buying an education won't buy him a future. He must earn it; through hard work whether it be in school or on the job. He must continually prove his abilities by performance. It matters not whether it be to an instructor or the employer. He must have fortitude and patience for the sake of learning.

If a prospective student keeps these things in mind, he won't be led astray by the false claims. He won't fall into the trap that may lead to a huge financial waste.

Costs. Courses generally run about \$2.50 to \$3.50 per actual hour. It's well worth it if the ability is there and the school is reputable and their courses are up-to-date. Much caution is necessary as you probably realize by now.

Take a Good Hard Look. Should we be concerned? My answer is a very emphatic yes! But what can we do about it? How can we force these schools to do a better job? Well, there are several ways. We could do it through legislation, or competition, or accreditation, or pressure from the business community, or by educating the general public and the students in high school; educating them in data processing and programming.

The high schools have really fallen short in this respect. They should have been teaching programming for the past five years. This is where the upgrading must begin.

Some schools are now recognizing this fact. Altoona Area School District in Pennsylvania has been teaching for some time now with a powerful GE 225 Pennsylvania Time-sharing System. The Cleveland Board of Education in Ohio has also gotten into computer education along with several other school districts in the Cleveland area. Other



Can there be this kind of excitement in programming?

You hear the rapids before you see them—a distant, almost subsonic roar . . . feel the stream pick up speed . . . then a rush through a smooth, narrow chute—and you're in white water! The dangerous thrust of foam-masked rocks, the sweeping power of fast, broken water and the nimble response of the light canoe to your stroke—this is wild, wet excitement of white water canoeing*.

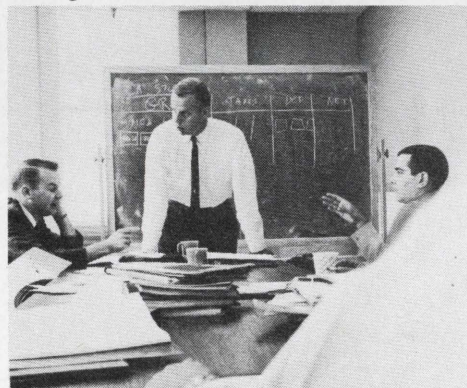
We think the good life includes excitement, off the job and on. And that data processing, as a career, has potential for intellectual excitement offered by few other professions. But not every programming environment can provide it.

We can at Xerox. In breadth and depth.

At Xerox, EDP is a vital ingredient in almost every phase of our operations . . . and becoming more so. Because we're an organization built on a foundation of innovation. And service.

The way we see it, both depend upon data. Accurate data. On the past. The present. To project the future. All along the spectrum from marketing and engi-

Try Xerox and see



One of the advanced systems you might work on at Xerox is EBS . . . Equipment Billing System. Here, Bud Seiph, EBS Manager, leads discussion of new systems approaches.

neering through manufacturing, service and field support.

The kind of programming jobs this creates can work very hard for your future, as well as ours. To start with, it can involve you deeply in many phases of our operations. You learn sales as well as systems analysis. Or distribution as well as disc-oriented software techniques. Too,

you'll get exposure to a variety of sophisticated systems, like our integrated Production Planning and Inventory Control System (PPICS) that oversees everything from inventory and bills of material to scheduling and workload distribution. Or a long-range strategic competitive planning model.

All this exposure does more than make you a better programmer. It can be the groundwork for several lines of advancement. As a programming specialist. A systems analyst. A functional specialist in one of the areas you've become acquainted with . . . and into management.

If you've a Bachelor's degree and/or experience with IBM 360 series systems using COBOL, the Univac 1108 using FORTRAN or COBOL, or IBM 7000 series using COBOL or AUTOCODER, we'd like to show you the kind of excitement that goes hand-in-hand with programming at Xerox. These openings are in Rochester, New York. Please send your resume to M. H. Hartigan, Dept. MZ-69-M1, Xerox Corporation, P.O. Box 1995, Rochester, N.Y. 14603.

XEROX

An Equal Opportunity Employer (m-f)

*Rochester is less than a 2-hour drive from some of the finest canoeing in the northeast.



Programmers... look to Link for challenge and opportunity.

If you're looking for an exciting, new career opportunity, where you can become actively involved in challenging projects, now's the time to look ahead to Link.

We're looking for experienced personnel to design automation and systems software. Our specific requirements are a background of 3-4 years of scientific programming for IBM 360-30 or -40 and expert command of machine language, as well as FORTRAN and COBOL. But beyond this, we're looking for programming personnel who want an out-of-the-ordinary career, one where advancement is as rapid as you are talented.

That's because we're a dynamic, expanding firm backed by the resources of a huge company, and we don't let our people get lost in the shuffle. You get individual recognition, responsibility and the rewards that go with it. The effects of your work are visible, significant and appreciated.

What's more, Link is ideally located right in the heart of the San Francisco Peninsula in Sunnyvale, near Bay and ocean, redwood forest and wine country. It's a truly outstanding environment, with an excellent educational climate (Stanford and Cal) and cultural setting (minutes from San Francisco).

The opportunity is here... the challenge is yours. To see if Link should be programmed into your future, send your confidential resume, including salary history and requirements, to Mr. R. O. F. Nadzam, Employment Manager.

LINK GROUP
**GENERAL
PRECISION
SYSTEMS INC.**

1077 E. Arques Ave., Sunnyvale, California 94086
An Equal Opportunity Employer
A subsidiary of The Singer Company

schools scattered around the country are also beginning to act. I take my hat off to them all, for this is the right direction.

Some institutions of higher learning have done outstandingly well in computer education during the past five to ten years. Case Institute of Technology, among others, offers a very, very excellent course of study in computer science, but for the most part, colleges, universities, and technical institutes that teach computer programming have fairly weak coverage of the subject. As you can see, this whole situation creates quite an educational gap and that's the reason why so many of these private data processing schools have sprung up lately.

The future isn't all that bad, however. Those high schools, colleges, and universities with weak programs in computer education have made great strides in the past couple of years. Strength in their programs looks to be only a year to two years away. This should be good news to both the interested individual and the industry.

The industry will continue to increase the demand for qualified people but, this demand will be met only if the high schools and colleges continue updating and strengthening their computer courses and if, as a result of this, the private computer schools either upgrade or cease to exist.

So, if you were to ask me today, "Just How Good are Private Computer Schools?", I'd have to say, for the most part, not so good. Remember though, there is good and bad in everything and so with enough caution one can separate them and get a good computer education. ■

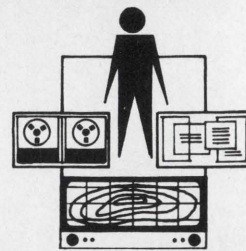
**SAN FRANCISCO
IN DECEMBER**

**SEE RESUME
ON PAGES 6-7-8**

**DATA PROCESSING POSITIONS
IN THE SOUTHWEST**

Contact:
DATA PROCESSING CAREERS
Richard Kemmerly, Suite 1109, Stemmons
Towers West, Dallas, Texas 75207. 214/
637-6360.

Connecticut Careers for



- **PROGRAMMERS**
- **DATA PROCESSING
DESIGN SPECIALISTS**

Now is the time to investigate the stimulating positions immediately available within our rapidly expanding System Center near Hartford and convenient to New Haven. These are truly groundfloor opportunities with a leader in the field of advanced computer technology, and many other sophisticated space-age projects.

DATA PROCESSING DESIGN SPECIALIST—Requires degree and experience with on-line and real-time systems. Formulate system concepts, design and execute systems for information retrieval, communications switching, and graphics. Experience in quantitative comparative evaluation of alternative system designs and in preparation of technical proposals and report writing is desirable.

PROGRAMMERS—Requires degree and experience with large, medium, or small scale computer information systems applications based on random access techniques. Emphasis on assembly language programming, use of real-time direct inquiry software, the creation and check out of operating systems and compilers and the production of automated graphics.

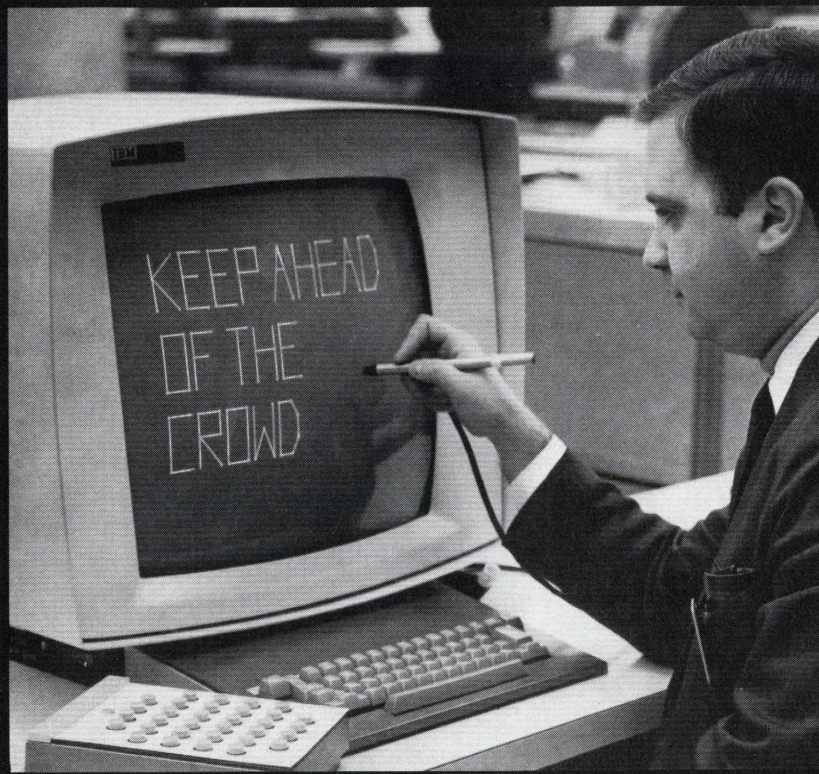
TO INTERVIEW, please forward your resume, stating present salary, to Mr. R. S. Wellington, Personnel Dept., Hamilton Standard, Windsor Locks, Conn. 06096.

An Equal Opportunity Employer

Hamilton Standard

**U
A®**
DIVISION OF UNITED AIRCRAFT CORP.

SOFTWARE AGE



... in our

SCIENTIFIC & COMMERCIAL COMPUTER-BASED ANALYSIS & DESIGN SYSTEMS

You can. You'll like what you see at Sikorsky Aircraft—a company dedicated to producing the most advanced VTOL airborne and surfaceborne transportation systems.

And you'll like working with a select group of stimulating, top-talent people . . . on abundant and provocative challenges. You would be applying your professional talents to specifying, designing and implementing advanced computer-based technical and commercial systems.

Our current equipment includes Univac 1108's and IBM 360's with Graphics and Teleprocessing.

Current and planned applications include—

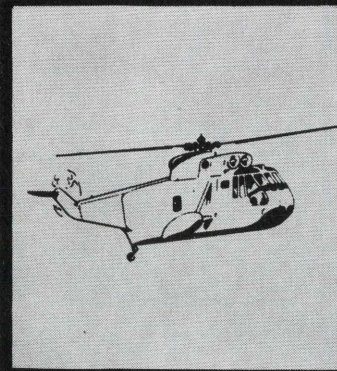
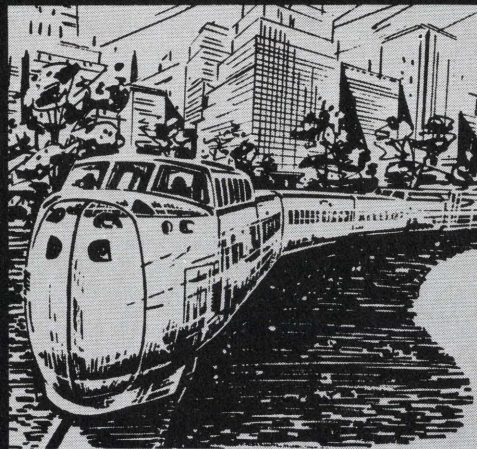
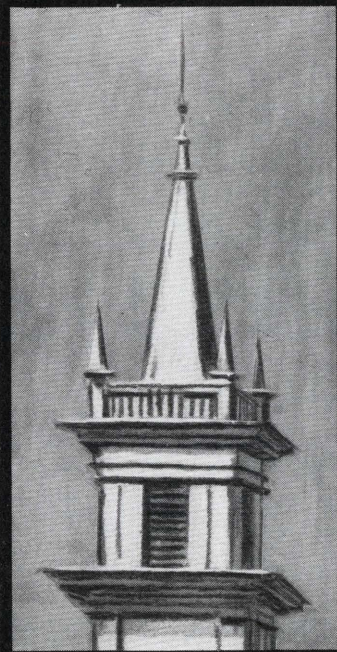
Scientific: Man/Machine Interactive Graphics in Engineering Analysis and Design.

Development of Batch Programs and Systems in all engineering disciplines.

Commercial: Data Base and Real Time applications in Accounting, Manufacturing, Purchasing, Inventory Control and other related areas.

We have exceptional assignments at all levels of experience for:

**COMPUTER SYSTEMS
PROGRAMMERS AND ANALYSTS
FOR BOTH COMMERCIAL
AND SCIENTIFIC FIELDS**



Sikorsky Aircraft



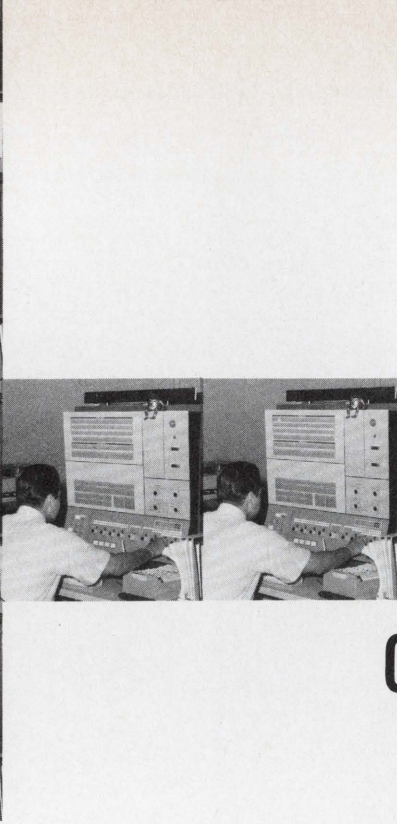
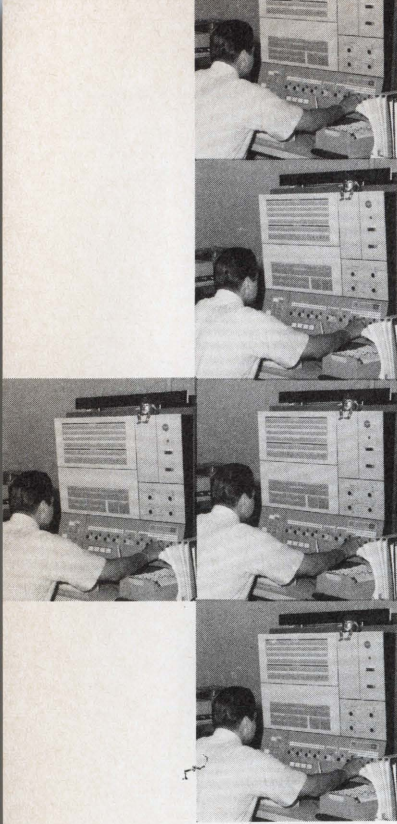
DIVISION OF UNITED AIRCRAFT CORPORATION

STRATFORD, CONNECTICUT

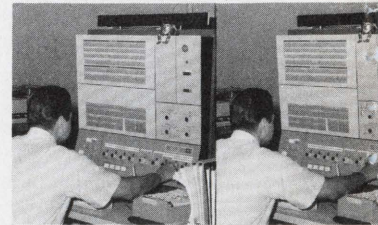
An Equal Opportunity Employer

You and your family will find the unique cultural and recreational advantages of pleasant Connecticut to be abundantly satisfying. And our interest in your continuing professional development is exemplified by our corporation-financed Graduate Education Programs. They are available at these fully accredited schools: Bridgeport • Brooklyn Poly • CCNY • Columbia • Connecticut • NYU • Rensselaer (Hartford Grad. Center) • Stevens • Trinity • Yale.

Send your resume in confidence, stating salary requirements, to Mr. Leo J. Shalvoy, Professional Employment—or—deposit your resume in our lock box at the Software Age Resume Center in San Francisco during the FJCC.



MIDDLE MANAGEMENT SEMINARS SOLVE



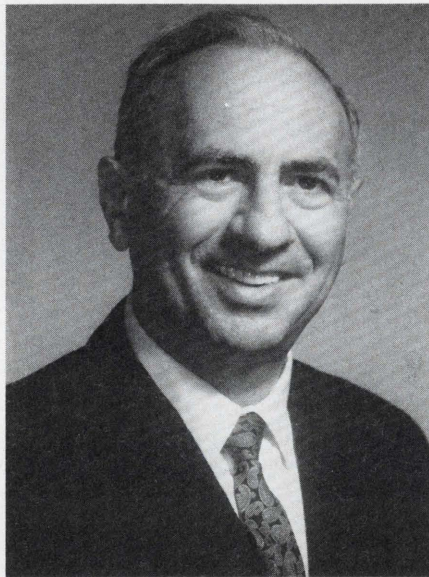
COMMUNICATION PROBLEMS

■ The communication barrier that exists between middle management and data processing personnel is one of the greatest problems in today's modern business world.

This barrier is responsible for such problems as duplication of large amounts of data processing work, wasted efforts among key employees, failure to find more uses and techniques to develop applications for a computer and a hesitancy among management personnel to approach data processing personnel about potential projects.

Charron-Williams College in Miami, Florida found that many companies are aware of this communication gap but are not taking the proper steps to teach management personnel about the operation of data processing systems.

Realizing the need for management to have an understanding of the computer and its programming, the college organized a data processing course for management. The course is designed to give management an overview of Data Processing Procedures. Lectures include principles of flow charting, studies in computer hardware, system analysis, concepts of computer programs, programming languages and case studies of computer applications.



Mr. Irving Goldstein has been President of Charron-Williams College for 19 years. He has simultaneously served as President of the Florida School of Medical Technology in Miami. On the Board of Directors of the Business University of Tampa and the Tampa Technical Institute—he is president of the Florida Association of Private Schools and is a board member of many national school associations as well as civic and fraternal organizations. Since his graduation from Columbia University, he has been involved in private school education for the past 25 years.

Charron-Williams, which is the oldest and largest business college in South Florida, having been founded in 1940, is not a newcomer to the field of data processing. The college has been offering courses in data processing for nearly 10 years. Graduates of the courses are qualified to write computer programs. Approximately 100 students a year complete this program and are placed in various companies.

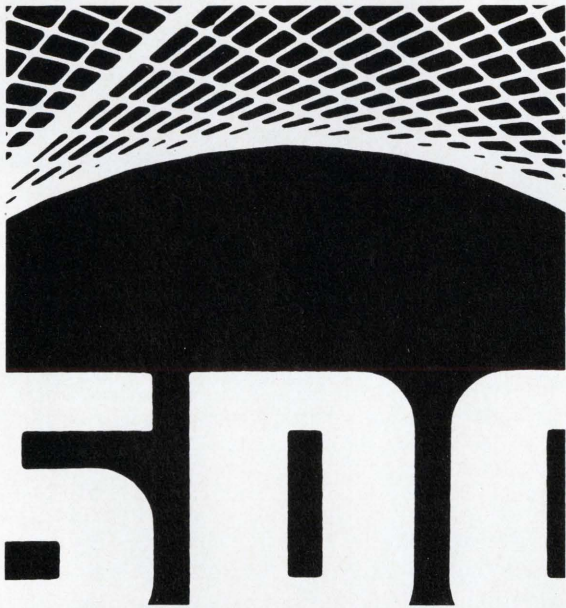
It was from a number of graduates that officials at Charron-Williams received reports about the lack of communication between management and data processing personnel.

What are computerized companies doing to break down this communication barrier?

"Companies aren't sure where to turn for the basic training required," according to George Gjertsen, Data Processing Director at Charron-Williams. "They generally seek the training from one of four areas—the computer manufacturer, the manager of data processing at the company, the company training staff or a qualified person in the company's data processing department.

"Experience has indicated, however, that there are problems blocking effective training in all of these areas."

Now look into the newest software company around.



You think you know all about us? Well, take another look – now.

New things happening around here could affect your career – for the better.

For instance, our new Commercial Systems division is applying our years of know-how in large-scale systems and software to the urgent needs of business and industry.

In defense and space, we're working on the frontiers of technology. In satellite control. On new languages for space-borne computers. Systems integration. Command and control.

For these jobs, we need competitive professionals who want a turned-on atmosphere and a wide-open opportunity. If that's you, better look into the *newest* software company around.

That's us. SDC.

SPACE & SATELLITES

Feasibility studies and software specifications for both military and civilian programs:

- Range and Satellite Support Data Systems
- Telemetry Computer Program Integration
- Orbit Determination
- Real-Time Control of Space Network Operations
- Space Programming Languages and Compilers

COMMAND & CONTROL

- Advanced Studies and Simulation
- System Analysis and Engineering
- Software System Design
- Implementation and Testing

INFORMATION MANAGEMENT SYSTEMS

- Basic Operating Systems
- General-Purpose Data Management
- Statistical Processing and Analysis
- Time-Shared Data Management Systems

SOFTWARE DEVELOPMENT

- Data Base Systems
- Executive/Operating Systems, especially time-shared executive systems
- Advanced Research in Computer Technology

System Development Corporation



Send your resume to Roger De Bruno, 2400 Colorado Avenue, Santa Monica, Calif. 90406.
Or – at the FJCC – put a resume in the SDC lock box, Resume Center, St. Francis Hotel.

PROGRAMMERS

BOLD CHALLENGES IN DATA PROCESSING!

The name of the game is "Do a better job—faster!" We play it all the time at the Army & Air Force Exchange Service—the civilian organization which serves Armed Forces personnel through "PX" and "BX" outlets—where we seek more and better EDP information to improve our performance in retailing!

If you enjoy a challenge and the opportunity to show what you can do with excellent equipment and professional associates, your route to success may be with us! We need:

COMPUTER PROGRAMMERS

- Hawaii
- Japan
- Europe
- United States

You'd be writing specific programs to organize and process our management information by the most rapid and meaningful methods.

Our EDP division is fully equipped with 360 MOD 20/30/40 Disk/Tape/Card systems using ALC or COBOL, and staffed with real professionals who know how to use them!

\$9,000—\$10,000

Your starting salary will depend on how much you have of the following: (1) a degree in computer science or its equivalent, plus (2) three to five years' experience in programming.

In addition to a good starting salary, you'll receive outstanding fringe benefits, including life insurance, family coverage in our hospital—medical—surgical plan, liberal vacations, sick leave, retirement programs, and opportunity for travel, advancement and promotion throughout our worldwide retailing network.

Relocation expenses will be paid.

If you qualify, AIRMAIL your resume, which MUST INCLUDE SALARIES EARNED, to:

Mr. M. W. Carter
DEPT. 11-SA

(Be sure to specify if you'd like to talk about an assignment in one of our centers overseas!)

**ARMY & AIR FORCE
EXCHANGE SERVICE
3911 Walton Walker Blvd.
Dallas, Texas 75222**

(You will be contacted within
two weeks.)

Equal Opportunity Employer

Gjertsen pointed out these various problems and explained why management personnel cannot be properly trained in the basic concepts of data processing by employing any of the four methods.

1. The computer manufacturer conducts periodic seminars, but they are usually held in another city from the company that is interested in training. The classes are formal and extremely large, which discourages questions from class members. There also is an inclination to use data processing terms without first defining them. The material is presented in a form that most non-data processing personnel are unable to comprehend.

2. The data processing manager at a company often will provide more confusion than training for management personnel. He has the tendency to speak the language that he knows and lives and uses such terms as "asynchronous processing, bytes, bits and something he calls an interrupt system." He also is involved with many complex problems since his department is the hub supporting the flow of data throughout the company. He is usually too busy and preoccupied to conduct training sessions for management.

3. Using a qualified person from the data processing department usually results in creating problems within his department. As one of the key persons involved in operating the computer, his absence from the department would prevent the company from realizing the maximum utility of its computer.

4. The training staff within an organization is not equipped to teach data processing because the subject matter requires someone who is well-grounded through experience to answer questions that arise.

Gjertsen said another alternative open to a company is to employ a man with teaching experience and a thorough data processing background for the training of management personnel.

"The main objection to this method," he explained, "is that the company must increase its payroll. It also means that a company's com-

EDP

- Programmers
- Analysts
- D. P. Management

CLIENT
COMPANIES
ASSUME
OUR FEE

Fast,
Efficient,
confidential
service to
individuals
seeking new
positions in
the field
of data
processing.
Call, write
or visit one
of our
offices.
Data
Processing
Placement
since 1959.

**Computer Personnel
Agency, Inc.**

LORNE EVJE

12 Geary Street
San Francisco, Calif. 94108
Phone: 982-0840

NATIONWIDE DATA PROCESSING
OPPORTUNITIES



CAREER MEMO

To the Computer Professional

Does your present position lack pride of accomplishment? . . . If so, it is time for a change. Professional Opportunities presently exist in:

SOFTWARE DEVELOPMENT
SYSTEMS DESIGN
PROGRAMMING
REAL TIME SYSTEMS
TIME SHARING
MANA. INFO SYSTEMS
ENGINEERING
MATHEMATICS
OPERATIONS RESEARCH

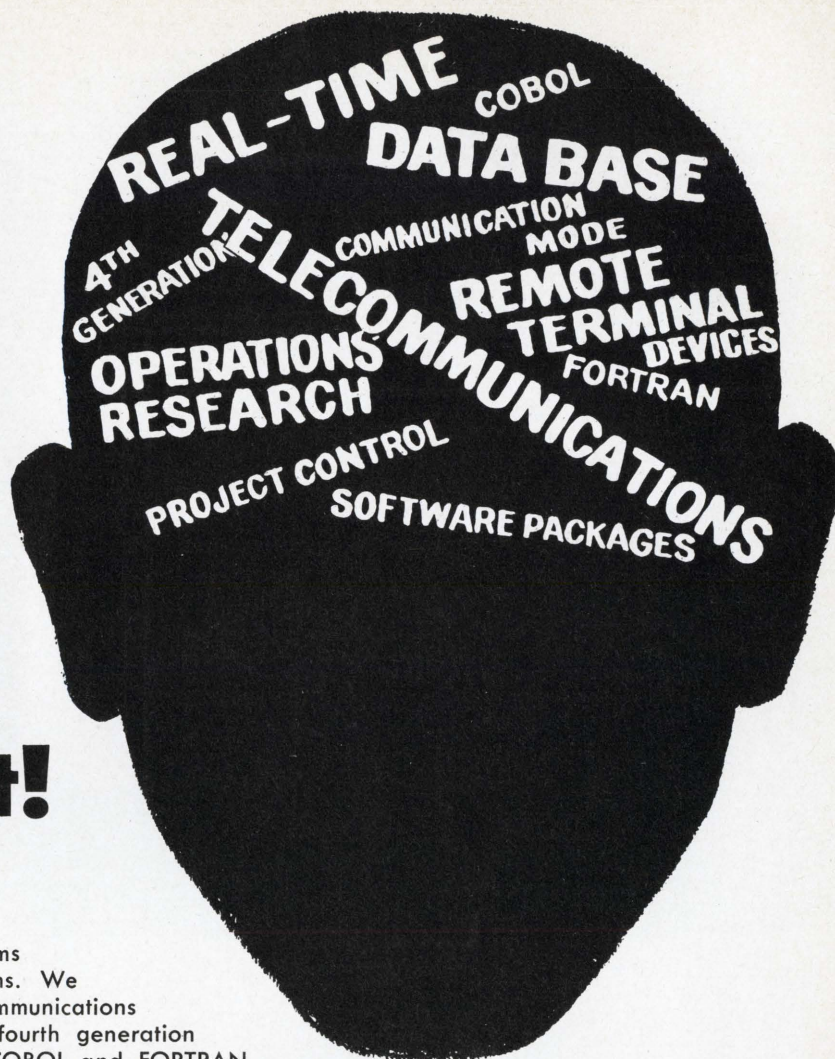
Your confidential inquiry is welcome.
Call or write, R. L. Kailhulte or Donald Wayne,

EVERETT KELLEY ASSOCIATES, INC.
Suite 1300—121 S. Broad St.
Philadelphia, Pa. 19107
215—KI 6-5240

Placement of Computer Professionals
since BINAC.



**You have it . . .
We need it . . .
Now use it!**



THE EQUIPMENT

We currently have the IBM 360 Systems and the Honeywell 200 Series Systems. We are planning for Real-Time and Telecommunications using IBM and Honeywell third and fourth generation systems. The languages utilized are COBOL and FORTRAN.

THE POSITIONS

LEAD PROGRAMMERS

Highly skilled individual with a minimum of 5 to 8 years experience as systems programmers.

SYSTEM PROGRAMMERS

Qualified individuals with a minimum of 3 to 5 years experience as senior programmer.

SENIOR PROGRAMMERS

Knowledgeable, self-starting individuals with a minimum of 2 to 3 years programming experience.

THE COMPANY:

DYNAMIC, one word that describes our present and future. Growth is responsible for these positions, and will be responsible for your advancement into a broader scope of responsibility and authority.

Our salaries, fringe benefit programs, retirement plan and brand new offices make us more than desirable—WE'RE IRRESISTABLE.

Please send your own resume, OR send the enclosed mail-in resume, OR fill out the enclosed resume and drop it into our box at the SOFTWARE AGE Resume Center in the St. Francis Hotel, The Italian Room.

Whichever you decide to do WE EXPECT TO HEAR FROM YOU!



® Registered service marks of the American Hospital Association
® Registered service marks of the National Association of Blue Shield Plans

Mr. L. F. Krizka
425 North Michigan Avenue
Chicago, Illinois 60611

an equal opportunity employer



Analog/Hybrid Applications Engineers:

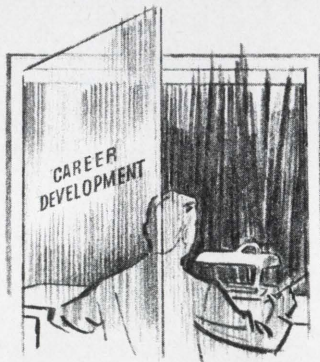
Help build a revolution.

Now in preliminary design, the Lockheed 500—a commercial derivative of the C-5—will revolutionize air cargo. A new family of airfreighters will follow. Additional Lockheed programs include the C-5, VTOL design, a new intra-theater airlifter, and nuclear application research.

□ Analog/Hybrid Applications Engineers are needed for these and other long-range programs. Requirements: a degree in

mathematics, physics, or electrical engineering; plus experience in analog/digital computer applications in flight simulations, controls and/or dynamics. □ Help build the air cargo revolution. Send your resume to: Mr. U. D. McDonald, Employment Manager, Dept. SA-11, Lockheed-Georgia Company, 2363 Kingston Court., S.E., Marietta, Georgia 30060. Lockheed is an equal opportunity employer.

Airlift Center of the World
LOCKHEED-GEORGIA
A Division of Lockheed Aircraft Corporation



what's a nice guy like E. B. Schultz doing in a place like this?

In his formative years, "E. B." had a four square job as Employment Manager for one of the biggest computer builders in the world. His name became synonymous with integrity, reliability, and mild-manneredness. Now he's VP in charge of "Career Development" at DMS, and some eyebrows have been raised. True, this is a euphemism for plain old head-hunting . . . but this is also the same old E. B. Schultz: low key, low pressure, dealing in low volume placement of strictly high level personnel. He's made for the job, because at DMS head-hunting is sort of a top-level sideline . . . a little something extra in the basic EDP package* we provide for our company clients. So when E. B. has an opening, you can be sure it's something very special. If you're also very special as an applications or systems programmer, systems analyst, or salesman, E. B. Schultz can put you on to the rare kind of job nobody else ever hears about. Send a resume or pick up the phone. (215) KI 6-0901

*Research and Planning, Educational Programs, Programming Services, Equipment Acquisition



DATA MANAGEMENT SERVICES, INC.

CORPORATE OFFICES: 1515 LOCUST STREET, PHILADELPHIA, PENNSYLVANIA 19102
NORTHEAST REGIONAL OFFICE: 31 LEWIS STREET, HARTFORD, CONNECTICUT 06103

puter equipment would become tied up if it were used for demonstration purposes in the teaching of management personnel."

He feels that the unique program Charron-Williams College has initiated is proving to be the most effective method of eliminating the communication gap between middle management and data processing personnel. The college has developed an approach to informal management training that is both inexpensive and complete for a participating company.

Gjertsen conducts the data processing seminar at Charron-Williams on a one day a week basis covering a 16-week period. Each session, which runs three hours, covers a specific phase of data processing from the structure of the punch card code through accounting controls, principles of unit record systems and computers.

Sessions are held in the college's computer room which contains IBM unit record equipment and an IBM 360 computer used for demonstrations.

Gjertsen, who has a thorough background in data processing, uses the feedback approach to teaching. Participants in the seminar, which is limited to 20 persons, are encouraged to ask questions as the material is presented during the lectures. This gives management personnel the opportunity to fully understand each point as it is covered. Before any terminology is used, Gjertsen presents a complete definition of it. Sessions are conducted around a conference table, and the students work simple problems together to illustrate principles covered in the lectures.

Management personnel enrolled in this first seminar offered by the college began to generate ideas for application to the data processing systems in their companies by the time the course was half-completed. Twelve of the participants in this initial seminar are supervisors of their respective departments at Pan American Airways in Miami. The departments they represent are supply, engineering, production control, quality assurance, production and accounting.

"We're looking for this course to bring certain management people up to a level of understanding that will enable them to make better use of

THE 4TH GENERATION IS ON ITS WAY!

(are you?)

Systems software for the fourth generation has been under development at CUC for over two years.

If you are an Operating Systems Specialist, you should investigate joining the fourth generation.

CUC has immediate, challenging openings in:

- MONITORS
 - Batch
 - Multi-Programming
 - Time Sharing
- I/O CONTROL
- GRAPHICS
- FILE AND DATA MANAGEMENT
- LOADERS & EDITORS
- ASSEMBLERS
- COMPILERS
- DIAGNOSTICS

All in the fourth generation.

We are moving ahead with the fourth generation! Join us. Top salary, benefits, promotion, opportunity.

If you are at the F.J.C.C. drop your resume at the Software Age Resume Center—St. Francis Hotel. Otherwise call or send resume to:

Len Lawrence
Computer Usage Company, Inc.
344 Main Street
Mt. Kisco, New York 10549
914/666-6741

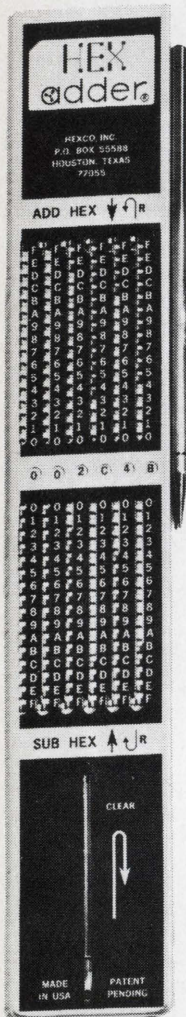


Equal Opportunity Employer

IBM / 360 PROGRAMMERS

without 16 fingers ?

A pocket Hexadecimal calculator is now available for programmers of IBM/360 and many other 3rd generation computers.



HEXADECIMAL CALCULATIONS ARE:

- becoming necessary for most 3rd generation programmers.
- difficult to perform under present manual methods.

HEXADECIMAL ERRORS ARE:

- costly in computer and programmer time.
- delaying the debugging of new programs.

The Hexadder is an all-aluminum, pocket-sized, precision calculator for adding and subtracting six-digit hexadecimals in seconds with 100% accuracy. \$15.00 each for prepaid orders.

HEXCO, INC.

P. O. BOX 5588
HOUSTON, TEXAS 77055

For more information, circle No. 14
on the Reader Service Card

the data processing department," according to John Stearns, supervisor of research and development, maintenance administration, for Pan American in Miami. "When they have this understanding, they will be able to derive the full advantages from data processing.

"We want to continue an education program along this line to break down the communication barrier between management and data processing. In speaking to a programmer, you have to be able to explain what you want."

Stearns said that it is essential for management to learn how to use the data processing department effectively in order to make the best possible improvements in the function of a company.

"The most important points that management should understand are the types of jobs that can be done on a computer, the costs involved in using a computer, the time element of developing a system to be used on a computer and a complete understanding of what a system is," he said.

Richard Howell, data processing manager at Pan American in Miami, said that he has already observed some results from the seminar at Charron-Williams.

"They are beginning to understand why certain projects cannot be done feasibly by electronic data processing," he said. "Before they started the course, most of them couldn't even talk about a job that they wanted.

"This course seems to be giving them an idea of what we are doing and a chance to talk our language. I am now able to pin them down better on what kind of job they want to have us do in data processing."

The following are comments from some of the Pan American employees taking the course at Charron-Williams.

William A. Snider, supervisor of inventory control: "I've been able to learn what the limits and capabilities of data processing are, and this helps me to communicate with the manager of data processing in a logical manner. The course has helped me to ask more intelligent questions. It's an excellent course because it starts with the basics and then moves up. Before you can understand computers, you have to learn the background."

programmers • analysts

GROW

NATIONWIDE POSITIONS
FROM \$7,000 TO \$25,000
ALL FEE PAID

- SOFTWARE DEVELOPMENT
- SCIENTIFIC PROGRAMMING
- REAL TIMES SYSTEMS
- BUSINESS SYSTEMS
- COMMERCIAL PROGRAMMING
- MANAGEMENT INFO SYSTEMS

Send resume, in confidence, with present salary and geographic preference.

FREE: CAREER OPPORTUNITIES BULLETIN

For a complete listing of outstanding positions with national companies circle subscriber reader card using home address only. No obligation.

La Salle Associates

DEPT. A.

2136 LOCUST STREET, PHILA., PA. 19103

For more information, circle No. 16
on the Reader Service Card

STORED BUT NOT RETRIEVED?

If you think your resume has been lost in the memory banks, it's time to talk to Taurus. Taurus Associates utilizes the latest information storage retrieval techniques to assist its trained personnel counselors in finding the position and the salary to match your technical and managerial skills. Your resume will receive prompt, professional handling, and you pay no fee.

- Specialists in software design
- Information storage and retrieval
- Real-time application
- Operations research
- Urban planning
- Econometrics
- Behavioral sciences

Write Alan S. Linden, Vice President,
or Call Collect 703/548-2103.

TAURUS ASSOCIATES

110 N. Royal Street
Alexandria, Virginia 22314

An Equal Opportunity Employer



General Electric is making computer power as universal as electric power

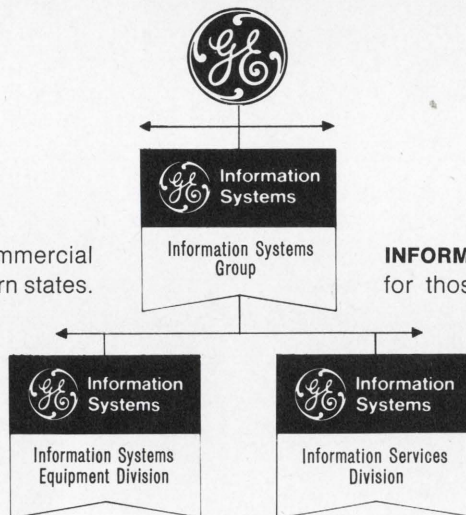
Meet two of the Divisions that are doing it.

Three years ago we installed our first commercial time-sharing GE-265. It served 11 western states. Two years ago international T/S possibilities were demonstrated by linking Cleveland, Oklahoma City and New York with France via Early Bird Satellite. Last year GE T/S services were used by 50,000 individuals, most of whom had never before used a computer.

Now, GE T/S services are the most widely used in the nation. They put computer power within reach of 85% of American industry.

Such leadership didn't just happen. It was the planned result of providing a creative environment for our scientists, engineers, software & programming specialists, and systems analysts; of investing in cooperative undertakings with imaginative partners such as Dartmouth and M.I.T.; of bringing to the total effort the unmatched experience of using, daily, some 250 computers in our Company-wide operations.

If making computer power as universal as electric power is your kind of goal then General Electric can be your kind of company. You'll find exceptional careers in Information Systems at both of these divisions:



INFORMATION SYSTEMS EQUIPMENT DIVISION— for those whose interests and training lean to hardware systems...their analysis, synthesis, design, development, production and general application; or to basic software and its design and development as in operating systems, compilers, assemblers, other automatic programming aids.

■ Send your resume and salary history (in strict confidence) to: G. Callender, General Electric Co., Information Systems Equipment Division, Sect. 164-L, 13430 N. Black Canyon Highway, Phoenix, Arizona 85029.

INFORMATION SERVICES DIVISION—for those whose interests and training lead to selling computer time-sharing to a wide range of users through demonstrating T/S capacity to solve customer problems; proliferating the use of T/S with existing customers by showing the ever-expanding applications of T/S computer power. There are openings in major cities across the U.S.

■ Send your resume and salary history (in strict confidence) to: F. W. Gibbins, Manager, Personnel Practices, General Electric Co., Information Service Department, Sect. 164-L, 7735 Old Georgetown Road, Bethesda, Maryland 20014. We are an equal opportunity employer M/F.

GENERAL  ELECTRIC

What do you want most?

- | | |
|--------------------------------------|-----------------------------------|
| <input type="checkbox"/> Respect | <input type="checkbox"/> Title |
| <input type="checkbox"/> Money | <input type="checkbox"/> Location |
| <input type="checkbox"/> Challenge | <input type="checkbox"/> Security |
| <input type="checkbox"/> Opportunity | <input type="checkbox"/> Fringes |

Our nationwide survey in the Financial & EDP field revealed that employment desires were in the order listed above.

We can assist in finding exactly what you want in Financial or EDP employment. That's all we handle... we're the largest specialized source.

Fees Paid By Management

E.D.P. MARKETING REP. -----	\$25,000
Knl. Software/Hardware Services	
SENIOR O/R ANALYST -----	25,000
Hvy. Programming/Modeling	
MGR. COMPUTER SOFTWARE -----	24,000
Scientific & Engineering Applic.	
SR. DATA PROC. CONSULTANT ---	20,000
Major Consulting Firm	
SR. PROGRAMMER -----	20,000
Giant T/S R/T System	
SYSTEMS COORDINATOR -----	18,000
Hvy. Brokerage, Invest. Banking	
DIR. INFORMATION SYSTEMS -----	18,000
Successful Conversion Experience	
MGR. OF PROGRAMMING -----	18,000
Knl. 1400 + 360	
DIRECTOR COMPUTER SERVICES ---	16,000
Strong O/R, Mgmt. Sciences	
MGR. COMPUTER OPERATIONS ---	16,000
Multi-System Installation	
PROGRAMMERS—Real Time -----	16,000
Hawaii or Domestic	
SR. SYSTEMS ANALYST -----	15,000
Experienced 3rd Generation	
E.D.P. MARKETING/SYSTEMS -----	15,000
Major Computer Manufacturer	
CORPORATE CONSULTANT -----	14,500
Multi Div. Mfg. Co.	
FORTRAN PROGRAMMER -----	14,000
Sci. or Commercial Exp.	
MGR. SYSTEMS PROCEDURES -----	14,000
Mfg./Acct. Applications	
PROGRAMMERS -----	13,000
COBOL/BAL or PL 1	
METHODS ANALYST -----	11,500
Manual Sys., Forms, Procedures	
SCIENTIFIC PROGRAMMER -----	11,000
Major Research Corporation	
COMPUTER OPERATIONS MGR. ---	11,000
Strong Administrator, any hdw.	

Mail resume to your nearest R-H office.



Atlanta: 235 Peachtree St., NE	(404) 668-2300
Baltimore: One Charles Center	(310) 837-0313
Boston: 140 Federal St.	(617) 423-6440
Chicago: 333 N. Michigan Ave.	(312) 782-6930
Cincinnati: 606 Terrace Hilton	(513) 621-7711
Cleveland: 1367 East 6th St.	(216) 621-0670
Dallas: 1170 Hartford Bldg.	(214) 742-9171
Detroit: 1114 Guardian Bldg.	(313) 961-5430
Garden City, N.Y.: 585 Stewart Ave.	(516) 248-1234
Los Angeles: 3600 Wilshire Blvd.	(213) 381-7974
Miami: 1107 Northeast Airlines Bldg.	(305) 377-8728
New York: 330 Madison Ave.	(212) 986-1300
Newark: 570 Broad St.	(201) 623-3661
Philadelphia: 2 Penn Center	(215) 568-4580
Pittsburgh: 429 Forbes Ave.	(412) 471-5946
Portland, Ore: 610 S.W. Alder St.	(503) 222-9778
St. Louis: 1015 Locust St.	(314) 231-0114
San Francisco: 111 Pine St.	(415) 434-1900
Stamford, Conn: One Atlantic St.	(203) 325-4158

World's Largest Financial & EDP Personnel Specialists.

John D. Mosure, supervisor of production personnel administration: "In addition to giving us an understanding of what data processing is all about, we are also learning what problems there are in that area.

"I used to have the tendency to think that data processing could handle everything that came up. You can save a lot of time and tribulation when you have a knowledge and understanding of just what they can and can't do. It helps all of us to work faster and more effectively."

Irving Goldstein, president of Charron-Williams, said that the college has been receiving inquiries from both large and small companies in regard to the data processing seminar.

"The number of inquiries indicates that companies are aware and concerned about the lack of communication between middle management and data processing personnel," Goldstein said. "We feel that the program we have developed will be filling a great need in this area."

PROGRAMMERS

Senior Programmers and Systems Analysts Need Not Apply—We Promote from Within

Broad range of assignments in: sales and production forecasting, order processing, inventory control and cost accounting.

Will prepare you for advanced responsibilities in: correlation analysis, standard, deviation, skewness and kurtosis problems and engineering and business model simulation projects.

Bachelor's degree, 1-3 years programming experience preferred. Knowledge of assembly language helpful.

Staley is among the world's largest processors of corn, soybeans and chemicals, supplying more than 600 products for industrial and consumer markets. We're headquartered in Decatur, Illinois, a fresh-air family community in central Illinois, less than 3 hours from Chicago.

Excellent starting salary and substantial benefits. Submit complete resume in confidence to:

WILLIAM J. SCHOETTE
Recruiting Supervisor



A. E. STALEY
MANUFACTURING CO.

P. O. Box 151
Decatur, Illinois 62525

An Equal Opportunity Employer



RSVP SERVICES

EMPLOYMENT AGENCY

FOR

COMPUTER

PROFESSIONALS

Serving

● PHILADELPHIA

● NEW JERSEY

● NEW YORK

METROPOLITAN AREA

Experienced Programmers and Analysts from these areas may call collect anytime (24-hour answering service)

N. J. (609) 667-4488
Phila. (215) 922-3993

OR SEND RESUME TO

HOWARD LEVIN

Director

RSVP SERVICES

Suite 714

One Cherry Hill Mall

Cherry Hill, N. J.

08034

RECRUITMENT • SELECTION • VOCATIONAL TRAINING
PLACEMENT FOR COMPUTER ORIENTED COMPANIES

PROGRAMMERS SYSTEMS ANALYSTS

Nationwide

With the installation and implementation of our unique National Marketing Analysis System (NMAS), Input, Inc. is now able to bring the nation's complex and ever-changing computer community into remarkable focus. Through the mass of exclusive information available to us through NMAS and by employing an innovative "search and solve" technique, our staff of trained consultants can lock in on the myriad complexities of your specific career requirements with an accuracy unparalleled in the field.

Fields covered include digital hardware design, systems analysis and programming of software, management information systems, and a variety of sophisticated scientific and commercial applications. We welcome your inquiries. Contact Mr. Lincoln Bouve or Mr. William Caine at 202/298-7510 for additional information or submit resume in confidence. Client companies assume all fees.

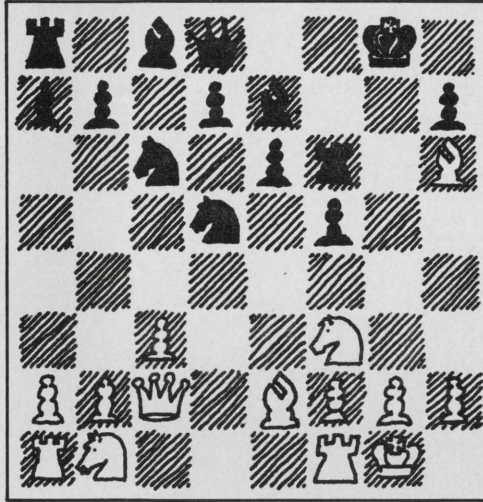
input, inc.

815 connecticut avenue, n.w.
washington, d.c. 20006

e.o.e./mf

suite 1200

Sicilian Defense— White resigns in 21 moves.



(At Auerbach, this is just a doodle.)

Planning chess strategy can be a rigorous intellectual exercise. At AUERBACH it's a coffee break caprice. We've gained our reputation for checkmates in the most complex areas of information science, computer programming, consultation and technology.

A move in the wrong direction can easily compound a problem. That's why, in a decade of growth, AUERBACH has gained international proportions, making the right moves for commerce, government and industry the world over. With new offices in Palo Alto and St. Louis complementing established facilities in Philadelphia, New York, Boston, Washington and Amsterdam, Holland, AUERBACH's dynamic growth can become your growth . . . your future.

As a leader in information science and technology, AUERBACH offers unlimited opportunities to creative and capable problem solvers.

Consider these outstanding openings:

**BUSINESS SYSTEMS
CONSULTING
I S & R CONSULTING
PRODUCT & MARKET
PLANNING
SYSTEMS PROGRAMMING
SYSTEMS ENGINEERING
SYSTEMS AND CONVERSION
PLANNING
SYSTEMS & EQUIPMENT
REQUIREMENTS ANALYSIS
MANAGEMENT ANALYSIS,
PLANNING AND CONTROL
SOCIAL INFORMATION
SERVICES
COMMUNICATIONS
CONSULTING IN A BUSINESS
ENVIRONMENT
SOFTWARE & HARDWARE
REFERENCE SERVICES**

If your background is in data processing, systems engineering, product and market planning, management science, operations research, finance, statistics, transportation, urban planning, the physical or social sciences; if you are conversant with current information science and technology, then opt for innovation, challenge and growth. Make your move now. Investigate these and other exceptional opportunities. Visit AUERBACH at Fall Joint Computer Conference (or leave your resume at the *Software Age* resume center). Or write to Mr. B. A. Garner, AUERBACH Corporations, 121 N. Broad Street, Philadelphia, Pa. 19107. Your inquiry will be held in the strictest confidence. And your reply will be prompt. We are an equal opportunity employer.



PHILADELPHIA / WASHINGTON / NEW YORK / BOSTON / ST. LOUIS / CALIFORNIA / AMSTERDAM

AN AUTOMATIC TEST SYSTEM BASED UPON PATTERN RECOGNITION DISPLAYS

FIGURE 1

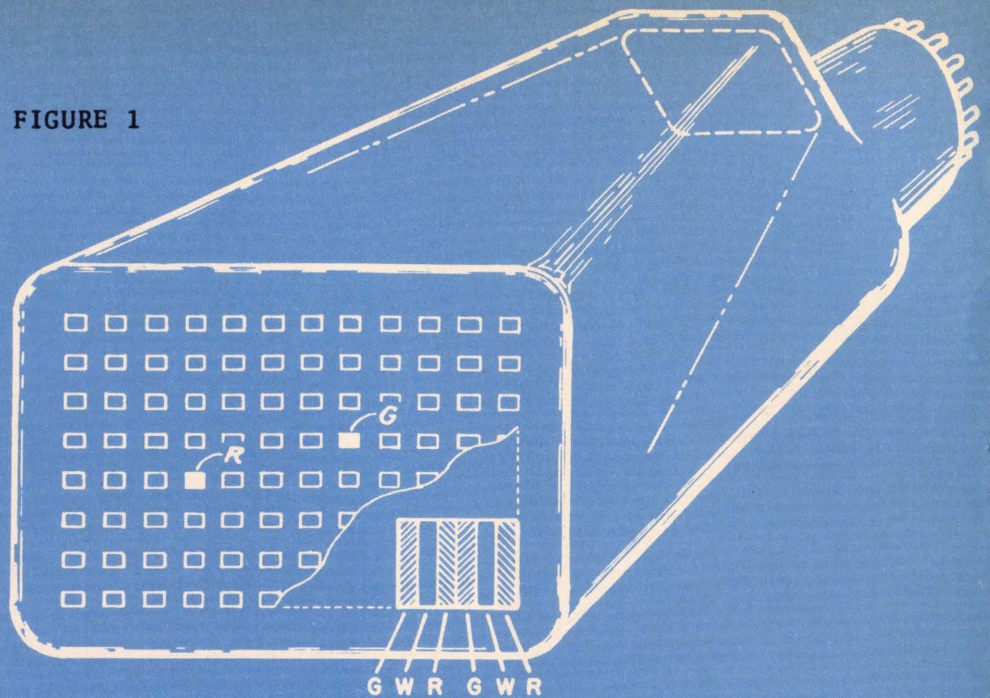


Fig. 1. A matrix of 8 X 12 or 96 data points is presented in real-time on a color cathode ray tube. One of the data points registers a high value and therefore appears in red; another data point registers a low value and appears in green. The other 94 points are within tolerance and therefore appear white. The sketch in the corner shows in greater detail the vertical line structure of the target screen on which the colors are produced for the different data points. An optical port is shown at the rear of the CRT envelope where a camera may be positioned for taking color photographs of the rear of the target screen.

David M. Goodman
New York University

ABSTRACT: Employing a large number of optical and electrical input signals, an automatic test system is proposed which rapidly samples a plurality of test data from an operating ensemble and which then displays the data block format so that interpretation is made on the basis of pattern recognition. The display is via a cathode ray tube which is operated in a TV mode so that the displayed test data can be continuously and rapidly up-dated. By means of rear ports in the cathode ray tube it is shown how failure patterns can be recorded on film and preserved to make the test system self-programming, thereby overcoming one of the major obstacles in presently conceived automatic test systems.

I. Introduction

The techniques of automation have been employed by the electronics industry at an ever increasing rate, beginning in the early 1950's. These techniques have been used with varying degrees of success to solve the information handling problem in command and control, missile launch, surveillance, and fire control systems to name a few. These techniques have also been applied in an attempt to provide adequate maintenance for these types of systems. The nature of these prior efforts is well documented.*

A new test technique described in Volume II of these lecture notes, makes use of optical fibres for transmitting test data in optical form; a vidicon for scanning the optical test data; and a cathode ray tube for displaying in real-time the results of test. Presented herein are proposed test systems which take advantage of and are in accordance with this advanced technique. The first arrangement pertains to an electronic assembly containing 96 test points. The data from these test points is displayed for analysis in such a manner that a fault anywhere in the assembly is detected and pinpointed at a single glance.

* "Automation In Electronic Equipment," N.Y.U. Press, 32 Washington Place, New York, New York 10003.

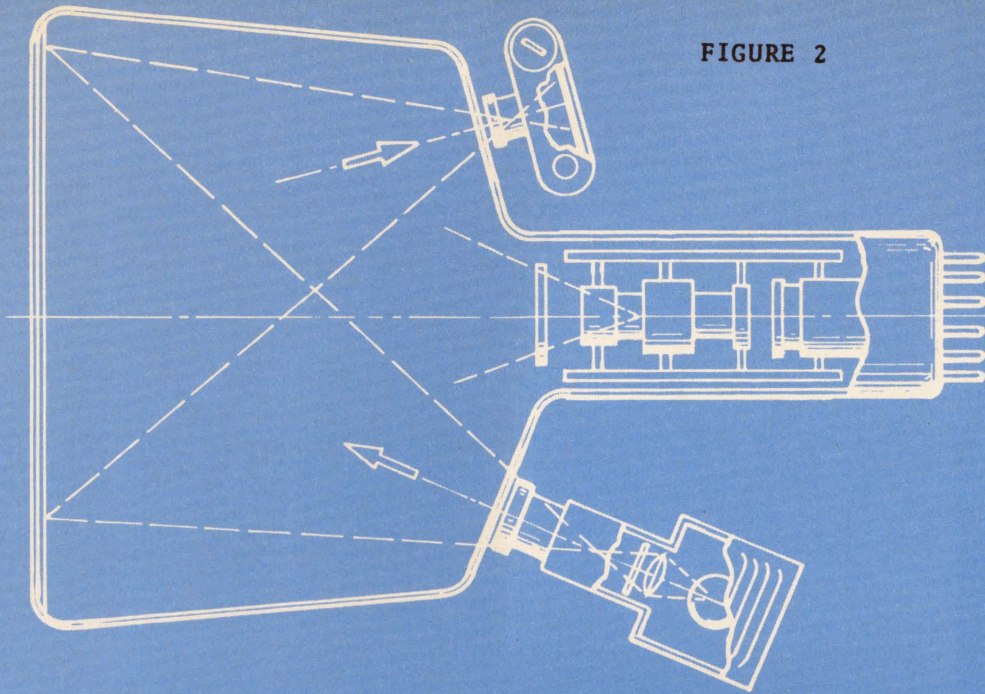


FIGURE 2

Fig. 2. A sectional view of a cathode ray tube with two separate optical ports provided at the rear of the tube envelope. Adjacent the upper port is a camera for taking pictures of the rear of the target screen. Adjacent the lower port is an optical projector for casting an image on the target screen. The projected image is viewed from the front of the CRT. And for this purpose, the target screen is made translucent.

The test system then is expanded so that a larger collection of test data can be displayed, stored, and interpreted.

Accordingly, it is an object of this test system

- (1) to provide real-time matrix type displays which present a large quantity of test data in multi-color easy-to-interpret patterns;
- (2) to provide in conjunction with the matrix display a film strip record-keeping device which operates to retain test data which is generated when the system under test develops a malfunction or out-of-tolerance condition; and
- (3) to provide in photographic and handbook form an information storage facility which contains a library of pre-recorded failure patterns representative of specific malfunctions that may occur in the system under test.

In order to set the stage for the detailed explanation of how these objectives are achieved, some of the terms which will be used in the description are now defined. These definitions should be reviewed by the reader for they set in perspective the logistic packages which typically are encountered in maintenance activities, and it

is towards a maintenance type display that this test system is oriented.

II. Definitions

Piece-part. A separately identifiable component such as a resistor, or vacuum tube. In micro-electronics a chip, or flat pack.

Major Piece-part. A component of substantial size and cost such as a high power transmitting tube.

Sub-assembly. A combination of piece-part physically located on a common chassis or carrier board. In micro-electronics, a replaceable card containing a plurality of flat packs or the like.

Assembly. A combination of piece-parts, major piece-parts, and sub-assemblies arranged electrically and mechanically in such a manner that the entire unit functions as a whole. The assembly generally is a replaceable unit.

Equipment. A combination of assemblies designed to perform a given function. An example is a radar, sonar, or communications transmitter or receiver.

System. A combination of equipments arranged so that a plurality of functions are grouped together to achieve an end result. An

example is a radar fire control system; or an air traffic control system.

Major System. A combination of systems arranged as in Sage; or in Dew Line; or Nike-Zeus; or Apollo; etc.

Module. Any sub-assembly, assembly, or equipment which is packaged so as to be removed and tested as an entity.

Unit Under Test (UUT). A generic expression applying to any of the foregoing definitions.

(PUT)—Piece-part under test

(MUT)—Module under test

(EUT)—Equipment under test

(SUT)—System under test

Test System (TS). Combinations of any of the foregoing UUT, PUT, MUT, EUT, and SUT with special circuits for achieving the test functions. The test system may be external or built-in. In this paper, they also generate the displays for pattern recognition.

III. The Matrix Display

To describe one form the Test System may take, an illustrative example is chosen which has 96 electronic components in an assembly, each of which can fail without causing the failure of any of the others. The assembly is designed with one test point available for each component, and when the circuit is energized a

voltage is obtained from each test point. These voltages are attenuated or amplified so that they all measure 1 volt dc for a normal functional assembly. The 96 voltages are sampled sequentially by a scanning device which feeds into circuitry to compare these 96 samples to their nominal value of 1 volt. A display is then generated in which the test data derived from the 96 test points is presented as luminous spots in the form of an 8 x 12 matrix of white dots. As long as the assembly is energized, and there is no failure, the appearance of the 8 x 12 matrix of white dots remains uniform and unchanged.

The circuits which measure the sampled data operate to route the 96 test voltages into five different channels according to the magnitude of the test voltage. The channels are divided into voltage levels of 0-0.7, 0.7-0.9, 0.9-1.1, 1.1-1.3 and over 1.3. By definition, a normal test voltage is in the range 0.9-1.1 volts. A low-marginal voltage is in the range 0.7-0.9 volts; a high-marginal voltage is in the range 1.1-1.3 volts. One failure voltage (low) is less than 0.7 volts; and the other failure voltage (high) is greater than 1.3 volts.

The five channels feed into selection networks which control the color of the dots generated on the display. Typically, a test voltage in channel 1 generates a red dot; channel 2, an orange dot; channel 3, a white dot; channel 4, a yellow dot;

AMPEX

The Videofile Information Systems Division is a new division of Ampex Corporation, world leader in magnetic tape memory equipment and systems. The Videofile System is a sophisticated real-time information storage and retrieval system serving a wide range of applications in government, industry and commerce.

There are now immediate and pending openings in the Division in Software, Marketing and Engineering areas:

SOFTWARE

MANAGER—Software Development

To direct the software development and the architecture of future information systems. Will assume total responsibility for all system analysis, software design, programming and related development. Position demands a strong managerial and technical background in sophisticated real-time system programming, time sharing, and multi-processing. Knowledge of digital hardware is essential. BSEE, with MSEE preferred, plus 7-10 years' related experience.

LOGIC ENGINEERS

Junior and Senior levels. To establish digital design procedures and/or design custom logic hardware. Positions require BSEE plus minimum 2 years' experience in computer digital systems.

Interviews may be arranged during the Fall Joint Computer Conference by contacting us at the St. Francis Hotel for a personal interview. Your resume may be left with Software Age Resume Center during the week of December 9 through 11.

Or send your resume in complete confidence to Mr. D. M. Channing, Ampex Corporation, 1020 Kifer Road, Sunnyvale, California 94086. You may phone Mr. Channing COLLECT to (408) 738-4910. We are an equal opportunity employer.

MARKETING

SALES SPECIALISTS

Situations are constantly developing for Senior Sales Specialists to develop markets and handle direct sales with potential Videofile Information Systems' customers. Positions require individuals with successful sales backgrounds in computer system sales.

SYSTEMS ANALYSTS

Positions involve in-depth analysis of potential customer document storage and retrieval requirements, preparation of proposals, and provision of technical systems and/or application information. Positions require individuals experienced in preparation of computer systems proposals and accustomed to providing customer liaison relative to computer systems.

AMPEX

Scientific Programming Engineers

**Bendix Kansas City needs your experience
...now...in these three vital areas:**

Computerized process control

Bachelors of Science in EE, ME, Chem E, IE, or Physics with 3-5 years of experience in computerized process control. Experience should include the selection and application of hardware configurations, including analog subsystems; development and selection of software for realtime executive systems, realtime monitors, multiprogramming and time-sharing techniques. Should have some knowledge of control systems, process instrumentation and interface equipment required.

Mathematical modeling and simulation

BSIE's, BSME's or MBA's with 3-5 years experience in simulation and modeling for management information systems or management sciences. Experience should include model development using GPSS, SIMSCRIPT or similar systems; programming; and close liaison with user departments.

Computer aided design

BSEE's, BSME's or MBA's (or equivalents) with 2-5 years experience in programming for design evaluation using ECAP, SCEPTRE, CSMP and similar systems for AC-DC and transient analysis of linear and non-linear circuits and systems.

If you can get excited about pioneering in new computer-engineering territories . . . can transmit your programming skills to others . . . and don't mind moving we-can't-tell-how-far into management . . . contact Bendix Kansas City **now**. Call (816) 363-3211 . . . or write directly to

Bob Renfrow
Professional Placement
Box 303-AW
Kansas City, Missouri 64141



Prime contractor for the AEC . . . equal opportunity employer

PROGRAMMERS SYSTEM DESIGNERS SYSTEM ANALYSTS MATH/O.R.

BOTH SCIENTIFIC AND COMMERCIAL APPLICATIONS ARE REPRESENTED WITHIN THE REQUIREMENTS OF OUR COMPANY CLIENTS WHO DEMAND—AND PAY FOR—THE BEST. APPOINTMENTS AT JR., INTERMEDIATE AND SR. LEVELS FOR THOSE WHOSE ABILITY AND POTENTIAL FOR GROWTH IS CLEAR CUT. BOTH MANAGERS AND INDIVIDUAL CONTRIBUTORS WILL FIND SUITABLE POSITIONS AMONG THE INDUSTRIAL LEADERS WHO UTILIZE OUR CONSULTING SERVICES. SALARIES RANGE FROM \$8000 TO \$25,000.

Our client companies assume all fees. You are invited to discuss your future with our staffing consultants. Send resumes or call for appointment.

F. J. C. C. Attendees Call Collect California Office
GRIFFING, INC.
STAFFING CONSULTANTS

260 Sheridan Ave., Palo Alto, Calif. 94306 (415) 327-1366
519 Shoreham Bldg., Washington, D. C. 20005 (202) 737-4754

PROGRAMMERS—ENGINEERS

Washington, D. C. • New York • New Jersey • New England • Philadelphia • Chicago • Minnesota • Texas • Ohio • Florida • Arizona • California • Southeast Asia

If you have a B.S., M.S. or Ph.D. and you are experienced or interested in any of the following, contact us immediately for free career counseling and an objective analysis of your position in today's market.

- | | | |
|--|---|---|
| <p>PROGRAMMERS</p> <ul style="list-style-type: none"> • Management Info Systems • Information Retrieval • Command & Control • Aerospace Applications • Real Time/On Line | <ul style="list-style-type: none"> • Systems Simulation • Software Development • Communications <p>SYSTEMS ENGINEERS</p> <ul style="list-style-type: none"> • Reliability Analysis • Digital Computer Systems | <ul style="list-style-type: none"> • Digital Logic Design • Digital Circuit Design • Digital Communications • Systems Integration • Soft Ware Analysis • Oceanography |
|--|---|---|

Salaries range from \$8,200 to \$25,000. Our client companies assume all fees. Forward resume in confidence, or call (collect): Mr. Martin E. Sheridan (Area Code 703) 524-7660.

SHERIDAN ASSOCIATES INC.

1901 North Fort Myer Dr., Suite 1010, Arlington, Virginia 22209
(Just over the Potomac from Washington, D. C.)
Personnel Consultants to the Computer Industry
Write for application and wage/salary survey.

For more information, circle No. 17 on the Reader Service Card

MSA

Rapid expansion and growth of our dynamic national management consulting and computer software firm has created management and staff positions for data processing professionals. These openings are available in Atlanta, San Francisco, New York, Chicago, Washington, and Charlotte.

If you have had extensive experience in any of these fields—

- Data Processing System Design
- Data Processing Systems Marketing
- Computer Programming
- Management Information Systems
- Management Sciences
- Computer Center Operations Management

And are interested in—

- Broadened experience through exposure to many industries
- Superior salaries
- Professional recognition
- Positions of responsibility
- Ownership participation program

Then call or write:

MANAGEMENT SCIENCE AMERICA, INC.

1389 Peachtree Street, NE
Atlanta, Georgia 30309
Telephone: 404/892-3390

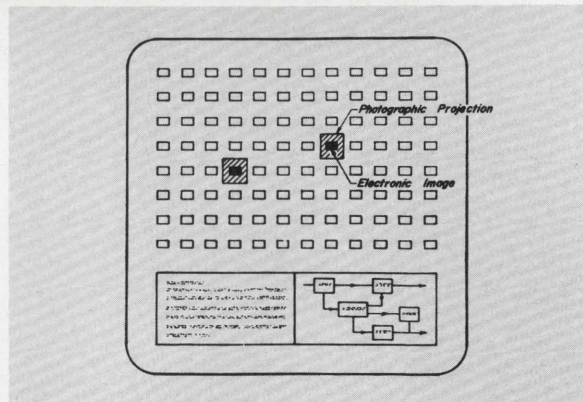


Fig. 3. Another matrix of 96 data points in which the real-time data is compared by an operator to data previously stored on film chips. Two of the data points are out-of-tolerance. The automatic information retrieval system has selected the proper mal-function chip, which fact is confirmed by the photographic projection properly overlaying the electronic real-time image. In the lower half of the CRT there is projected from the same film chip some text and schematic drawings which contain appropriate instructions for the operator.

and channel 5, a green dot. These color dots are clustered together for each of the 96 test points in the 8 x 12 matrix. What this display means to an observer thus becomes evident. Suppose test point 37 has changed color; it is because the test voltage is not normal and it takes but a brief inspection to determine from the actual color of the test point if the drift is marginal, or if the component has failed. The color also reveals whether the drift is high or low, or if the failure is open circuit or short circuit. These relationships are tabulated here for convenience.

Channel	Voltage Range	Color	Significance
1	0-0.7	Red	"Short" Circuit
2	0.7-0.9	Orange	Marginal-low
3	0.9-1.1	White	Normal
4	1.1-1.3	Yellow	Marginal-high
5	>1.3	Green	"Open" Circuit

IV. The Test System

A closed circuit television chain is used to generate the display. A rectangular raster is scanned at a 60 cycle rate in a standard 525 line format so that each of the 96 test points is measured in sequence and the results displayed 60 times each second. In other words, the voltage from test point 37 is examined every 16.6 milliseconds; and the dot on the matrix corresponding to this test point is energized once every 16.6 milliseconds. If the voltage is normal the dot remains white. If the voltage is not normal it will be routed into the proper one of the other four channels and the dot will appear as red, orange, yellow, or green. If the voltage drifts through more than one range, then the color of the displayed test point will drift accordingly. If the voltage varies rapidly, as in an intermittent condition, then the dot will flicker in color.

Thus, once attracted by an off-normal color the observer can determine after a few seconds of examination if this is an intermittent condition; if it is a drift; or if it is a failure.

Attending the Fall Joint Computer Conference?

**Learn about career
opportunities with
CONTROL DATA
CORPORATION
by attending our
career seminars**

**From Control Data technical management men you'll
learn what's happening in these six key areas:**

MARKETING

SPACE & DEFENSE SYSTEMS

PRODUCTS & COMPONENTS

**COMPUTER SYSTEMS &
DEVELOPMENT**

SOFTWARE

**MANUFACTURING &
PERIPHERAL PRODUCTS**

They'll also discuss specific career opportunities within each area and how you can contribute. If you're a programmer, analyst, scientist, engineer or just interested in the possibility of a career with CONTROL DATA, you're invited to attend.

CONTROL DATA SEMINARS will be held in the California Room of the Fairmont Hotel at 3 PM and 7 PM daily during the conference. The sessions last an hour and refreshments will be served at the close of each.

If you're going to work for a computer company, why not work for the **Supercomputer** company?

If unable to attend, send your resume to Mr. B. E. Grylewicz at: 8100 34th Avenue South, Minneapolis, Minnesota 55440

CONTROL DATA

CORPORATION

An Equal Opportunity Employer

A. Failure Diagnosis

When a fault appears the observer refers to a previously prepared handbook of test point abnormalities, looks at the entry for test point 37, and finds the diagnosis for the color condition he just observed. This diagnosis can be made in less than a minute, the time it takes to find the entry, if the handbook is complete. To achieve these rapid results the handbook of test point abnormalities obviously was prepared in advance. To do this for 96 individual test points is not very difficult. But suppose, as is often the case, that failures of components do not occur singly but in combinations. Now failure patterns have to be derived for the handbook that take into account the various combinations and permutations of the 96 voltages derived from the test points. Even for only 96 test voltages this can become an excessive burden, especially since each voltage can take on five different effective values. A more practical method of preparing the handbook is to predict, from the design, the most probable failures and to generate from these (either by calculation or experimentation) a series of different failure patterns. These patterns, representing multiple malfunctions, also become part of the handbook. When a complex failure occurs, the observer has to match these patterns with those actually displayed. This matching process will take a little more time in the case of multiple malfunction than it did in

the case of a single abnormality. But after a history of learning on a display of this sort it can safely be assumed that the observer's skill will increase to the point where he will recognize certain patterns for the often repeated failures; he will not have to refer to the handbook; and so diagnosis again becomes almost instantaneous.

Using the foregoing arrangement it is conceivable, even likely, that on occasion a failure pattern will be generated for which there is no equivalent in the handbook. It is necessary in this situation to trouble shoot the test assembly using any technique then available under the circumstances that prevail. After the failure is thus tracked down, the failure pattern and this new-found diagnosis is entered into the handbook. Except for this last step of entering the information in the handbook, this procedure is equivalent to ordinary present day maintenance procedures. And even with respect to this last step, it should be noted that when a technician traces down a fault new to him he stores the information in his mind so that if the failure is repeated he need not go through all the steps of re-tracing the fault.

B. Self Programming

To supplement the handbook and to achieve results similar to that inherent in a thought proc-

Corporate EDP & Procedures Manager

For a large electronics growth company headquartered in California with divisions in the U.S. and abroad. This position reports to the Controller and includes responsibility for corporate computer systems, programming, and operations (third generation equipment), as well as corporate systems and procedures. We want an experienced manager who is oriented towards achieving user satisfaction, who can plan and execute efficient and economic data processing and systems functions and who can communicate effectively with all levels of management. We prefer a college graduate with heavy experience in manufacturing applications.

Please forward your resume, in complete confidence, explaining your qualifications for this key job to S/A Dept. 1105. We are an equal opportunity employer.

1020 CHURCH STREET
EVANSTON, ILLINOIS 60201

Programmers and Systems Analysts:

Come to IBM and help solve tomorrow's programming problems.

Many people talk about tomorrow. At IBM's Federal Systems Division, we work on it.

We need creative programmers that think ahead of the state-of-the-art. Our present projects are geared to help solve problems in the 1970's.

Wide range of projects.

Right now we're researching missile systems to cover the needs of the next decade. We're out to help monitor air traffic while en route. Looking for ways to simplify mail handling in tomorrow's Post Office. Retrieving delicate seismological data. And becoming even more involved in America's space program.

In this work, of course, we use the latest computers and peripheral equipment. Much of the work is in real-time... involving multiple-access concepts.

How about you?

We need programmers and analysts with experience in one of two basic areas: information-handling systems or scientific engineering programming. You should have a Bachelor's degree in Mathematics, Physics, Engineering, Economics, or Statistics with at least one year's experience.

Can you solve problems?

Today's major growth industry is information handling and control. And IBM is a leader in that field. This growth environment can bring out the best of your talents and abilities. Because in a growth company like IBM you must work constantly toward greater achievement. This means more opportunities to achieve distinction and personal recognition.

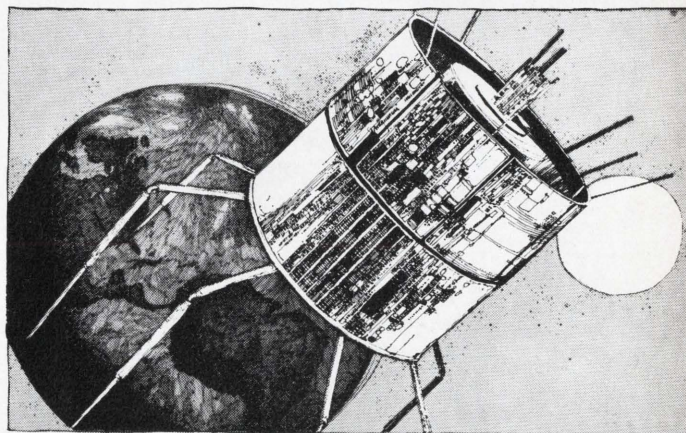
So if you're a problem-solver who wants a personal sense of achievement and recognition for your hard work in an exciting growth company, consider IBM.

Call or write.

Learn more about the opportunities for you at IBM. Immediate openings exist in the Whippany, New Jersey, area; in metropolitan Washington, D.C.; and at Atlantic City, New Jersey. Call Jim Dunn at (301) 921-7724. Or send a brief letter or resume to him at IBM Corporation, Federal Systems Division Headquarters, Dept. BL1028, 18100 Frederick Pike, Gaithersburg, Maryland 20760.

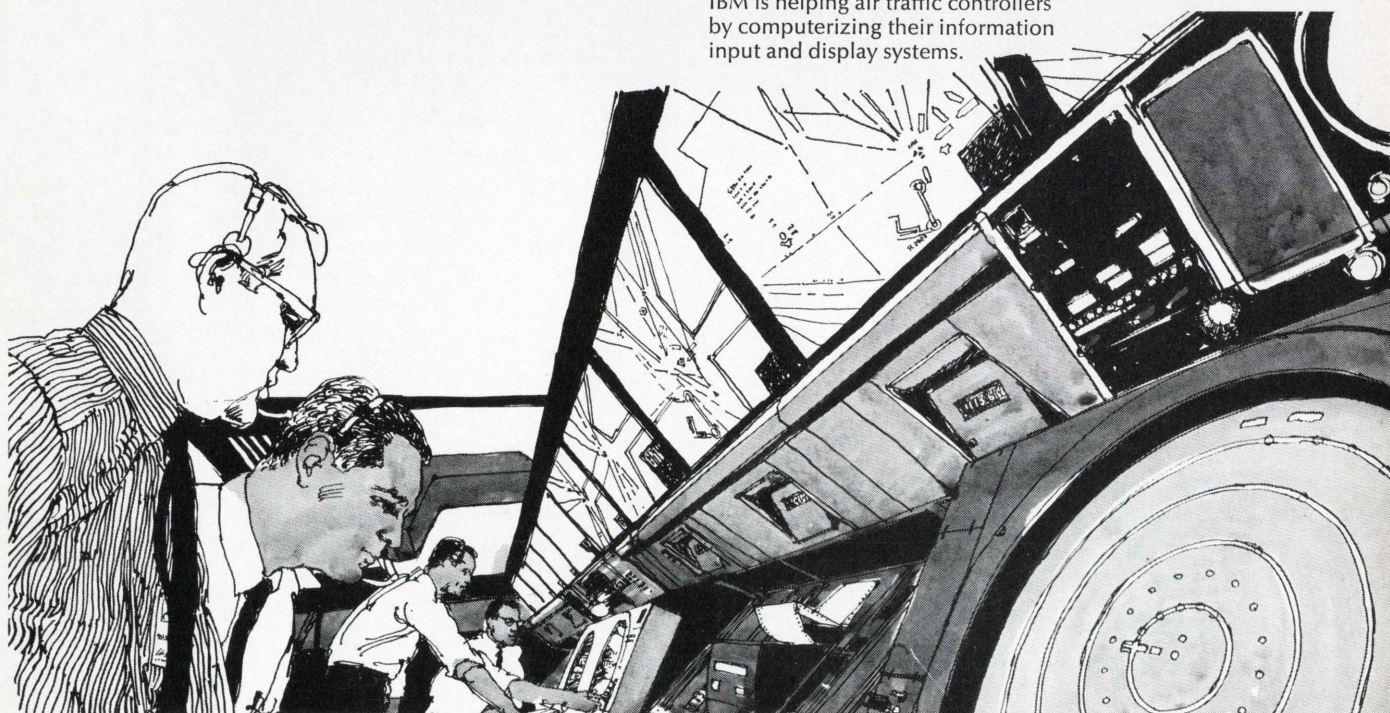
An Equal Opportunity Employer

IBM



IBM works with NASA's Goddard Space Flight Center to help control and maneuver satellites like ATS (Applications Technology Satellite).

IBM is helping air traffic controllers by computerizing their information input and display systems.



SDS

Scientific Data Systems, a leader in the field of time sharing and scientific computing, has immediate openings in its new Southern California facilities for programmers and computer sales representatives.

COBOL SPECIALISTS: Positions require 5 years' programming experience in business or systems-oriented applications, familiarity with at least two COBOL systems and knowledge of business data processing market. Applicants will participate in field support, system evaluation, technical training, and program maintenance activities for COBOL and BDP software packages.

SYSTEMS PROGRAMMERS: Experienced systems programmers are needed to develop large-scale time-sharing systems for commercial application. Positions involve development of both language processors and operating systems. Applicants should have 3-5 years' professional systems programming experience with some exposure to time-sharing systems.

QUALITY ASSURANCE PROGRAMMERS: To design and develop acceptance tests for SDS software. Positions require development of automatic and general purpose testing packages for both batch and time-sharing systems. Applicants must be thoroughly versed in FORTRAN, COBOL, or an assembly language, or have extensive operating systems experience. Familiarity with time-sharing systems desirable.

APPLICATIONS ANALYSTS: Will work with customers who are installing new SDS software systems and assist in preparing special programs. Some travel required. Must be familiar with all standard software. BS degree in math, engineering, or science preferred. Minimum 2 years' experience.

DIAGNOSTIC PROGRAMMERS: Individuals with programming and digital hardware experience are needed to develop diagnostic programs for SDS computer systems. Must have hardware, software, and systems experience and ability to isolate computer problems quickly and accurately. Experience related to processor, memory, or peripheral diagnostic programming required.

COMPUTER SALES REPRESENTATIVES: Applicants should have an accredited college degree and a minimum of 2 years' sales and/or applications experience in the digital computer/systems marketplace. Excellent salary and commission plan.

If you are interested in any of the above positions and are attending the Fall Joint Computer Conference, please contact an SDS Professional Placement Representative at the Del Webb Town House, 8th and Market Streets, San Francisco.

Or write to Mr. William Kendall, Manager of Employment

SCIENTIFIC DATA SYSTEMS

SDS

555 Aviation Blvd., Dept. SWA-11
El Segundo, California 90245
An equal opportunity employer

BATTLING WINDMILLS?

If your talent is getting nowhere fast, we will introduce you to a wide variety of unusual opportunities in the computer field.

At Management Scientists, our forte is career planning for the Data Processing professional. As consultants to leading corporations on the national and international scene, we are ready to SELECTIVELY help you construct a career future in line with your personal goals and objectives.

At present we are recruiting for:

- Applications Programmers
- Systems Programmers
- Software Development Programmers
- Systems Analysts & Engineers
- Sales & Marketing Specialists
- Commercial & Scientific

Send your resume in confidence, including salary and geographic requirements. Our clients assume all fees.

**Management
Scientists, Inc.**

101 Park Avenue, New York, N. Y. 10017
Dept. SA11-68 (212) 532-7710

Exclusively: DATA PROCESSING & MANAGEMENT SCIENCES
Career Planners—Recruitment Specialists

ess, a camera unit is positioned to take photographs of the cathode ray tube as illustrated in Figure 2.

In a properly functioning assembly, the 96 test points create an 8 x 12 matrix of white dots which are uniform in disposition as has been stated. For this normal condition there is no need to take any pictures. The information is repetitive and redundant. But when a test point varies from normal, thereby generating a different color, it becomes desirable to record the event and the time of occurrence. Accordingly, a photo-cell detector responsive to the drift or failure colors is positioned to face the display screen. The detector is energized when a non-normal color is displayed thereby to open the shutter of the camera. Preferably the shutter stays open for one full raster scanning cycle, in this case 1/60 second. In so doing the camera records

- (1) the last cycle of information (due to the persistence of the phosphors in the CRT) and
- (2) the data displayed in the 1/60 of a second following the opening of the shutter and
- (3) either clock time or running time, or both.

The shutter is then closed and the film is advanced. If the non-normal condition persists, the camera is again activated, etc. It is thus that the camera takes a series of pictures in color which yields a permanent history of performance of the 96 component assembly.

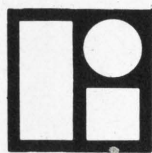
By repeating this process of photographing the display, a handbook is soon compiled which contains the pattern for each possible drift and failure mode. Each new diagnosis which is entered into the handbook should be complete and accurate since the electronic post-mortem examinations can be carried out carefully and with precision.

C. Failure Reporting

It is a further advantage of the camera arrangement just described that a filmed record has been made showing the status of events for the scanning cycle that preceded the actual failure. This record often will suffice to determine the sequence of stages that the assembly went through as it reached the failure mode. This type of failure identification is best used so that re-design or retrofit of the assembly under test can be better accomplished. Not only will the actual failure be recorded but the original stresses which brought about this condition will be part of the record. In other words, the instant arrangement can provide a good failure reporting system for it identifies the failed component as well as the cause of failure, which may originate with some other component. Additionally, if a given failure is not catastrophic but is due to gradual deterioration process then the observer of the display will see the onset of drift, he can anticipate the failure, and he can take

“...mellonics?”

mel·lon·ics \mel-'lŏn-ics\ (n.) : division of Litton Industries : a software house. Leading U.S. specialist in real time information handling systems. Originally dedicated to software support of national space programs; has branched into air and sea transportation systems, urban rapid transit, automated baggage handling, total reservations systems, management information systems, process control, engineering product development (examples: reservation display terminals, voice recognition systems), many other areas where software expertise must be applied to automation needs. Has achieved a tenfold expansion of both revenues and staff over the last thirty months. Presently seeking systems analysts and programmers at all levels with backgrounds in AARS, PARS, and other airline reservation systems; product engineers with software exposure; analysts and programmers with two or more years' experience in BTAM, QTAM, or OS/360 BAL real time access methods, to work on operating system modifications, executive programs, and compiler development; and mathematicians, statisticians, and operations researchers. Manager of Industrial Relations is Russ Kiessig at divisional headquarters: 1001 West Maude Avenue, Sunnyvale, California, 94086. Russ will be in San Francisco during FJCC '68 at the Sir Francis Drake hotel.



Mellonics Systems Development Division
LITTON INDUSTRIES

*Mellonics pursues an affirmative policy
of nondiscrimination in employment*

TROUBLE-TRAN PRESENTS XTRAN'S ADVENTURES IN FORTRAN

Send your ANSWER to the problems posed here in each issue to:

TROUBLE-TRAN EDITOR software age

1020 Church St., Evanston, Illinois 60201

You can also profit by submitting PROBLEMS for this feature. If your problem in FORTRAN programming is selected for use in this feature, you will receive \$25.00

Contest Rules:

1. USA Standard FORTRAN is assumed.
2. CDC-6000 FORTRAN and IBM System/360 FORTRAN IV (level H) are used in verifying answers.

The correct answer bearing the earliest postmark will net the reader submitting it \$25.00

The second correct answer with earliest postmark wins \$15.00



By GEORGE N. VASSILAKIS
of TRW's Software and Computing Center

PROBLEM OF THE MONTH

```
X=F(3.)
Y=FPRIME(3.)
Z=X+Y
.
END
```

```
REAL FUNCTION F(A)
F=A*A
RETURN
ENTRY FPRIME(A)
FPRIME=2.*A
RETURN
END
```

What is the value of Z? Why?

ANSWER TO LAST MONTH'S PROBLEM

The key to last month's problem was to count the storage that was required by the labeled COMMON in the following three statements:

```
COMMON/R/R(5)
COMMON/X/X/X/Y/Y/Z
COMMON/W/W(10)
```

First let us look at the second statement. FORTRAN permits the same symbol as the name of a variable and the name of a labeled COMMON block. The name of a block may appear in more than one place and the compiler will link all the pieces together.

The first X in statement COMMON/X/X/X/Y/Y/Z is the name of the block X. The second X is the variable X. The third X is the second appearance of block X. The first Y is the variable Y in block X. The second Y is the block Y. Z is a variable in block Y.

Statement COMMON/X/X/X/Y/Y/Z may be replaced by the following two statements:

```
COMMON/X/X,Y
COMMON/Y/Z
```

The total storage needed depends on the machine and the loader.

1. IBM—7094
 $6 + 2 + 2 + 10 = 20$
At load time, every labeled COMMON block is assigned to the nearest even location in memory.
2. CDC—6600
 $5 + 2 + 1 + 10 = 18$
No problems here.
3. IBM System/360
 $6 + 2 + 2 + 10 = 20$
Labeled COMMON blocks must start at double-word boundaries.

P. S. New material is urgently needed for this column.
XTRAN

TROUBLE-TRAN WINNERS

\$25.00—Frank M. Oliva
Systems Analyst
American Oil Company
Information Services & Computer Sciences Department
910 South Michigan Avenue
Chicago, Illinois 60680

\$15.00—Gerhad Postpischil
Systems Analyst
Applied Data Research, Inc.
2425 Wilson Boulevard
Arlington, Virginia 22201

SCIENTIFIC & COMMERCIAL PROGRAMMERS & ANALYSTS

FJCC Interviews

Dec. 9 thru 11

Call Mr. Vincent Iannoli
at 781-7898

(or deposit your résumé at the Software
Age Center in the St. Francis Hotel.)

Computer Applications Incorporated, one of the country's largest Information Service Companies, is offering excellent opportunities to become involved in sophisticated broad-spectrum applications. In the scientific field assignments offered in such areas as satellite control systems, spacecraft simulation studies and display systems. Our commercial activity runs the gamut from inventory control through complex management information systems—in such areas of the economy as Transportation, Banking, Insurance and Publishing.

PHILADELPHIA AND HARRISBURG

Commercial Programmers.

IBM 360 or Spectra 70—COBOL and or BAL — 2 to 4 years experience — degree required. Burroughs 5500 — COBOL — 2 to 4 years experience — degree required.

WASHINGTON, D.C. AREA

Scientific Programmers.

IBM 7090—FORTRAN IV—and or BAL— 2 to 5 years experience — degree required in Math or Physical Science. Scientific IBM 360—BAL—2 to 5 years experience—some visual display.

NEW YORK AND BOSTON

Commercial Programmers/Analysts.

IBM 360 — COBOL-BAL or ALP-OS/DOS — all levels 1 to 5 years experience. Application, Banking, Transportation, Insurance and Publishing.

CALIFORNIA

Commercial Programmers.

Honeywell & G&E. Experience. 2-5 years experience. Software Development CDC 6600/6640. Knowledge of SCOPE. Command & Control Analysts. ASN Tactical Data Systems—3-5 years experience.

If interview inconvenient, send résumé to
Mr. Vincent Iannoli, Manager—Industrial Relations

COMPUTER APPLICATIONS INCORPORATED

555 Madison Avenue, New York, N.Y. 10022 / An equal opportunity employer

corrective action in advance of the failure itself. For this purpose, the handbook also is prepared to contain instructions specifying corrective action that may be taken under these circumstances.

D. Information-Retrieval and Self-Test

The next step in the development of this Test System is to provide the observer with mechanical assistance in sorting through the different failure patterns in his handbook. To aid in this information-retrieval process, each of the 96 points in the 8 x 12 matrix is provided with a circuit controlling relay. Thus, test point 37 has its associated relay 37. This relay is energized only when one of the four non-normal voltages appear at the test point. This relay functions to select the failure cards which are punched with a hole at position 37. These cards may be of the type conventionally used in machine accounting systems, or they may be designed specifically for the Test System. In either case, the details of punching, collating, and sorting are believed sufficiently well known so that this brief reference thereto suffices for the purposes now at hand. Position 37 is punched on four cards, with one card and one hole corresponding to each of the four non-normal voltages. When relay 37 is energized all the cards with a hole at position 37 are sorted from the deck. The cards are then sorted as a consequence of the test voltage being in either of channels 1, 2, 4, or 5. Likewise if test points other than 37 were off normal, their cards too would be removed from the deck; and there would be a further selection which takes into account the passage of the test signal through channels 1, 2, 4, or 5. Written, typed or printed on each card is a description of the component which caused the drift (or malfunction) together with a description of the adjustment (or repair) which is to be made. Additionally, each card carries a first photographic film transparency with this same descriptive information; and a second photographic transparency which contains the multi-color drift or failure pattern.

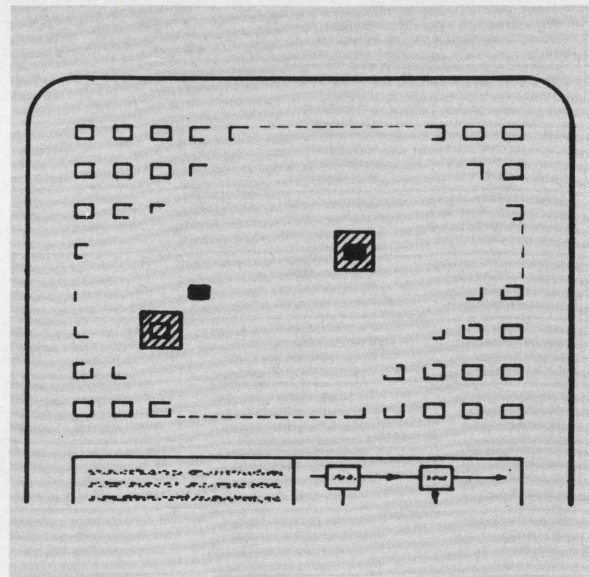
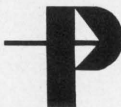


Fig. 4. An example of the failure of the information retrieval system to select the proper malfunction chip. Note that one of the out-of-tolerance data points and the photographic overlay are not in proper register.

In response to the operation of the photocell detector, a transport mechanism inserts the appropriate failure card 37 (due to operation of relay 37) into the optical projector which is positioned towards the rear of the display CRT as illustrated in Figure 2. The information on the photographic transparency thus is projected onto the rear face of the CRT. Therefore, the operator who is observing the real-time test data also sees the descriptive information together with the failure pattern stored on the two film transparencies. On one section of the CRT set aside for the projection of the first transparency, there appears the English language instruction or description of malfunction. An aural or visible alarm or message may accompany this projection of the data to make sure that the observer's attention has been drawn to the display. Simultaneously, the failure pattern recorded on the second transparency is projected for viewing by the observer. In this case, however, the failure pattern recorded on the film is not projected on a special portion of the CRT but is projected to be super-imposed over the 8 x 12 matrix of test points as illustrated in Figure 3.

This is done so that the observer can match the failure pattern generated by the test system with that stored on the film, thereby to verify that the proper failure card has been selected. This visual comparison is made on the basis of (1) dot positions in the matrix and (2) the color of the dot at each position. This is a form of self-test of the Test System which can be "eyeballed" by the observer with relative ease.

When a complex fault occurs involving more than a single component a number of relays will



**Professional
Career
Centers, Inc.**

**PROGRAMMERS
PROGRAMMER/ANALYSTS
SYSTEMS ANALYSTS**

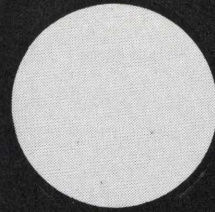
*In this age of specialization let a specialist help
you make sure your next move is the correct move.*

For **FREE SALARY ANALYSIS** based upon the latest industry salary curves, circle Reader Service No. 11 and send your resume to

PROFESSIONAL CAREER CENTERS, INC.
4641 Montgomery Avenue, Bethesda, Maryland 20014
(Suburban Washington, D. C.)
or call 301/657-2760
Nationwide and Overseas

For more information, circle No. 11 on the Reader Service Card

**Live in Pasadena
Work on the Moon...**



**or Venus
or Mars
or Jupiter**

And Surveyor VII has helped solve the commuting problems.

If you work in JPL's Systems Division, you will help solve other vital problems. There are immediate openings in:

MISSION ANALYSIS—providing technical support to project management by use of mathematical modeling, tradeoff analysis, definition and comparison of objectives and cost effectiveness studies. Applying these techniques to space missions and to non-space programs. Developing mission success evaluation models, project and flight objectives and performing near-Earth and near-planet mission design. Education and experience required for this position include a Master's Degree (Ph.D. desirable) in Engineering, Science, Mathematics, or Astrodynamics and 0 to 10 years experience in mission analysis, civil systems and related fields.

TRAJECTORIES AND PERFORMANCE—performing systems analysis and design of spacecraft orbits about Mars and Venus. Analyzing planetary capsule trajectories and atmospheric entry for Mars 73 and future missions to Mars and Venus. Developing new and improved methods for trajectory computation and analysis. Education and experience required for this position include a Degree (Master's desirable) in Engineering, Science, Mathematics, or Astrodynamics and 0 to 10 years

in trajectory and flight path analysis.

ADVANCED PROJECTS—participating in interdisciplinary mission studies and representing systems analysis section capabilities to the study team. Identifying areas of technology advancement necessary for upcoming mission studies and investigating potential applications of space technology to non-space problems. Education and experience required include a Master's or Ph.D. Degree in Engineering, Physics or Mathematics and 5 to 10 years background in analysis, familiarity with space trajectories and spacecraft disciplines, and ability to apply these techniques to management and other non-space problems.

FLIGHT PATH ANALYSIS—formulating the concept, developing the equations and supervising the coding of advanced state-of-the-art computer programs needed for interplanetary flight path analysis. Developing new and applying existing optimization techniques to flight path design problems. Education and experience required include a Master's or Ph.D. Degree in Engineering and 5 to 10 years experience in systems analysis related to orbit determination, guidance strategy, trajectory design or flight path accuracy for space missions.

SYSTEMS DESIGN AND SELECTION—designing and selecting of computer hardware and software for real-time spacecraft command and control. Designing and specifying of the interstation ground communication network; data monitoring and validation. Education and experience required include a Degree (Master's desirable) in Engineering, Science or Mathematics and suitable experience.

TRAJECTORY AND ORBIT DETERMINATION PROGRAMMING—developing computer programs for precision trajectory computation and analysis and interplanetary orbit determination. Education and experience required for this position include a BS Degree (Master's desired), skill in developing trajectory and orbit determination programs and experience in celestial mechanics.

If you qualify for any of these openings, send your complete resume—in confidence—to Mr. Wallace Peterson, Supervisor, Employment at JPL.

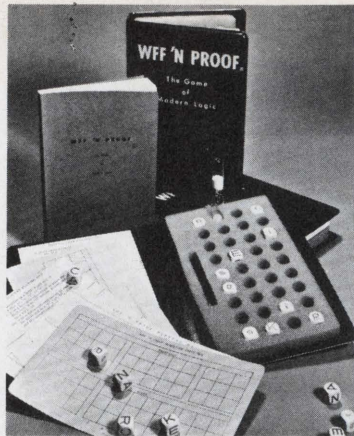
JET PROPULSION LABORATORY

4806 Oak Grove Dr., Pasadena, Calif. 91103
Attention: Professional Staffing Dept. 11
"An equal opportunity employer."
Jet Propulsion Laboratory is operated by
the California Institute of Technology
for the National Aeronautics and Space Administration.



WFF 'N PROOF

Developed in the course of the ALL Project (Accelerated Learning of Logic) Wff'nProof incorporates 21 games of progressive difficulty; has been used to teach propositional calculus to elementary school children but challenges the intellect of professional logicians. Complete with 224-page manual which is an introduction to the world of modern logic; filled with valuable tips to clear thinking.



\$6.75 Postpaid



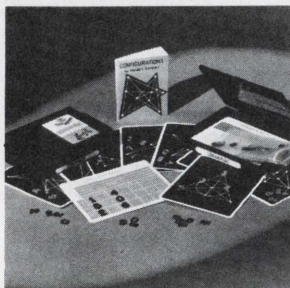
OH WAH REE

The ancient game of mathematical strategy which has intrigued millions for more than 30 centuries. A game at once so simple in its basics that a pre-schooler can enjoy it yet so complex in its possibilities that its fascination multiplies with the mathematical grasp of the player.

\$8.50 Postpaid

CONFIGURATIONS

Based on concepts from the geometry of incidence, CONFIGURATIONS is a series of intriguing mathematical and geometric puzzles that will challenge and delight those who enjoy careful reasoning. It is authored by Professor Harold L. Dorwart, Chairman of the Mathematics Department, Trinity College, Hartford.



\$4.95 Postpaid

TWIXT

Another famous "bookshelf" game, package matches that of Oh-Wah-Ree. A stimulating game with a fascinating chess-like strategy of move and countermove. Two or four players.

\$8.50 Postpaid

SCIENCE/SYSTEMS

P. O. Box 1176
Evanston, Ill. 60204 S/A-11

Please send me at the address below:

.....
.....
.....
.....

Foreign please write us for postage quote.

Cash, check or money order with order.

(Games are shipped from separate warehouses)

(name)

(address)

(city)

(state)

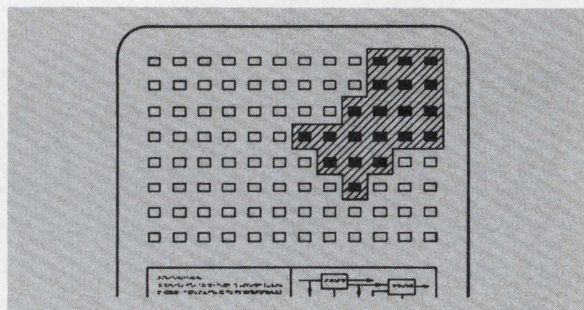
(zip code)

Illinois residents add 5% OES

be energized. To retrieve the proper failure card a series of card sorting operations commence. The first pass selects all possible faults associated with one of the non-normal test points. The second pass takes into consideration all possible faults collected from the first pass, and selects only those cards which have a fault associated with the second non-normal test point. This selection process continues until only the failure card remains whose pattern matches that generated by the assembly under test. The two photographic transparencies on that card then are projected for viewing by the observer. This is illustrated in Figure 4 where the concept of pattern recognition is clearly revealed.

V. Summary of the Test System

The observer so far has been given a test system in which any drift, intermittent, or failure in the assembly under test shows up as a "color flag" in a matrix of white dots which are displayed on a television-like receiver. To determine the significance of this "flag" the observer may rely on his memory, may refer to his handbook, or he may read the information from the display screen itself. Perhaps most important,



he knows that the matrix-like failure pattern in his handbook is also projected on the face of the CRT to overlay that generated by the electron beam in real-time. This gives him the opportunity to confirm immediately that the failure card that was selected by the automatic information-retrieval sub-system does in fact yield the failure pattern generated by the faulty assembly. If the two patterns do not match, as illustrated in Figure 5, the observer, is put on notice that either of two conditions prevail.

First: the retrieval sub-system or some other unit of the Test System may not be functioning properly. And, this may be verified by exercising a special sub-routine in the information-retrieval unit. Second: the Test System may be functioning properly but there may not be a suitable failure card in the library. This is equivalent to a "program-stop," type of condition which probably is inherent in any automatic physical system which is designed to make logic decisions. Fortunately, this mis-match of the test patterns should be the exception rather than the rule in a well instrumented system and the possibility of its happening should not detract from the already described substantial gainful results.

(Continued next month)

JOIN THE IDEA CORP

Are you a Programmer, Systems Analyst or EDP Salesman who is not satisfied with common solutions? Are you restless and discouraged working on assignments offering redundant routine?

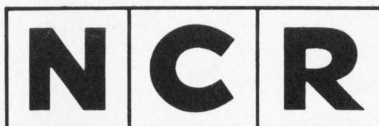
The Idea Corp offers a constant supply of fresh challenges to keep your mind alive and active. Take a look at NCR, a business equipment manufacturer that supplies hardware/software answers to a constantly changing and expanding market. Current requirements are in Dayton, Ohio with sales and systems positions available in cities coast to coast.

- 1. RETAIL SYSTEMS/PRODUCT PLANNING:** Application Systems Analyst with the responsibility of systems cost analysis in the area of retail organizations, primarily in chain and department stores. Assigned programs would be in support of retail data collection and on-line systems. The position would involve cost and performance evaluations of proposed systems and competitive systems, survey and data collection, market analysis and trends. BS/MS in business, mathematics or engineering with 3-4 years' experience in systems analysis. Retail experience desirable.
- 2. RETAIL SYSTEMS/SYSTEMS ARCHITECTURE:** Application Systems Analyst with the assignment of business systems architecture in the area of future retail systems. The interpretation of requirements to permit the orderly structure of new system concepts and operational retail business systems. The responsibilities are business system architecture, performance modeling and evaluation and business system functional requirements. Experience in systems analysis, software, an understanding of hardware and study in mathematical modeling and simulation techniques are desired. BS/MS in business, mathematics, engineering or industrial management with a minimum of 3-4 years' experience.
- 3. ADVANCED TECHNOLOGY/MILITARY:** Systems Analyst to serve on a post office contract for Automatic Generation of Dispatch Billing Data. The responsibilities include: analysis of systems to be converted from manual to automated operation; economic comparisons between manual and automated systems; prepare equipment specifications and assist in the selection of equipment as well as systems testing. BS/MS engineering or mathematics with experience in defining and implementing systems utilizing digital equipment and mechanized methods. Some programming experience with a knowledge of programming languages. Statistics experience helpful.
- 4. SOFTWARE DOCUMENTATION SPECIALIST:** Prepare technical manuals and sales material on new or modified systems, devices, equipment or installations. The material is to be used primarily by Customer Services, EDP Technicians and Field Personnel for training, reference, education and maintenance. Degree required; Journalism, or English major desired; no experience necessary but desired.
- 5. SOFTWARE DEVELOPMENT PROGRAMMERS:** Will be significant in the creation of realtime, on-line major projects for commercial institutions. Involves the design of complete packaged software systems for various input/output routines. Experience in machine language or large file computer programming desirable. The software must be fully expandable to provide for any operating requirements of modern computer applications.
- 6. SALES:** Experienced EDP salesmen and trainees. We offer a twelve-month accelerated Sales Training Program. On-the-job training. Four intensive weeks of training at corporate headquarters. A balanced program of Sales Training, Retail Management, Systems Requirements of industry, hospitals, government, schools, contractors, route control, financial, commercial and competition. Upon completion of training we offer you a guaranteed territory to profitably operate.
- 7. SYSTEMS ANALYST:** Customer representative. Two or more years' experience in programming with related systems analysis in commercial applications involving medium-to-large scale magnetic tape and random access systems. After initial period of orientation, you'll handle selected accounts for installation of EDP equipment and sales support.

Thank you for thinking of us. You are invited to explore the opportunities at NCR. Contact us now while you're thinking about it. Start thinking for us and for yourself.

For confidential consideration, send letter or resume and salary requirements to:

Mr. Ronald L. Lauterbach
The National Cash Register Company
Executive & Professional Placement
Main & K Streets
Dayton, Ohio 45409



AN EQUAL OPPORTUNITY EMPLOYER

market place

The Classified Ad Department
of
SOFTWARE AGE

SERVICE AVAILABLE

SR. PROGRAMMER / ANALYSTS — \$20,000

A number of assignments available with computer manufacturer, Dutchess County, N. Y.

Must have minimum 2 years experience working with IBM 360 Operating System: Software or PLI.

Harley Pebbles—(313) 871-7222

DATA PROCESSING SERVICES OF DETROIT

2990 W. Grand Blvd. Detroit, Mich. 48202

MOONLIGHT SERVICE

MOONLIGHTERS WANTED: Whatever your experience—COBOL, RPG, NEAT or BAL in business applications, or the wildest machine languages for math/science applications—we have part-time work in your area. Best contract rates, your hours, for analysts, programmers, documentation specialists and top-flight operators qualified for debugging adequately documented programs. Send complete qualifications—areas of experience, machines and languages with which you are familiar to: Dept. 890, SOFTWARE AGE, 1020 Church St., Evanston, Ill. 60201.

PART TIME PROGRAMMERS/ANALYSTS with COBOL experience in such areas as management information systems, inventory control, accounting, personnel, or general manufacturing or information retrieval applications. Degree not necessary. All work will be corresponded through the mail on high contract rates. Send brief resume to Box SA-11, Software Age, 1020 Church Street, Evanston, Illinois 60201.

SOFTWARE OFFERED

STOP CONVERTING HEXADECIMAL! Write for free brochure on The Hexadder. Hexco, Inc., P. O. Box 55588, Houston, Texas 77055.

IBM EQUIPMENT SALE—PURCHASE—LEASE

All Models of computers and unit record equipment available under IBM maintenance.

I—C—E, Inc.

1130 New Hampshire Ave., N. W.
Washington, D. C. 20037
(202) 659-3536

PROGRAMS

PAYROLL: IBM 360/30 DOS 32 K COBOL payroll programs suitable for hourly, salary or combination system including tax calculators. Call or write: Accountants Processing Center, 2200 So. Brentwood Blvd., St. Louis, Missouri 63144; (314) 968-3434.

CLASSIFIED ADS in software age

market place

where you can
reach **110,000**

programmers, mathematicians,
analysts and EDP managers.

CLASSIFIED ADVERTISING

Non-Display Classified: For firms or individuals offering commercial products or services, 75¢ per word (including name and address). Minimum order \$7.50. For Blind Ad Service, an additional \$10.00. For "Positions Wanted" Ads, 55¢ per word (including name and address). No minimum. Payment must accompany copy except when ads are placed by accredited advertising agencies. Frequency discounts: 5% for 6 months; 10% for 12 months paid in advance.

Display Classified: One inch by one column, \$70.00. Column width 2 1/4". Photographs accepted for an additional \$20.00. Advertiser to supply all photo, art, cuts, or camera ready copy.

General Information: One inch display Help Wanted and Employment Services ads will be accepted in the classified section. Employment ads 1/8 page or more will appear run of book, will be keyed to the resume form in back of publication, and will qualify to free daily resume service.

Closing Date: 1st of preceding month (for example, May issue closes April 1st).

Send order and remittance to: Classified Dept., Software Age, 1020 Church Street, Evanston, Illinois 60201.

software age

1020 CHURCH STREET • EVANSTON, ILLINOIS • 60201

CLASSIFIED ADVERTISING ORDER FORM

Please refer to the above information for complete data concerning terms, frequency discounts, closing dates, etc. Cash with order.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35

_____ Words { @ 55¢ (Reader Rate) } = \$ _____
{ @ 75¢ (Commercial Rate) }

_____ Include Photograph @ \$20.00 additional (Display Ads Only)

Run Ad Blind \$10.00 Insert _____ time(s) Total Enclosed \$ _____

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Signature _____

WORD COUNT: Include name and address. Name of city (Des Moines) or of state (New York) counts as one word each. Zone or Zip Code numbers not counted. (Publisher reserves right to omit Zip Code if space does not permit.) Count each abbreviation, initial, single figure or group of figures or letters as a word. Symbols such as 35mm, COD, PO, AC, etc., count as one word. Hyphenated words count as two words.

SA-11

PROGRAMMERS. SIT DOWN AND WRITE YOURSELF A NEW CAREER.

OUTSTANDING OPPORTUNITIES EXIST IN THE FOLLOWING AREAS.

Realtime Programming

Requires BS or MS in engineering, math, or physics with a minimum of 2 years of programming of which at least one involved realtime applications. Programs developed relate to realtime ballistics guidance systems.

Scientific Programming

To develop computerized models for solution of engineering problems associated with design and development of advanced missiles, space vehicles, and marine guidance systems. Appropriate degree required plus 5 years' experience.

Management Systems Programming

Large scale high language programming employing use of COBOL, Fortran, and PL-I for support of large scale management systems. A good knowledge of one 360 System is required.

Make Second Fold Here

From _____

PLACE
STAMP
HERE

autonetics

Division of North American Rockwell
E. F. Brunetti, Administrator
Professional Placement, Dept. SA 115, Bldg. 68
3370 Miraloma Avenue
Anaheim, California 92803

Make First Fold Here

Postal Regulations Require Sealing with Staple or Tape

My present position is (title and brief description of principal responsibilities) _____

My educational background is (highest degree, major, year obtained, school, etc.) _____

I am experienced and interested in the following _____

I am considering a change because _____

Name (please print) _____

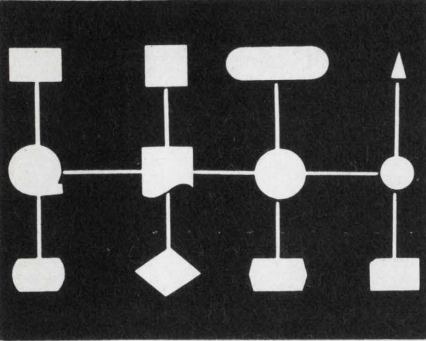
Home Address _____

Home Phone _____ U.S. Citizen? _____

(Include area code)

AN EQUAL OPPORTUNITY EMPLOYER.

PERT-PROGRAMMING



MAGNETIC SYMBOLS

Reduce Work and Speed Operations for

- SYSTEMS ANALYSTS
- PROGRAMMERS
- METHODS SPECIALISTS

MINUTEMAN Magnetic Symbols provide fast, simple and highly visual means of handling PERT, flow charts, diagramming and scheduling problems. Made of sturdy Vinyl "write-on" plastic, in colors. Symbols are easily marked with grease pencil and wiped off. Last indefinitely. The ultimate in convenience, efficiency and economy.

Write for **FREE** catalog on the most modern and flexible visual programming and scheduling systems.



MAGNETIC AIDS, INC.

11 WEST 42nd STREET, NEW YORK 36, N. Y.

For more information, circle No. 50
on the Reader Service Card

FREE

CALLAHAN
OPPORTUNITIES
BULLETIN

Over 50 current job opportunities listed with manufacturers, users, consultants, universities and government (in all sections of the United States and Europe).

For:

Programmers
(scientific and commercial)
Systems Analysts
Hardware Engineers
Software Specialists
Salesmen and Consultants
EDP Instructors

Many of these positions are listed exclusively with the Callahan Center. All costs are assumed by our client companies.

CALLAHAN CENTER FOR COMPUTER PERSONNEL

1819 JFK Blvd., Suite 414, Blvd. Bldg.
PHILADELPHIA, PA.

Phone: (215) LO 7-4811

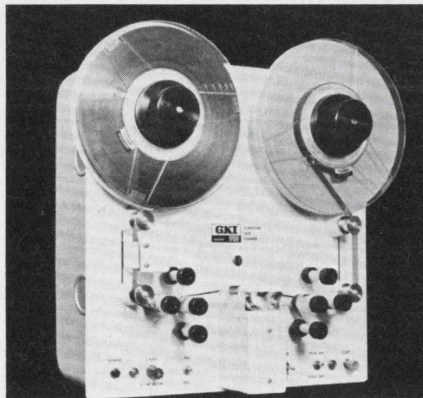
For more information, circle No. 51
on the Reader Service Card

new products

The AIMS-V Translator is a unique software package that accepts unstructured input prepared on the AIMS-V SHORTHAND COBOL notational specification sheets and yields output of a complete COBOL source program. The COBOL programs that are generated have common formats regardless of the parameters of the specific system. Therefore, better program documentation is available than with previous COBOL programs. A savings of at least 50 per cent program coding time and keypunch time can be realized when using AIMS-V in comparison to straight COBOL. It is operational on the IBM 360-30 and up for \$15,000 including on-site training and fully documented.

For more information, circle No. 52
on the Reader Service Card

* * *



General Kinetics Incorporated announces the availability of a new brochure on the Model 999 Computer Tape Cleaner.

This new brochure describes the unique means for removing error causing dirt from magnetic tape. The GKI Model 999 Computer Tape Cleaner has these outstanding features:

Cleans computer magnetic tape automatically, highest efficiency cleaning process, economical for all sizes of computer installations.

For more information, circle No. 53
on the Reader Service Card

* * *

Automated Systems Inc., of Olympia, Washington has developed a new software package called LOG-IN (Log-Inventory) which is a punched-card-to-computer-system for the timber industry, written in COBOL and operated on any Honeywell series 200 computer.

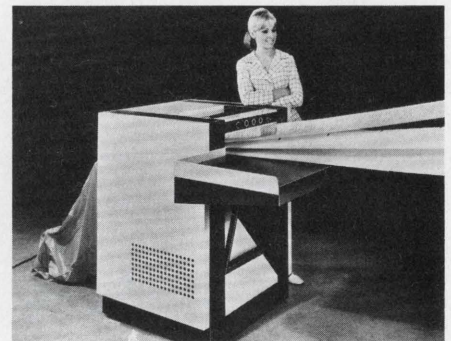
The package records, classifies and summarizes truck-ticket log records and provides management with reports for accounting, inventory, and analysis of log production from each tract.

The minimum configuration (on a series 200 computer) is 32K core memory, five mag tape units, a card reader, and a 132 print position line printer.

An 11-page booklet is available at a cost of \$1.00.

For more information, circle No. 54
on the Reader Service Card

* * *



The powerful Shredmaster Conveyor-400 is a clean, efficient way to destroy obsolete computer print-outs (in either batch or continuous forms), IBM cards and tab cards. With its fast moving conveyor belt feed, it can shred up to 2500 pounds of paper per hour. It can also destroy books, magazines, plastic cards, aluminum duplicating plates, even entire files of old records while the contents are still in their file folders.

The Conveyor-400 is completely mobile on heavy duty casters which allow the machine to be moved to areas where needed and eliminates moving large amounts of paper to the machine. The shreds are caught in a large, dust-free disposable plastic bag at the rear of the machine.

For more information, circle No. 55
on the Reader Service Card

* * *

Programming Sciences Corporation announced recently that SSTPAC, a stand alone diagnostic monitor system, written for the IBM System/360, is now available for distribution. SSTPAC will provide full on-line diagnostic services for any device capable of operating with a System/360.

Originally developed for use with alphanumeric CRT display terminals, SSTPAC

has been generalized for use with disk or tape drivers, printers, plotters, optical or film scanners, audio response units and all other System/360 compatible devices.

For more information, circle No. 56 on the Reader Service Card

* * *

The first of several optional special features of the MARK IV File Management System has been announced by Informatics Inc.

The new feature, Table Lookup, according to C. Gordon Utt, MARK IV Marketing Manager, operates as an integral part of MARK IV. It allows a reduction in file size through the use of codes which are automatically translated by MARK IV to produce attractive reports. The previous time consuming task of creating tables and retrieval techniques for processing this type of information is greatly simplified by this special feature.

MARK IV, a proprietary software product of Informatics, is a general purpose file management system now in use with IBM System/360 software in over 60 installations in North and South America, Europe, Africa and Asia.

For more information, circle No. 57 on the Reader Service Card

* * *

The Ince-Data Mark II data acquisition system utilizes IBM-compatible magnetic tape cartridges to completely eliminate digital playback conversion. It can be cartridge-loaded and programmed in the field. The solid state system has five basic components: programmable data formater/controller, analog and digital multiplexer, analog to digital converter, digital clock, magnetic tape recorder.

Data format handles up to 144 individual digital characters. Systems control is achieved with a 400-pin patchable connector.

High-speed analog multiplexer sequentially samples 20 differential or 40 single-ended inputs, with single scan, continual scan or start/stop scan rates.

Digital clock correlates all input data. Front panel decimal display shows days, hours, minutes and seconds. Clock can be used to drive external controls or remote displays. Pre-set and start/stop controls provide start/stop synchronization with external time standard.

Incremental magnetic tape recorder is 7-track and compatible with IBM NRZI



at densities of 200 and 556 BPI, and records at speeds up to 2,000 characters per second synchronous speeds and up to 1,000 characters per second asynchronous. Recorder uses a self-threading single speed cartridge for quick and easy loading or reloading; each cartridge holds 1,000 feet of 1.5 mil mylar tape wound on a removable 6" diameter reel. All recorder controls can be mounted remotely.

It measures 6 1/2" high, 7 1/4" wide, 13 1/2" long; weighs approximately 29 pounds. Standard power is +28 volts dc at 4 amps; optional power converters are +12 volts dc, and 60 Hz, 400 Hz, 115 volts.

For more information, circle No. 58 on the Reader Service Card

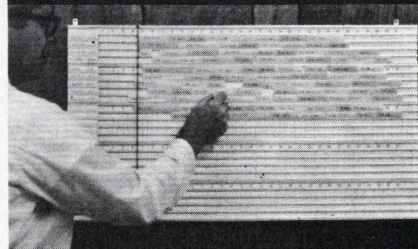
* * *



Single laboratory analyst operates the new OMEGA Data Reduction System recently introduced by Beckman Instruments, Inc., Fullerton, California. The new sys-

VISU-TROL SOLVES SCHEDULING PROBLEMS

- Provides Realistic Production Scheduling
- Assures Full Capacity Loading
- Permits Easy Schedule Changes
- Shows Available Open Time Slots



SEE AT-A-GLANCE

VISU-TROL™ SHOWS SCHEDULE OF: COMPUTER TIME • MACHINE LOAD MANPOWER • MATERIAL • BUDGETS TRAINING SCHEDULES JOB ORDERS

Colored vinyl write-on labels. Extruded aluminum channels. You can enlarge board with additional basic boards.

COMPLETE — including basic supplies — \$49.49

Packaged Board ORDER NOW

FREE Complete Systems Manual for: Computer Scheduling, Machine Loading.

For FREE VISUAL CONTROLS BROCHURE only write Dept. SA-11.

W

(203)-227-4111

WASSELL ORGANIZATION, INC.

25 Sylvan Road South, Westport, Conn. 06880
Wassell Systems Canada Ltd., Toronto

For more information, circle No. 32 on the Reader Service Card

S-T-R-E-T-C-H

Your EDP \$\$\$'s

\$9950

Buys Any Of These Devices

- Aweco keypunch acoustic silencer covers — teletype model too.
- Columbus Forms Splicer. Don't throw away left-over forms stacks; don't interrupt long printing runs.
- Portable keypunch; not a toy, precision made for manual keypunching needs.



PERIPHERY, Inc.

65 Nicholas Road
Framingham, Mass. 01701 (617) 877-5111

For more information, circle No. 33 on the Reader Service Card

61

MIS
INCORPORATED

THE PROFESSIONAL PLACEMENT SERVICE

173 NEWBURY STREET • BOSTON, MASSACHUSETTS 02116
(617) 262-1900

We are . . . a specialized Personnel Consulting Firm staffed and managed by individuals with proven experience and a thorough knowledge in all areas of data processing . . . professionals working for professionals. The need for qualified management and support personnel is critical. Our objective is to fill this need. We can succeed only by understanding your individual requirements. We look forward to working with you.

■ SYSTEMS/MATH ANALYSTS

■ OPERATIONS RESEARCH

■ PROGRAMMERS/BUSINESS/SCIENTIFIC

■ MIS SPECIALISTS

THERE IS NEVER A CHARGE FOR OUR SERVICES

An Equal Opportunity Employer

tem provides laboratory analysts in a wide range of industries with exclusive use of an Olivetti Underwood computer in their laboratories for time-saving analyses. Now in use with liquid scintillation instrumentation, the new system is also adaptable for use with fluorometers, infrared and ultraviolet spectrophotometers, atomic absorption analyzers, electrochemical equipment. The computing module is the Olivetti Underwood Programma 101 desktop-size computer.

For more information, circle No. 59
on the Reader Service Card

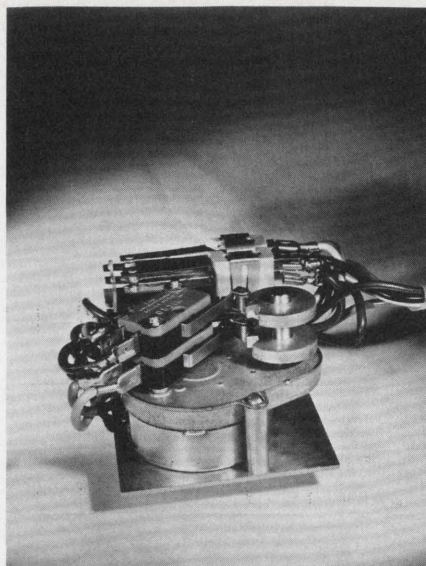
The 101 desktop computer by Olivetti Underwood Corporation. New desktop-size computer is programmable for use in a wide range of businesses, schools, laboratories and hospitals. It is little larger than a typewriter, yet it can "write", store, and run programs calling for as many as 120 mathematical steps and instantly print out results on paper tape. The 101 sells outright for \$3,850.

For more information, circle No. 60
on the Reader Service Card

A time delay relay for use in temperature control and regulation applications has been unveiled by the Industrial Timing Division of Sessions here. Sessions is a subsidiary of Consolidated Electronics Industries Corporation.

Sessions has been granted preliminary patent authorizations.

The device enables a compressor to operate independent of a timer and is



believed to be the only electro-mechanical device of its type on the market.

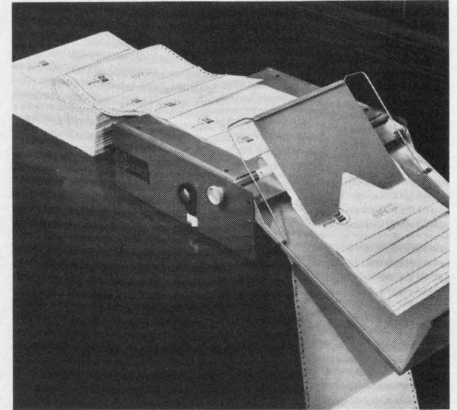
The standard 115-volt, 60-cycle package utilizes split adjustable cams and Sessions' high reliability S-2000 series synchronous motor. The electrical no-back motor is patented by Sessions and is known for its ability to withstand high static loads. Torque rating is 30 oz. in. @ one rpm.

The device incorporates a 3½x2½x3" package with a variety of mountings available. It provides time delay relay in case of power failure with automatic set and restart characteristics. The device to be controlled remains activated as long as the thermostat is energized.

For more information, circle No. 61
on the Reader Service Card

A new type continuous envelope using a radically different method of affixing conventional envelopes to carrier strips has been developed by Moore Business Forms, Inc. The new product, called "Mooremailer," offers many unique features heretofore unavailable in a continuous envelope. In the Mooremailer, regular correspondence envelopes are affixed to a carrier strip by four glue spots positioned under the envelope flaps. These spots are not visible when the flap is sealed, making each envelope appear as individually addressed instead of mass addressed.

Developed especially for use in computer-driven printers and other writing equipment, the unique edge-to-edge position of the envelopes keeps non-printing time to a minimum. The low profile flap allows greater printer address area and minimizes the possibility of ribbon shadow or character omission.



When feeding, envelopes lie perfectly flat with no loose edges or overlapping flaps, to cause smudging or spotty impressions, when run on high speed printers, tabulating machines, electronic accounting machines and typewriters with pin feed devices.

For more information, circle No. 62
on the Reader Service Card

The Graphics & Instrument Division of Electronic Associates has introduced a new series of X-Y recorders.

The first in this line of plotters is the OEM-17 X-Y recorder, a new concept in plotter design for the original equipment manufacturer.

The OEM-17 plotter employs a highly reliable, low cost design using a DC servo system. It offers flexibility in size and interface to accommodate various system requirements. The plotter is available with its own power supply or can be supplied with power from the system.

Some features of the OEM-17 include: a 17" x 17" plotting surface; sealed feedback potentiometers; a magnetic paperhold system; a disposable fibre-tip pen writing system; and static accuracy of ±0.2% of full scale.

For more information, circle No. 63
on the Reader Service Card

**WCP HAS INVENTED
WCP NEWS
TO HELP 600 EDP MANAGERS
FIND YOU**



(it's a free service.)

WCP NEWS provides a confidential exchange of information between fee-paying companies and top EDP personnel seeking advancement; and, is only part of WCP's direct efforts to bring together the best computer-oriented companies and you. A free copy of WCP NEWS will show how it works.

Contact:

WCP / INFORMATION SYSTEMS
PERSONNEL RECRUITING
AND CONSULTING

An agency affiliate of Western Operations, Inc.
120 Montgomery St., San Francisco, Calif. 94104
(415) 981-1131

62 For more information, circle No. 34
on the Reader Service Card



EDP-SYSTEMS

WE SPECIALIZE IN CAREER CORRECTION

ARE YOU 'UNDERED'?

UNDER . . . PAID or UNDER THE WRONG BOSS . . . UNDER THE
WRONG CLIMATE or UNDER PROMOTED
UNDER UTILIZED or UNDER THE WRONG HOURS . . . UNDER THE
WRONG POLICIES . . . or just "UNDERED"?
FOR "OVERING" . . . CALL WA 3-2640

LAWRENCE PERSONNEL

1015 Chestnut, Philadelphia, Pennsylvania 19107

FEE PAID BY CLIENT COMPANIES • NO CONTRACTS • ALWAYS CONFIDENTIAL

Engineers, scientists, programmers

Sooner or later you're going to want a better job.

If it's sooner, read this ad.

It's the shortest cut we know to some of the best job opportunities to come along in a long time.

How do we know?

We know because we are General Electric, Honeywell, McDonnell Douglas, Westinghouse Electric Corporation, Emerson Electric, Eastman Kodak, AC Electronics, Control Data, Philco-Ford, Collins Radio, Bendix, Conductron/Missouri, Perkin Elmer, Texas Instruments, Martin Marietta—Denver, Litton, Itek and other top companies which attend Career Centers.

We get together because, just as one of our Career Centers gives you the broadest possible choice among jobs, it gives us the best possible chance to interview and hire large numbers of engineers and scientists in just a few days.

To make certain you're in line for the choicest of these jobs (jobs paying from 10K to 28K) it's important for you to pre-register for the Career Center that's scheduled to visit your locality.

We will evaluate your qualifications—minus your name and address—well before the Center begins. Our representative will arrange a personal, private interview schedule for you with those of us you are interested in meeting. Even if your present employer is there, he won't know you are.

So, the sooner the better. And nothing could make it sooner than filling out and mailing the coupon today. We'll have a complete registration kit in your hands before you know it. Another thing, there are never fees for you to pay.

***Meet us in San Francisco during FJCC at the Miyako Hotel, December 9-11, 1968, 9am to 9pm. Call (415) 433-2630.**



Equal Opportunity Employer

Mr. Sam Adler, Career Center, 635 Madison Avenue, New York, N.Y. 10022

- | | |
|--|---|
| <input type="checkbox"/> January 3-4 Dallas | <input type="checkbox"/> April 2-3 Philadelphia |
| <input type="checkbox"/> January 9-10 Atlanta | <input type="checkbox"/> April 10-11 Rochester |
| <input type="checkbox"/> January 16-17 Philadelphia | <input type="checkbox"/> April 17-18 Cleveland |
| <input type="checkbox"/> January 23-24 New York | <input type="checkbox"/> April 24-25 Houston |
| <input type="checkbox"/> January 30-31 Boston | <input type="checkbox"/> May 1-2 Washington, D.C. |
| <input type="checkbox"/> February 6-7 Washington, D.C. | <input type="checkbox"/> May 7-8 Pittsburgh |
| <input type="checkbox"/> February 13-14 Pittsburgh | <input type="checkbox"/> May 13-15 Boston (SJCC) |
| <input type="checkbox"/> February 20-21 Minneapolis | <input type="checkbox"/> May 21-22 New York |
| <input type="checkbox"/> February 25-26 San Diego | <input type="checkbox"/> May 27-28 Minneapolis |
| <input type="checkbox"/> February 27-28 Los Angeles | <input type="checkbox"/> June 5-6 Los Angeles |
| <input type="checkbox"/> March 6-7 Palo Alto | <input type="checkbox"/> June 10-11 Palo Alto |
| <input type="checkbox"/> March 12-13 Milwaukee | <input type="checkbox"/> June 19-20 Chicago |
| <input type="checkbox"/> March 18-19 Hartford | <input type="checkbox"/> June 26-27 Philadelphia |
| <input type="checkbox"/> March 24-27 New York (IEEE) | |

Career Center is not coming to my city in the near future, but please register me for consideration by employers attending all Career Centers.

I plan to attend the center(s) checked below. Please send me full information.

_____ Name

_____ Address

_____ City

_____ State _____ Zip

Your career means as much to us as it does to you.

Here's why:

Source Edp has a single purpose: to improve your career. Our success depends on it. The growth of our firm over the past six years is evidence of this success. Source Edp is the largest recruiting firm in the United States dedicated solely to the computer field.

Information processing is a "people" business.

No recruiting firm is better than the people who work there. That's why Source Edp has a staff composed of top Directors of MIS, IBM Executives and Systems Management Consultants. The individual you talk to at Source Edp has already been where you would like to go. So he's able to help you plan your career on an intelligent, long-range basis.

Our coverage is worldwide.

Source Edp can provide selective exposure that can't be matched. With offices in major metropolitan areas, Source Edp is where the positions are. We stay up-to-the-minute on openings and personally visit our

clients to gain a full understanding of their plans, environment and potential for the individual. In addition to openings in the United States, Source Edp is constantly being retained by its clients to fill computer positions throughout the world.

We work full time on your future.

Opportunities for the computer professional today are simply too varied and numerous to allow any one individual to survey the field adequately . . . particularly on a part-time basis. To optimize career success you need the full-time help of professionals. The type of help offered by Source Edp.

You may never know about the best positions of all.

The one best position for you may be available *only* through Source Edp. Many Source Edp openings are exclusive. And most are not advertised. But whether the position is an exclusive or not, it can only be recommended to an individual whose interests and abilities are familiar to us. Since no

one can tell when the right position for you might be available it's important that you make yourself known to us *now*.

How can we prove ourselves?

There are three things we can do to prove ourselves.

First, call your local Source Edp office. Make a date to go in and talk. There's no cost or obligation and all calls are kept in complete confidence. When you talk to one of our people ask him about *his* computer background.

Second, if you're attending the Fall Joint Computer Conference visit the fully staffed Source Edp office in San Francisco. It's been serving computer professionals in that area for over two years.

Third, write for our free **Computer Salary Survey and Opportunities Analysis**. It will give you a wealth of information and show you just how familiar we are with your chosen profession. You can get your copy by circling the reader service number or, for faster service, write directly to the Source Edp office nearest you.

Send for your free Computer Salary Survey and Opportunities Analysis today.

Chicago—David B. Grimes, 100 S. Wacker Drive (312) 782-0857
Dallas—Paul K. Dittmer, 7701 Stemmons Freeway (214) 638-4080
Detroit—Charles C. Walther, 2990 West Grand Blvd. (313) 871-5210
Los Angeles—Robert G. Harrison, 3470 Wilshire Blvd. (213) 386-5500
Minneapolis—Fred L. Anderson, 801 Nicollet Mall (612) 332-8735
New York—Edward R. Golden, 1414 Ave. of the Americas (212) 752-8260
San Francisco—Richard O. Clark, 111 Pine Street (415) 434-2410

source  edp

For more information, circle No. 19 on the Reader Service Card

software age

THIS INQUIRY IS IN
DIRECT RESPONSE TO
YOUR ADVERTISEMENT
IN
SOFTWARE AGE
MAGAZINE

CONFIDENTIAL INQUIRY

Your original copy of this form will be retained at the offices of SOFTWARE AGE and will be used for no other purpose than to notify the specific firms which you have checked (on the reverse side) of your interest.

TYPE OR PRINT CLEARLY FOR PHOTO REPRODUCTION

JOB DESIRED: _____

List computer hardware knowledge (names of systems, tape, disk, terminals, etc.): _____

Programming specialties and years of experience (commercial, scientific, theoretical, experimental, analog, etc.): _____

Systems programming on which you have had development experience (compilers, assemblers, executives, monitors, O.S., etc. Indicate for what computer): _____

Programming languages used and extent of experience (COBOL, FORTRAN, etc.): _____

Applications programmed (aerospace, banking, insurance, math subroutines, compilers, etc.): _____

Systems analysis experience (card design, flow charting, operation analysis, etc.): _____

EDP management experience (include years and number of people reporting to you): _____

SALARY: _____ (current) _____ (desired) DATE OF AVAILABILITY: _____

EDUCATION: Indicate major as well as degree unless self-explanatory.

Degrees _____	_____	_____
Years _____	_____	_____
Schools _____	_____	_____

EMPLOYMENT: Indicate present employment and previous jobs below.

Employer _____	_____	_____
City _____	_____	_____
Years _____ to _____	_____ to _____	_____ to _____
Title or Function _____	_____	_____

Name _____ Age _____

Home Address _____ Home Phone _____

_____ (city) _____ (state) _____ (ZIP code) U.S. Citizen? _____

Security Clearance _____ Location Preference _____

Marital Status _____

Military Status _____

BE SURE YOU HAVE CHECKED ON REVERSE SIDE
THE COMPANIES YOU WANT TO SEE THIS INQUIRY.
PUT FORM IN STAMPED ENVELOPE AND MAIL TO:

software age

MAGAZINE

1020 CHURCH ST., EVANSTON, ILL. 60201

check your interests here

Fill in the confidential inquiry form on the other side of this sheet. This form provides all the information advertisers require to screen applicants. If further information is desired, you will hear from the advertiser direct. Then, check below the boxes of those companies to which you want copies of your

form sent. Mail to SOFTWARE AGE, 1020 Church Street, Evanston, Illinois 60201. (Please do not send us your own resume. We will only process this form. A new form must be filled out for each issue in which you are answering ads.)

	Page
<input type="checkbox"/> 1. Ampex Corp.	44
<input type="checkbox"/> 2. Army & Air Force Exchange Service	34
<input type="checkbox"/> 3. Ashland Oil & Refining Co.	20
<input type="checkbox"/> 4. Auerbach Corp.	41
<input type="checkbox"/> 5. Bendix Corp., Kansas City Div.	45
<input type="checkbox"/> 6. Blue Cross-Blue Shield	35
<input type="checkbox"/> 7. Collins Radio Co.	13
<input type="checkbox"/> 8. Computer Applications, Inc.	53
<input type="checkbox"/> 9. Computer Usage Co., Inc.	37
<input type="checkbox"/> 10. Continental Illinois National Bank	21
<input type="checkbox"/> 11. Control Data Corp.	47
<input type="checkbox"/> 12. General Electric Co., Information Service Dept. ..	39
<input type="checkbox"/> 13. General Electric Co., Information Systems Equip- ment Div.	39
<input type="checkbox"/> 14. Hamilton Standard Div. of UAC	30
<input type="checkbox"/> 15. Honeywell, Inc., Electronic Data Processing Div.	3rd Cover
<input type="checkbox"/> 16. Hughes Aircraft Co., Aerospace Div.	15
<input type="checkbox"/> 17. Hughes Aircraft Co., Fullerton	28
<input type="checkbox"/> 18. IBM Corp.	49
<input type="checkbox"/> 19. ITT Federal Electric Corp.	26
<input type="checkbox"/> 20. Jet Propulsion Laboratory	55
<input type="checkbox"/> 21. Johnson & Johnson	27
<input type="checkbox"/> 22. Link Group, General Precision, Inc.	30
<input type="checkbox"/> 23. Lockheed-Georgia Co.	36
<input type="checkbox"/> 24. Management Science of America, Inc.	46
<input type="checkbox"/> 25. McDonnell Douglas Corp./Santa Monica	12
<input type="checkbox"/> 26. McDonnell Douglas Corp./St. Louis	12
<input type="checkbox"/> 27. Mellonics Systems Development Div. Litton Systems, Inc.	51
<input type="checkbox"/> 28. Montgomery Ward Data Center	22
<input type="checkbox"/> 29. National Cash Register Co.	57
<input type="checkbox"/> 30. National Cash Register Co., Electronics Div.	19
<input type="checkbox"/> 31. North American Rockwell Autonetics Div.	59
<input type="checkbox"/> 32. Northrop Corp.	4
<input type="checkbox"/> 33. Pratt & Whitney Aircraft	18
<input type="checkbox"/> 34. Raytheon Co., Equipment Div.	4th Cover
<input type="checkbox"/> 35. RCA, Information Systems Div.	25
<input type="checkbox"/> 36. RCA, Staff Employment Dept.	3
<input type="checkbox"/> 37. S/A Dept. 1105	48
<input type="checkbox"/> 38. Scientific Data Systems	50

	Page
<input type="checkbox"/> 39. Sikorsky Aircraft	31
<input type="checkbox"/> 40. A. E. Staley Manufacturing Co.	40
<input type="checkbox"/> 41. System Development Corp.	33
<input type="checkbox"/> 42. TRW Systems Group	2nd Cover
<input type="checkbox"/> 43. Vitro Laboratories	24
<input type="checkbox"/> 44. Xerox Corp.	29

EMPLOYMENT AND SEARCH AGENCIES

<input type="checkbox"/> 45. Callahan Center for Computer Personnel	60
<input type="checkbox"/> 46. Career Center	63
<input type="checkbox"/> 47. Computer Careers Inc.	20
<input type="checkbox"/> 48. Computer Personnel Agency, Inc.	34
<input type="checkbox"/> 49. Computer Personnel Consultants	10
<input type="checkbox"/> 50. Data Management Services, Inc.	36
<input type="checkbox"/> 51. Griffing, Inc.	46
<input type="checkbox"/> 52. Robert Half Personnel Agencies	40
<input type="checkbox"/> 53. Input, Inc.	40
<input type="checkbox"/> 54. Everett Kelley Associates, Inc.	34
<input type="checkbox"/> 55. LaSalle Associates	38
<input type="checkbox"/> 56. Lawrence Personnel	62
<input type="checkbox"/> 57. Management Scientists, Inc.	50
<input type="checkbox"/> 58. MIS, Inc.	61
<input type="checkbox"/> 59. National Manpower Register	23
<input type="checkbox"/> 60. Professional Career Center	54
<input type="checkbox"/> 61. RSVP Services	40
<input type="checkbox"/> 62. Sheridan Associates	46
<input type="checkbox"/> 63. Source EDP	64
<input type="checkbox"/> 64. Taurus Associates	38
<input type="checkbox"/> 65. WCP Information Systems Personnel	62

PRODUCTS AND SERVICES

(Use Reader Service Card)

Anaheim Publishing Co.	11
Hexco, Inc.	38
Magnetic Aids, Inc.	60
Periphery, Inc.	61
Science/Systems	56
Wassell Organization, Inc.	61

I do not now receive S/A. Please enter my FREE subscription.

Name Street Address

City State Zip Code

Prime Experience in What Industry / My Specialty

Technical Degree Non-Technical Degree No Degree

..... I Have Analog/Hybrid Experience

Year Born



1020 Church Street
 Evanston, Illinois 60201