

LOGISTICS RESEARCH INC.

P. O. BOX 431
141 S. PACIFIC AVENUE
REDONDO BEACH, CALIFORNIA
OREGON 8-7108

May 28, 1956

Dean of Science and Engineering
University of Queensland
Queensland, Australia

Dear Sir:

You will find information enclosed on the low-cost ALWAC III-E general purpose, electronic digital computer. Logistics Research Inc. has designed, engineered and produced the best product in the low-cost field, and it is available on six months delivery.

Throughout the world, but particularly in the U.S., centers of learning such as yours are aware of the increasing significance of cybernetics in the sciences, education, industry, and government.

Electronic computers have become practical and invaluable tools in the swift computation of everyday scientific-engineering-research, as well as business-industrial-governmental problems. The techniques of computer application and programming, while progressing rapidly, have yet far to go before their tremendous potential is fully realized.

A number of fine universities are already pioneering in this field, as both educators and practitioners of this advancing new science. They have also discovered that their computers may be applied with profit to the problems of nearby scientific, engineering, and research organizations, to the mutual benefit of all concerned.

The ALWAC III-E machine is relatively simple to operate and maintain, with reliability stressed in every phase of its construction and operation. Several outstanding universities will take delivery on their ALWAC computers later this year.

We invite you to investigate the ALWAC III-E, examining its flexibility and range, so well suited to the wide scope of institutional requirements. Please let us know if you desire further information, or care to discuss computer application with a representative.

Thank you for your consideration.

Sincerely,

Abbott Kinney
Abbott Kinney
Advertising Director

AK:nb

Enclosure

*any by hand
are you interested
in this?*

W. B. B. Taylor
ps/le

LOGISTICS RESEARCH INC.

100 BOX 441
100 PACIFIC AVENUE
REDWOOD BEACH, CALIFORNIA
CROSSING 5-7100

MAY 22, 1956

Dean of Science and Engineering
University of Queensland
Queensland, Australia

Dear Sir:

You will find information enclosed on the low-cost AIWAC III-E general purpose, electronic digital computer. Logistics Research Inc. has designed, engineered and produced the best product in the low-cost field, and it is available on six months delivery.

Throughout the world, but particularly in the U.S., centers of learning such as yours are aware of the increasing significance of cybernetics in the sciences, education, industry, and government.

Electronic computers have become practical and invaluable tools in the swift computation of everyday scientific-engineering-research, as well as business-industrial-governmental problems. The techniques of computer application and programming, while progressing rapidly, have yet far to go before their tremendous potential is fully realized.

A number of fine universities are already pioneering in this field, as both educators and practitioners of this advancing new science. They have also discovered that their computers may be applied with profit to the problems of nearly scientific, engineering, and research organizations, to the mutual benefit of all concerned.

The AIWAC III-E machine is relatively simple to operate and maintain, with reliability stressed in every phase of its construction and operation. Several outstanding universities will take delivery on their AIWAC computers later this year.

We invite you to investigate the AIWAC III-E, examining its flexibility and range, as well suited to the wide scope of institutional requirements. Please let us know if you desire further information, or care to discuss computer application with a representative.

Thank you for your consideration.

Sincerely,

Abbot Kinney
Advertising Director

AK:nd
Enclosure

alwac III-E

ELECTRONIC DIGITAL COMPUTER

- SCIENCE
- ENGINEERING
- INDUSTRY
- BUSINESS
- GOVERNMENT
- FINANCE

LOGISTICS RESEARCH INC.

141 PACIFIC AVENUE REDONDO BEACH, CALIFORNIA

WHAT CAN ALWAC DO?

The ALWAC III-E is a low-cost, general purpose, electronic digital computer designed for an extraordinary range of application to the problems of scientific-engineering-research and business-industrial-financial organizations. If a problem can be explicitly formulated — ALWAC can solve it at electronic speed.

ALWAC is able to organize, calculate, and make decisions. By using an internally stored sequence of instructions set up by the operator to apply to simple or complex problems, ALWAC can absorb facts (words or numbers), store, sort, distribute, rearrange, and then call them when needed for calculation, modification, or for output.

ALWAC can store and obey a sequence of up to 16,000 instructions, and by adding, multiplying, subtracting or dividing is capable of calculating required answers of any degree of complexity, in any desired sequence.

Individual steps in a routine can be judged or monitored, and the process guided by decision or branch points in the routine. ALWAC's power is based on its ability to choose different courses of action depending on the nature of some intermediate results — even to the extent of changing criteria by which it decides.

When decision criteria are logical or quantitative, they can be coded into standardized routines, placed in permanent storage, and used repeatedly in miscellaneous problems as required.

The machine's "eyes", "ears", and "voice" are inputs and outputs — punched paper tape, magnetic tape, punched cards, typewriter keyboard or high-speed reader.

A FEW CURRENT ALWAC APPLICATIONS ARE...

Aerodynamics

Wind tunnel calculations, tables of Mach number as a function of speed and altitude, missile guidance simulation, airframe system analysis, structural analysis, ballistics and trajectory analysis, miscellaneous data reduction, etc.

Scientific Design & Research

Electromagnetic diffraction and reflection, servo-analysis, non-linear potentiometer design, curve and surface fitting, propagation techniques, etc.

General Computation

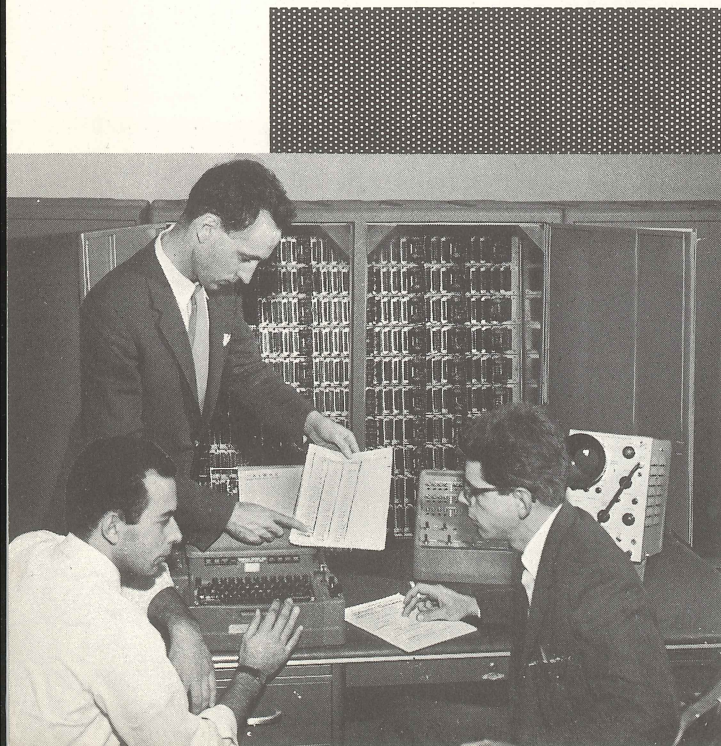
Simultaneous equations, differential equations, mass spectrometer computations, X-ray diffraction data reduction, operations research, stochastic processes, eigenvalue determination, etc.

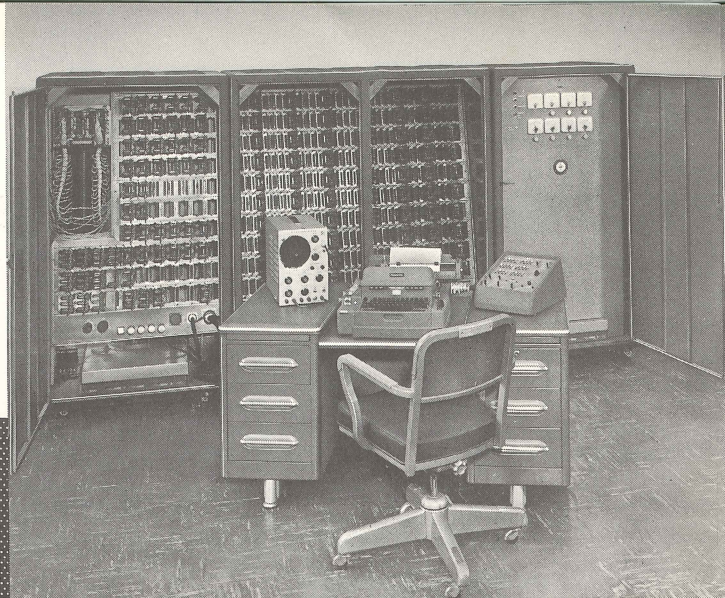
Network Analysis

For public utilities: gas distribution analysis, power load distribution problems, etc.

Preliminary Design

Gas turbine design and analysis, stress problems, fluid mechanics, thermodynamic studies, etc.





Linear and Non-Linear Programming

In a non-linear petro-chemical industrial application, ALWAC is utilized to solve blending and cost problems. The machine takes into account such factors as limiting vapor pressure, effects of adding catalyst polymer to different base stocks, required octane number of output, and different results of adding tetra-ethyl lead to various base stocks. Linear programming applications, i.e. production scheduling, theory of games (military logistics), etc.

Surveying

ALWAC is used to close traverses and automatically distribute error of closure. Surveyors have discovered ALWAC convenient for running out lot boundaries, boundary and street intersections, shots for placing curb stakes, and other miscellaneous trigonometric work.

Tabular Data

A customer finds ALWAC efficient at preparing weight tables of linear pipes and rods, in assorted shapes and sizes.

Meteorology

ALWAC is applied to correlate meteorological data for forecasting, and other purposes.

The brief descriptions listed are a small sampling of ALWAC's scope. Perhaps the most significant point regarding computer application is that not only has ALWAC tremendously reduced the time formerly required to perform simple and complex calculation, but that users are constantly discovering new and entirely different ways in which the machine can be applied to assist their operations.

RELIABILITY

The elemental factor in every phase of ALWAC design, construction and operation is reliability. Actual "up-time" tabulation of ALWAC machines installed...Averages 96%.*

All ALWAC electrical components are utilized well below their operating ranges. Marginal operation is pin-pointed through an elementary detection method, as well as by automatic checking features in various critical computing sequences.

ALWAC electronic components are built in standardized plug-in units of only a few types, with extensive use of compact etched circuitry — making marginal plug-in replacement simple. Plug-in unit test equipment comes with ALWAC, allowing quick checking of circuitry components.

Coding or machine errors such as unforeseen overflow of an arithmetic register, or loss of information in copying from one memory channel to another, are prevented by built-in checks.

ALWAC will stop and give an alarm if any of these errors should occur, indicating type of error by control panel lights.

The quality of ALWAC performance reflects the fine engineering, and skilled craftsmanship which is the hallmark of all LOGISTICS RESEARCH INC. products.

*LOGISTICS RESEARCH INC.'s "up and down-time" figures are based on a 40-hour week. Scheduled and non-scheduled maintenance time is accounted for within the 40-hour week average operating time percentage.

SPECIFICATIONS

TYPE: General Purpose, Stored-Program, Binary.

STORAGE: Magnetic Drum.

3500 RPM
4096 word main storage. (Standard)
8192 word main storage. (Optional)
128 words of fast access storage.
4 arithmetic registers.
32 words of fast access storage for constants.

WORD STRUCTURE: 32 binary bits plus sign. (Up to 4,294,967,295.)

OPERATIONS (103):

Instruction Type

Single address (two or four operations per word.)

Number of Operations

22 Copy and Exchange	12 Input-Output
10 Transfer Control	9 Card Converter
14 Arithmetic	16 Magnetic Tape
8 Block Transfer	2 High-Speed Reader
10 Modify Accumulator	

SPEED:

Add or Subtract	1-9 ms.
Multiply or Divide	17-25 ms.
Shift	1-17 ms.
Compare	1-9 ms.
Transfer	1-9 ms.

INPUT-OUTPUT: Decimal, Alphabetic, or Hexadecimal.

Standard Equipment

Flexowriter	10 char./sec. (Multiple units with priority control can be attached.)
-------------------	---

Optional Equipment

High-Speed Reader	400 char./sec.
Card Converter	100 cards/min.
Magnetic Tape	10,000 char./sec.
Motorized Punch	20 char./sec.
Teletype Punch	60 char./sec.

PHYSICAL CHARACTERISTICS:

Three cabinets with combined overall dimensions of 29" deep x 125" wide x 67" high. Cabinets are mobile, mounted on ball-bearing swivel casters, and may be separated.

	Width	Weight
Memory	47 in.	600 lbs.
Power Unit	34 in.	900 lbs.
Arithmetic and Control Unit	55½ in.	600 lbs.
Total Weight: 2200 lbs.		
Power: 6½ KW, 220V, 60 cycles, single phase.		

DERATING:

Clock-pulse rate of 67 kc.

Trigger voltage levels of 0 and 15.

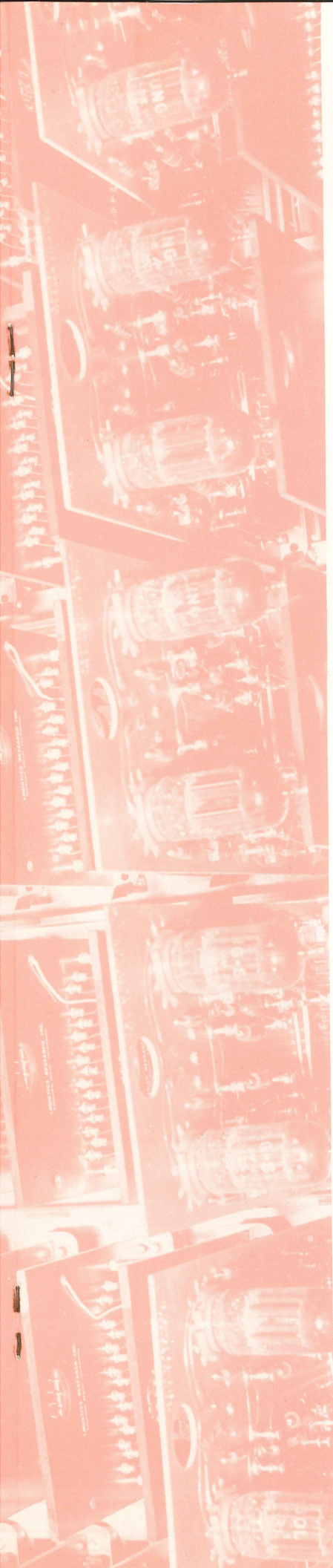
Dynamic response characteristics of circuitry relatively non-critical. Normal drift in characteristics does not affect ALWAC's operation.

ALWAC utilizes small part of its tube and diode rated capacity.

COOLING:

Adequate cooling of computer at normal room temperature is provided by internal fans. Room temperature should not exceed 80°F. An outside exhaust fan is recommended if computer room is not air conditioned.

*Ranges from 6½ to 8 KW with auxiliary equipment tied-in.



INPUT - OUTPUT

Input-output for the ALWAC III-E can be decimal, alphabetic, or hexadecimal. Fast conversion routines, or automatic conversion requiring no computer time permit maximum data rates for most applications.

The versatile set of input-output equipment currently available with the ALWAC III-E model is listed below. These units may be incorporated singly, or in various combinations to suit particular needs.

STANDARD

FLEXOWRITER 10 char./sec. input-output. Keyboard, paper tape reader, and punch. Various combinations may be utilized. Computer may call for intermittent input. Full control of output format by coding.

OPTIONAL

HIGH-SPEED READER 400 char./sec., or a block of 32 words received for permanent storage in 1.5 seconds. Input only, reading punched paper tape.

CARD CONVERTER 100 cards/min. (80 columns of alphanumeric characters per card.) 16 words may be read or written from each card, or less if desired. (x-overpunches for sign.)

MAGNETIC TAPE 10,000 char./sec. Search, read or write. 500 in./sec. rewind. (2,000,000 decimal digits per reel.) Start and stop time, 20 milliseconds. (Tape buffer unit has a capacity of 32 words each of 32 bits plus sign and is able to control 16 individual tape handling units.) Tape has 2400 feet of ½ in. tape, with 7 tracks. The 5th track is utilized for parity check.

MOTORIZED PUNCH 20 char./sec.

TELETYPE PUNCH 60 char./sec.



FEATURES

THE E-REGISTER

ALWAC III-E is so designated because one arithmetic register, called the E-register, has two important uses — automatic address modification and tallying.

The E-register can serve as a base-register for relative-address coding. Successive tallying operations will shift the base one position at a time until it reaches a pre-determined point, when the routine will automatically leave the loop.

NUMBER SYSTEM

Binary, decimal, or hexadecimal.

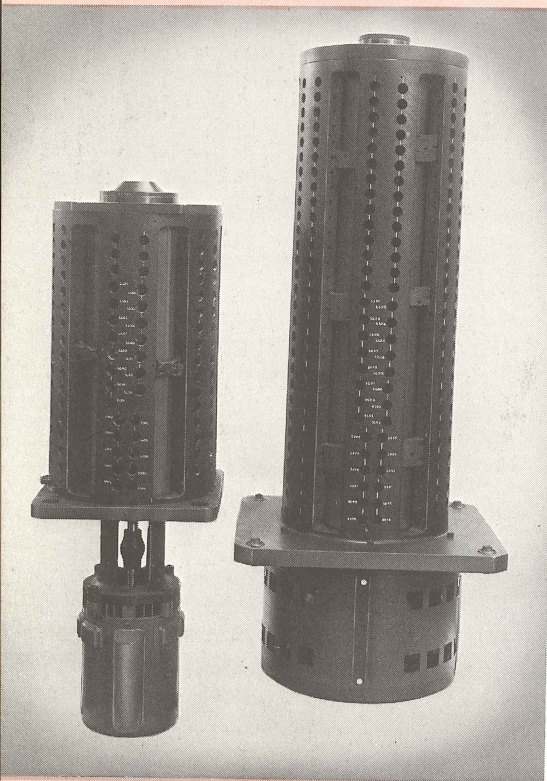
OPERATION

Fixed point, either integer or fractional. Floating point operation may be readily programmed using operations provided for that purpose.

INSTRUCTION

Single address. Take next instruction from next storage position unless change of control is ordered.

RELIABILITY



The ALWAC III-E has a flexible repertoire of 103 operations, including:

E-REGISTER

This is a special 16 bit register which is added to the address portion of any marked operation, just prior to operation execution.

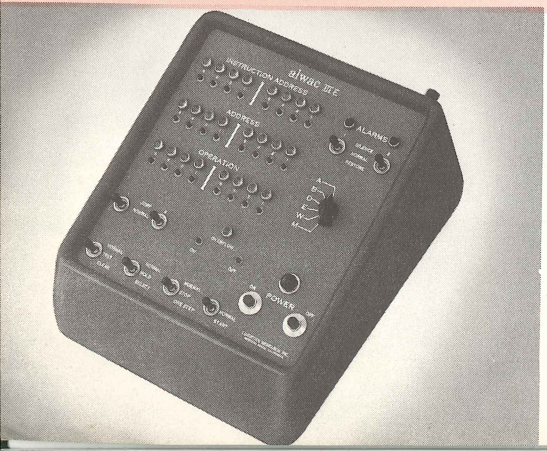
The address is not altered in storage, so that numbers may be called from a sequence of addresses without need to restore or prestore the starting address. An entire group of operations requiring change of address can be altered in one E-register operation.

The E-register simultaneously serves as a tally device in repetitive routines. It may also be used with input from the High-Speed Reader to alter addresses within subroutines, permitting placement of input at any point in the storage.

FLOATING DECIMAL POINT CODING

Float instruction brings first non-zero digit to extreme left bit position. Special counter tallies the number of shifts for addition or subtraction of exponent.

VERSATILITY



SUB-ROUTINE LIBRARY

APPLICATIONS DIVISION

CONTROL PANEL

Power "on" and "off" switches and indicator.
The "run", "stop", or "step-by-step" selector.

Displays and Reset Buttons:

- Next Order Address Register
- Address Register
- Order Register
- Overflow Indicator
- Operator Error Alarm
- Machine Error Alarm

Decision switches controlling selection of alternatives at branch points in routines. Rotary switch selecting one of arithmetical registers for display on adjacent oscilloscope.

DESIGN

Most ALWAC components are on plug-ins. The plug-ins can be individually removed, thoroughly tested and quickly returned to the machine — making for simple marginal checking and easy maintenance.

OPERATIONS

MULTIPLE PRECISION ARITHMETIC

Retention of overflow bits aids in multiple precision operations. A and B registers may be used as a double length accumulator.

COMPARISON AND TRANSFER OF CONTROL

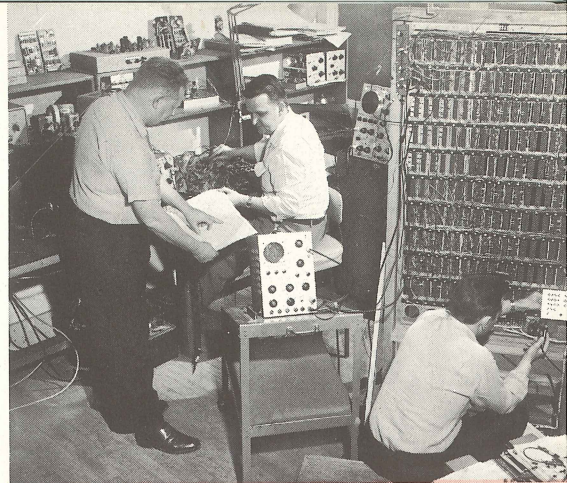
Eight different jumps and conditional jumps.

TRANSFER BETWEEN BULK AND QUICK ACCESS STORAGE

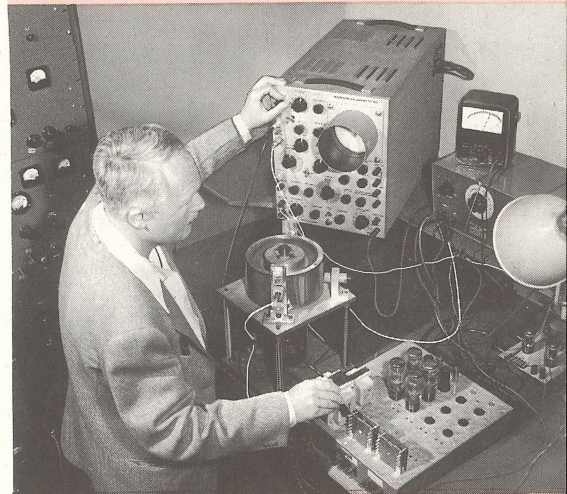
Blocks of 32 words may be transferred between quick access loops and main storage. New material is written over old with no erasure required, thus the information is in both the old and new positions after execution of operations.

AUTOMATIC CONVERSION

Input from Flexowriter or High-Speed Reader may be automatically converted to binary by using operations provided for that purpose.



SIMPLICITY



LOW - COST



The ALWAC Sub-Routine Library is available to ALWAC owners and users. This is a collection of carefully coded and tested routine "building blocks" which can be assembled by the coder into complex routines.

Under constant expansion, the Library contains conventional utility routines for machine testing, input-output conversion, start, tally, and maintenance; routines for transcendental functions, linear and non-linear programming, least-squares curve and surface fitting, matrix inversion, complex arithmetic, floating point arithmetic, etc.

If you can describe some of your computing problems, or send detailed specifications to LOGISTICS RESEARCH INC.'s Applications Division, they shall be pleased to examine them for ALWAC application.

When the time comes for considering application of a computer to an organization's operations, it is beneficial to have selected personnel engage in study of precisely how and where the computer may be most efficiently utilized.

Fundamental preparation by personnel most familiar with an organization's problems, paves the way to early and full realization of the tremendous benefits possible through use of a fine computer.

Address inquiries to: Applications Division

LOGISTICS RESEARCH INC.

141 South Pacific Avenue, Redondo Beach, California