APPLICATIONS

Manufacturer
Commercial, scientific and engineering data processing.

Government Sample
U. S. Naval Ordnance Test Station, China Lake
Scientific data processing.

Industrial Sample
Douglas Aircraft Company, Incorporated
Aircraft engineering.

United Aircraft Corporation
The United Aircraft Corporation provides a central computing facility located at the Research Department for the solution of engineering and research problems. It services the three UAC Divisions: Pratt and Whitney Aircraft, Sikorsky Aircraft, and Hamilton Standard which are engaged in the design and manufacture of aircraft engines, helicopters, propellers and other aircraft equipment.

Computing equipment includes: two IBM Type 704, one IBM Type 701, three IBM Card-Programmed Calculators, and three Burroughs Type E101 calculators. Additional features include a Universal Tape Selector on each IBM Type 704 calculator. This device was designed by UAC and permits electrical switching at the console of magnetic tape units to main frame or off-line input/output components.

NUMERICAL SYSTEM

Manufacturer

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary</td>
<td>Binary</td>
</tr>
<tr>
<td>Internal number system</td>
<td>18 or 36 per data word</td>
</tr>
<tr>
<td>Binary digits per instruction</td>
<td>18</td>
</tr>
<tr>
<td>Instructions per word</td>
<td>2</td>
</tr>
<tr>
<td>Instructions decoded</td>
<td>32</td>
</tr>
<tr>
<td>Instructions used</td>
<td>32</td>
</tr>
<tr>
<td>Arithmetic system</td>
<td>Fixed point</td>
</tr>
<tr>
<td>Instruction type</td>
<td>One address</td>
</tr>
<tr>
<td>Number range</td>
<td>(-2^{35}-1 \leq n \leq 2^{35}-1)</td>
</tr>
</tbody>
</table>
Timing: Synchronous
Operation: Sequential and partially concurrent

Government Sample
U. S. Naval Ordnance Test Station, China Lake
Each half or whole word is uniquely addressable.

**ARITHMETIC UNIT**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Time (excl. stor. access)</th>
<th>Microsec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add</td>
<td>60 or 36</td>
<td></td>
</tr>
<tr>
<td>Mult</td>
<td>444</td>
<td></td>
</tr>
<tr>
<td>Div</td>
<td>444</td>
<td></td>
</tr>
</tbody>
</table>

Construction: Vacuum tubes or magnetic cores
Basic pulse repetition rate: 1 Mc/sec
Arithmetic mode: Parallel

Operation time of 60 microseconds is for CRT.
Operation time of 56 microseconds is for Magnetic Core.
Times given above include access to instruction.

**STORAGE**

<table>
<thead>
<tr>
<th>Media</th>
<th>Words</th>
<th>Microsec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic Core</td>
<td>4,096</td>
<td>12</td>
</tr>
<tr>
<td>Cathode Ray Tube</td>
<td>2,048 or 4,096</td>
<td>12</td>
</tr>
<tr>
<td>Magnetic Drum</td>
<td>8,192 or 16,384</td>
<td>50,000</td>
</tr>
</tbody>
</table>

Magnetic drum access time is average to first word of group. All times given below are in microseconds. Computation time is available depending on programming technique. Subsequent word time is 1,280 per word of which 1,000 can be used for computation. Magnetic Tape: 300,000 binary words per tape. (Up to 4 magnetic tapes) Type 726. (2 magnetic tapes per frame. Pulse packing 100 groups per inch.)

The time to accelerate magnetic tape to write status (75 inches per sec.) is 10,000 of which 6,000 is available for further computations. Time to write subsequent words is 792 each, of which 700 is available for further computation. Time to read subsequent words is 792 of which 540 is available for further computation. Magnetic tape (1 magnetic tape per frame). Pulse packing 200 groups per inch. -- 900,000 binary words per tape. 540,000 binary coded decimal and alpha-numeric words per tape. Up to 10 tapes.

Time to accelerate magnetic tape to write status (75 inches/sec.) from standstill is 10,000 of which 7,000 are available for further computation. Time to write subsequent words is 400 each of which 356 is available for further computation. Time to accelerate magnetic tape to read status (75 inches/sec.) from standstill is 10,000 of which 3,000 are available for further computation. Time to read subsequent words is 400 each of which 288 are available for further computation. Magnetic tape unit can rewind 2,400 feet of tape in 1.2 minutes.
Either magnetic core or cathode ray tube storage is used. Time is in microsec.

Government Sample

U. S. Naval Ordnance Test Station, China Lake System has 4,096 words of magnetic core storage, 8,192 words of magnetic drum and 900,000 words on each tape unit. Access times are 12, 50,000 (random) and 10,000 (from standstill) microseconds, respectively. Ten type 727 tape units are utilized.

**INPUT**

<table>
<thead>
<tr>
<th>Media</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punched Card Reader</td>
<td>150 cards/min</td>
</tr>
<tr>
<td>Magnetic Tape Type 726</td>
<td>12,500 dec dig/sec</td>
</tr>
<tr>
<td>Magnetic Tape Type 727</td>
<td>15,000 char/sec or 25,000 dec dig/sec</td>
</tr>
<tr>
<td>Cards to Magnetic Tape</td>
<td>250 cards/min</td>
</tr>
</tbody>
</table>

The punched card reader operates such that 177 millisec are available between cards for computation. The Type 727 Magnetic Tape Unit operates at the above rates for alphanumeric characters and decimal digits respectively. For the card to magnetic tape converter the cards must be in decimal alphanumeric code. The magnetic tape is written in binary coded decimal alphanumeric code and simultaneously checked.

Government Sample

**OUTPUT**

<table>
<thead>
<tr>
<th>Media</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punched Card</td>
<td>100 cards/min</td>
</tr>
<tr>
<td>Line Printer</td>
<td>150 lines/min</td>
</tr>
<tr>
<td>Cathode Ray Tube Display</td>
<td>8,300 data points/sec</td>
</tr>
<tr>
<td>Magnetic Tape Type 726</td>
<td>12,500 equiv dec dig/sec</td>
</tr>
<tr>
<td>Magnetic Tape Type 727</td>
<td>100 cards/min</td>
</tr>
<tr>
<td>Magnetic Tape to Card</td>
<td>150 lines/min</td>
</tr>
<tr>
<td>Magnetic Tape to Line Printer</td>
<td>150 lines/min</td>
</tr>
</tbody>
</table>

The punched card recorder may operate on binary or decimal cards. Binary cards contain 24 words. 342,000 microseconds are available for computing while punching one card.

The printer is of the wheel type. It is connected to the computer through the analytical and logical unit. 322,000 microseconds are available for computation between successive lines.

The CRT Display Unit consists of two display tubes: a 7-inch tube for photographic purposes and a 21-inch tube for visual displays.

Magnetic Tape to Card Unit operates with Type 727
Tape Unit only. Alphanumeric punched characters are automatically internally checked by unit. Magnetic Tape to Line Printer Unit operates with the Type 727 Tape Unit only. The printer is of the wheel type, 150 lines/min, 120 alphanumeric char/line. 1,000 lines/min operation is possible, with 60 char/line (wire matrix printer).

Government Sample
U. S. Naval Ordnance Test Station, China Lake System utilizes the following equipment:

<table>
<thead>
<tr>
<th>Medium</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Card Punch</td>
<td>100 cards/min at 72 cols/card</td>
</tr>
<tr>
<td>Printer</td>
<td>150 lines/min at 72 char/line</td>
</tr>
<tr>
<td>Magnetic Tape</td>
<td>2,500 words/sec</td>
</tr>
<tr>
<td>Tape to Printer</td>
<td>150 lines/min at 120 char/line</td>
</tr>
<tr>
<td>Tape to Cards</td>
<td>100 cards/min at 80 cols/card</td>
</tr>
</tbody>
</table>

The two peripheral converters accept binary coded decimal information on magnetic tape.

CIRCUIT ELEMENTS ENTIRE SYSTEM

| Tubes       | 4,000 |
| Tube types  | 35    |
| Crystal diodes | 12,800 |

Government Sample
U. S. Naval Ordnance Test Station, China Lake In addition to above system also consists 147,456 magnetic cores and 26 separate cabinets.

CHECKING FEATURES

Magnetic Tape (Type 726) - vertical parity bit check for each tape column.
Magnetic Tape (Type 727) - Horizontal and vertical parity bit check for each tape row and column.
Line Printer - Echo checking for each printed character.
Card to Magnetic Tape - checks magnetic tape as Type 726. Checks card.
Tape to Printer (Type 727 magnetic tape only) - horizontal and vertical parity bit check for each tape row and column. Echo checking for each printed character.
Tape to card - horizontal and vertical parity bit check for each tape row and column.
Arithmetic and Logical Unit - overflow in accumulator. Two extra positions are on left side of accumulator so that overflow is not lost. Divide check. Dividend Divisor

Government Sample
U. S. Naval Ordnance Test Station, China Lake Above checks are utilized. Echo checking must be wired in on Line Printer board. Instructions used to test condition of tape check light and overflow indicator.
POWER, SPACE AND WEIGHT

<table>
<thead>
<tr>
<th>System name</th>
<th>Weight (lbs)</th>
<th>KVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Frame</td>
<td>2,650</td>
<td>35.4</td>
</tr>
<tr>
<td>Punched Card Recorder</td>
<td>720</td>
<td>0.7</td>
</tr>
<tr>
<td>Line Printer (Wheel Type)</td>
<td>2,795</td>
<td>3.1</td>
</tr>
<tr>
<td>Magnetic Drum</td>
<td>1,480</td>
<td>9.9</td>
</tr>
<tr>
<td>Cathode Ray Tube Frame</td>
<td>2,445</td>
<td>11.8</td>
</tr>
<tr>
<td>Power Frame No. 1</td>
<td>2,610</td>
<td>5.8</td>
</tr>
<tr>
<td>Power Frame No. 2</td>
<td>2,750</td>
<td>5.8</td>
</tr>
<tr>
<td>Power Distribution Unit</td>
<td>1,230</td>
<td>1.2</td>
</tr>
<tr>
<td>Magnetic Tape Unit (726)</td>
<td>1,270</td>
<td>4.6</td>
</tr>
<tr>
<td>Magnetic Tape Control Unit</td>
<td>1,636</td>
<td>6.0</td>
</tr>
<tr>
<td>Punched Card Reader</td>
<td>530</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Space Occupied:
Machine including two 726 frames - 3,000 sq. ft.
Customer engineering requirements - 400 sq. ft.
Air conditioning - 40 tons

Government Sample
U.S. Naval Ordnance Test Station, China Lake
System requires 80 KW, 156 KVA, 1,404 cu. ft., 1,400 sq. ft. The system area is 44 by 27 ft. and weighs 40,050 lbs., including peripheral equipment. The above power, space and weight does not include supporting machines such as key punches, reproducers, and sorters. This equipment would add 5 KVA and 8,000 lbs.

Industrial Sample
Douglas Aircraft Company, Incorporated
Total Engineering Building is air conditioned.

PRODUCTION RECORD

Produced 19
Operating 16
Delivery time Special

COST, PRICE AND RENTAL RATE

Rental rates are subject to change.

System I.                                      | Monthly Charges |
------------------------------------------------|-----------------|
Electronic Analytical Control Unit             | $8,100          |
Electronic Storage Unit (2,048 words)         | 2,600           |
Punched Card Reader                            | 200             |
Alphabetic Printer (wheel type)                | 200             |
Punched Card Reader                            | 200             |
2 Type 726 Magnetic Tape Readers & Recorders   | 1,700           |
(2 magnetic tapes per frame) for a total of 4 magnetic tapes |
Magnetic Drum Reader and Recorder              | 1,400           |
Tape Control Unit                              | 2,500           |

System II.
Electronic Analytical Control Unit             | $8,100          |
Electrostatic Storage Unit (2,048 words)       | 2,600           |
Punched Card Reader                            | 200             |
Alphabetic Printer (wheel type)                | 200             |
Punched Card Reader                            | 200             |
4 Type 727 Magnetic Tapes (one magnetic tape per frame) |
Magnetic Drum Reader and Recorder              | 2,200           |
Tape Control Unit                              | 1,400           |

This system is compatible through common language tape units with the 650, 702, 704, 705 and the additional equipment listed below.

Either of the above systems may replace the 2,048 words of cathode ray tube storage with 2,048 words of magnetic core storage.

Tape to Card Punch and Card Punch Control Unit (punches 100 cards/minute)
Magnetic Tape to Line Printer (wheel type) and Printer Control Unit

RELIABILITY AND OPERATING EXPERIENCE

Government Sample
Atomic Energy Commission, University of California Radiation Laboratory
System accepted 26 April 1954; the average error-free running period is 6.2 hours; good time is 3,032 hours and the attempted to run time is 3,587 hours, resulting in an operating ratio of 0.85; the average error free running time is calculated by dividing the total hours less the total Scheduled Maintenance less Total unscheduled Maintenance less the Loss Time Claimed by Operator all by the Total number of Hours of Down and Lost Time reported. The above figures are given for the period January 1955 to June 1955 when operating 24 hours/day.

U.S. Naval Ordnance Test Station, China Lake
A core storage was installed recently.

Industrial Sample
Douglas Aircraft Company
Average error-free running period 4 hours plus
Good time 4,068.1
Attempted to run time 4,351.8
Operating ratio (Good/Attempted to run) 0.93%
Figures based on period 1 January 1956 to 30 September 1956

Power on 5,104.6 hours from 1 January 1956 to 30 September 1956
Preventive maintenance 13.6%
Non-scheduled maintenance 6.7%
Douglas machine time 79.9%

General Motors Corporation
System accepted in April 1954; average error free running period is 4.3 hours derived from the records for 1 month; good time of 1,067 hours and attempted to run time of 1,067 hours yielding an operating ratio of 0.96 for a four month period.
Lockheed Aircraft Corporation
Systems accepted on 14 May 1953 and 15 July 1954; average error free running periods of 3-4 hours on one and 1-1/2 hours on the other; good time of 74.4% and 50% where good time is considered as actual production and the remaining 25.6% and 50% respectively, consists of preventive maintenance, breakdown, machine re-work and idle time. The average error-free running period is reduced considerably when tapes are used frequently. Short runs are made wherever possible (1-5 hours), but the same program is run for as long as 12 hours and would run longer if time permitted.

United Aircraft Corporation, Research Department
Average error-free running period
2 hours
Good time
2,667 hours
Attempted to run time
3,473 hours
Operating ratio (Good/Attempted to run)
0.77
Figures based on period 1 February 1956 to 30 September 1956
Acceptance test 5 October 1953

Attempted to run time includes calculation, checkout, machine error, unscheduled maintenance, and scheduled maintenance time. The scheduled maintenance for the above period was 367.96 hours and the unscheduled maintenance was 290.75 these two figures should be subtracted from the above "Attempted to Run" figure.

FUTURE PLANS

Government Sample
U. S. Naval Ordnance Test Station, China Lake
A modification has been made to the system to allow asynchronous digital data to fill the entire storage unit at one time. Such data are fed from magnetic tape containing the digitized version of analog information originating at the test equipment. The analog to digital conversion is done as a separate step, prior to entering the data into the computer.

Industrial Sample
Douglas Aircraft Company, Incorporated
System to be replaced by an IBM Type 704 system in May 1957.

INSTALLATIONS

Government Sample
U. S. Naval Ordnance Test Station
China Lake, California

United States Weather Bureau
Washington, D. C.

Industrial Sample
Boeing Aircraft
Wichita, Kansas

Douglas Aircraft Company, Incorporated
El Segundo, California

General Motors Corporation
Detroit, Michigan

Glenn L. Martin Company
Baltimore 3, Maryland

Lockheed Aircraft Corporation
Burbank, California

United Aircraft Corporation
East Hartford 6, Connecticut

University of California
Radiation Laboratory
Berkeley 4, California

ADDITIONAL FEATURES AND REMARKS

Manufacturer
The following pertains to the first picture (at the beginning of this system description)

In the center of the installation shown here, is the Electronic Analytical Control Unit, and at its right is a Card Reader. Behind the control unit is the Power Distribution Unit. On the left are the Magnetic Drum Storage Unit and the Electrostatic Storage Unit. In the group at the right are two Magnetic Tape Readers and Recorders, the Alphabetic and Numerical Printer and the Card Punch. Two Power Supply Units are not visible. Overlooking the installation is a glass-enclosed conference room.

Government Sample
U. S. Naval Ordnance Test Station, China Lake

Subroutines are available for most applications. There are several general purpose programs. System uses the PACT-I Compiler.

Industrial Sample

General Motors Corporation
Two interpretive systems are used, Speed Co and ADOM. Speed Co 3-address while ADOM is 2-address. Both provide for floating point arithmetic, transcendental functions, In-Out operations, B-boxes, and tracing all of which aid in coding and checkout.

Lockheed Aircraft Corporation
A general purpose system called FLOP, a contraction of Floating Octal Point, was developed at Lockheed by members of the Digital Computing Staff. FLOP converts the 701 into an entirely different machine, one which performs all its operations in a floating octal system, but also permits all the normal 701 operations to be executed in fixed binary. The floating octal operations performed by the system are add, subtract, multiply, divide (all with real or complex numbers), log x, x, sin x, sin⁻¹ x, and square root. The system also provides certain logical operations and control of the input-output devices in three number systems: binary, octal, and floating decimal.

This system was developed in order to obtain a minimum of elapsed time from when a new problem first enters the department to when answers are obtainable.
APPLICATIONS

Manufacturer
Commercial and scientific.

Government Sample
U. S. Navy Aviation Supply Office
Commercial, inventory control.
Industrial Sample
Bank of America
Accounting statistical analysis
Chrysler Corporation Service Parts Warehouse
Invoicing, cost of sales and inventory control.
Commonwealth Edison Company of Chicago
Customer billing and accounting.
General Electric Company, Hanford Atomic Product's
Operation
Provide general data processing and computing service
to entire plant, both commercial and scientific work.

NUMERICAL SYSTEM

Internal number system  Binary coded decimal and alphabetical

Characters per instruction  5
Instructions decoded  32
Instructions used  32
Arithmetic system  Fixed point
Instruction type  One address
Number range  Variable
Timing  Synchronous for central processing unit and
asynchronous for input-output.
Operation  Sequential and concurrent

The machine is not a fixed word length system. It is possible to have both variable field and variable record lengths. Consequently there are no "words". The characters are alphanumeric. Five characters are required to make up an instruction.
Industrial Sample
Bank of America
System may be used with a number range of
$10^{-511} < n < 10^{511}$
without multiple precision.
General Electric Company, Hanford Atomic Products
Operation
Variable word length; floating point programs are
10 and 2 decimal.

**ARITHMETIC UNIT**
The time required to add is 23 microseconds, excluding
the storage access time. The time required to multiply is given by

$$23 \left[N_p (N_c + 4) + 1\right] + 115 \text{ microseconds.}$$

The time required to divide is given by

$$23 \left[10 + N_d + (N_d - N_r) (7.5K + 15)\right] + 115 \text{ microseconds.}$$

where

- $N_p$ = number of multiplier digits
- $N_c$ = number of multiplicand digits
- $N_d$ = number of dividend digits
- $N_r$ = number of divisor digits
- $K = N_r$ if $N_r > 8$ and $K = N_r + 0.005 (8 - N_r)$ if

$N_r < 8$

The arithmetic unit is constructed of vacuum tubes, crystal diodes and magnetic cores and operates
serially by binary coded decimal character and
parallel by bit.

**STORAGE**

<table>
<thead>
<tr>
<th>Media</th>
<th>Alphanumeric</th>
<th>Microsec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatic or Magnetic Core</td>
<td>10,000</td>
<td>23 or 17</td>
</tr>
<tr>
<td>Magnetic Drum</td>
<td>60,000</td>
<td>8,120+4ON</td>
</tr>
<tr>
<td>Magnetic Tape</td>
<td>5,760,000</td>
<td>10,140+67N</td>
</tr>
</tbody>
</table>

Magnetic drum has 300 sections of 200 characters each. $N$ = number of characters.

Government Sample
U.S. Navy Aviation Supply Office
System has magnetic core storage unit in lieu of
electrostatic.

Industrial Sample
Bank of America
System has magnetic core in lieu of electrostatic
storage unit and does not have magnetic drum storage.

Chrysler Corporation Service Parts Warehouse
System has magnetic core and magnetic drum.

General Electric Company, Hanford Atomic Products
Operation
System has magnetic core, magnetic drum, and magne-
tic tape storage.

**INPUT**

<table>
<thead>
<tr>
<th>Media</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic Tape</td>
<td>75 inches/sec</td>
</tr>
<tr>
<td>Punched Card</td>
<td>250 cards/min</td>
</tr>
</tbody>
</table>

**Government Sample**

U.S. Navy Aviation Supply Office
Magnetic tape unit operates at 200 char/inch and 75 inches/sec. Card reader operates at 250 cards/min at 80 char/card.

**Industrial Sample**

General Electric Company, Hanford Atomic Products Operation
Card reader at 250 cards/min with off-line card to tape conversion. Magnetic tape speed is \((10,000 + 67N)\) microseconds, where \(N\) is the number of characters.

**OUTPUT**

<table>
<thead>
<tr>
<th>Media</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic Tape</td>
<td>15,000 char/sec, 75 in/sec</td>
</tr>
<tr>
<td>Punched Card</td>
<td>100 cards/min</td>
</tr>
<tr>
<td>Typewriter</td>
<td>600 char/min</td>
</tr>
<tr>
<td>Printer</td>
<td>500 lines/min, 120 print pos.</td>
</tr>
<tr>
<td></td>
<td>150 lines/min, 120 print pos.</td>
</tr>
<tr>
<td></td>
<td>1,000 lines/min, 60 print pos.</td>
</tr>
</tbody>
</table>

1,000 lines/min, 120 print pos.

**CIRCUIT ELEMENTS ENTIRE SYSTEM**

- **Government Sample**
  - U.S. Navy Aviation Supply Office
  - System has all above output systems.

- **Industrial Sample**
  - Bank of America
  - System has all above output systems.
  - General Electric Company, Hanford Atomic Products Operation
  - Magnetic tape to card and tape to printer conversion done on "off-line" basis.

- **Circuit Elements**
  - **Tubes** 10,000
  - **Tube types** 10
  - **Crystal diodes** 17,000

**Industrial Sample**

- **Bank of America**

  In addition to the above, the system has 165,000 magnetic cores. It utilizes tube types 6211, 5965 and 5687.
CHECKING FEATURES

Instruction
During the execution of an instruction, a character code error, an invalid operation part transfer, or an operation part interpretation, may be detected and indicated.

Machine
The machine check indicator is turned on when a character code error is detected during the execution of all instructions (except write, write and erase, read, and read check) in which information is read from accumulator storage or memory. Read-Write -- checks the transmission of data from all input units to memory. It also checks the transmission of all output data from memory to the drum, tape unit, card punch record storage, printer record storage, and typewriter.

Printer-Punch
This indicator reflects any error when information is punched in a card or when printed on the printer.

Overflow
The overflow check indicator is turned on during an add or subtract operation when the number of digits in the result is greater than the number of digits in the longer of the original fields. An overflow is indicated as a result of a round off operation if a carryover is made out of the highest order position of the original accumulator storage field.

Sign
The indicator turns on when a field addressed by an arithmetic instruction does not have plus or minus zoning over the right hand digit.

Industrial Sample
Bank of America
The following checks are used:
Odd-even redundancy
Read-write operations
Longitudinal redundancy on magnetic tape processing.
General Electric Company, Hanford Atomic Products Operation
Parity check using 7 bit code with only six bits of real data is used for all internal operations and all input-output. All corrective action can be programmed or machine can be set to stop on error at the programmer's discretion.

Normally operated with internal error detection set to stop, but with input-output error correction programmed.
### POWER, SPACE AND WEIGHT

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Qty</th>
<th>Power (K.W.)</th>
<th>Current (Amps.)</th>
<th>Heat (B.T.U.)</th>
<th>Weight (lbs.)</th>
<th>Size (Nearest Inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>702</td>
<td>Central Processing Unit</td>
<td>1</td>
<td>25.0</td>
<td>87</td>
<td>85,000</td>
<td>2,991</td>
<td>139 by 63</td>
</tr>
<tr>
<td></td>
<td>Main Power Unit</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2,961</td>
<td>34 by 61</td>
</tr>
<tr>
<td></td>
<td>Console</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>508</td>
<td>35 by 61</td>
</tr>
<tr>
<td>712</td>
<td>Card Reader</td>
<td>1</td>
<td>5.0</td>
<td>17</td>
<td>17,000</td>
<td>1,053</td>
<td>28 by 49</td>
</tr>
<tr>
<td>756</td>
<td>Card Reader Control Unit</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1,712</td>
<td>27 by 57</td>
</tr>
<tr>
<td>717</td>
<td>Printer</td>
<td>1</td>
<td>9.0</td>
<td>31</td>
<td>30,700</td>
<td>2,244</td>
<td>30 by 64</td>
</tr>
<tr>
<td>717</td>
<td>Printer Control Unit</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1,866</td>
<td>27 by 57</td>
</tr>
<tr>
<td>722</td>
<td>Card Punch</td>
<td>1</td>
<td>7.6</td>
<td>26</td>
<td>26,000</td>
<td>1,176</td>
<td>25 by 53</td>
</tr>
<tr>
<td>758</td>
<td>Card Punch Control Unit</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1,866</td>
<td>27 by 57</td>
</tr>
<tr>
<td>732</td>
<td>Drum Unit</td>
<td>1</td>
<td>6.9</td>
<td>24</td>
<td>23,600</td>
<td>1,775</td>
<td>27 by 57</td>
</tr>
<tr>
<td></td>
<td>Drum Power Supply</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1,646</td>
<td>27 by 40</td>
</tr>
<tr>
<td>727</td>
<td>Tape Unit</td>
<td>10</td>
<td>13.0</td>
<td>45</td>
<td>44,200</td>
<td>9,110</td>
<td>24 by 66</td>
</tr>
<tr>
<td>752</td>
<td>Tape Control Unit</td>
<td>1</td>
<td>8.4</td>
<td>29</td>
<td>28,700</td>
<td>1,636</td>
<td>27 by 57</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>74.9</strong></td>
<td><strong>259</strong></td>
<td><strong>255,700</strong></td>
<td><strong>32,844</strong></td>
<td></td>
</tr>
</tbody>
</table>

Approximately one Ton of air conditioning required for 12,000 B.T.U.

**Government Sample**

U.S. Navy Aviation Supply Office

System requires 75 KW, occupies 19,694 cu. ft., 2,052 sq. ft., measuring 57 ft. by 36 ft. by 9-1/2 ft. The system weighs 33,000 lbs. The air conditioning consists of a 40-Ton unit and a 15-Ton unit, occupying 3,168 cu. ft. of space and 288 sq. ft. of area, measuring 12 ft. by 24 ft. by 11 ft.

**Industrial Sample**

Bank of America

System requires 95 KW, 16,000 cu. ft., 2,500 sq. ft., measuring 55 ft. by 45 ft. by 8 ft. Air conditioner requires 68 KW, 2,552 cu. ft., 319 sq. ft., measures 29 ft. by 11 ft. by 8 ft., and has a capacity of 60 Tons. The air conditioning equipment designed to accommodate requirements for comfort conditioning of
engineering, mail handling, tabulating, and office personnel and space.

General Electric Company, Hanford Atomic Products Operation

Power service to system is 300 amps., 208 volts, 3 phase for computer and 105 amps., 440 volts, 3 phase for air conditioner. The machine room is 40 ft. by 60 ft. and the air conditioner requires an area of 20 by 20 ft. The air conditioner capacity is 52 Tons. Power consumption has been stated in terms of service supplied rather than actual machine consumption. The space required is a function of the amount of engineering and observation space and other miscellaneous working areas which are considered necessary or desirable to have in addition to the actual cubic footage of the equipment.

PRODUCTION RECORD

Produced 14
Operating 14

COST, PRICE AND RENTAL RATE

<table>
<thead>
<tr>
<th>Rental Rates of System Components</th>
<th>Monthly Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>702 Central Processing Unit</td>
<td>$8,650</td>
</tr>
<tr>
<td>712-756 Card Reader and Card Reader</td>
<td>1,050</td>
</tr>
<tr>
<td>717-757 Control Unit</td>
<td>1,800</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rental Rates of System Components</th>
<th>Monthly Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>722-758 Card Punch and Card Punch Control Unit</td>
<td>1,050</td>
</tr>
<tr>
<td>727 Magnetic Tape Unit</td>
<td>550</td>
</tr>
<tr>
<td>752 Tape Control Unit</td>
<td>550</td>
</tr>
<tr>
<td>732 Magnetic Drum Storage Unit</td>
<td>2,800</td>
</tr>
<tr>
<td>719 Printer, 1,000 lines per minute 60 printing positions</td>
<td>1,400</td>
</tr>
<tr>
<td>730 Printer, 1,000 lines per minute 120 printing positions</td>
<td>2,100</td>
</tr>
<tr>
<td>760 Storage Unit for Printers and Tapes</td>
<td>1,850</td>
</tr>
</tbody>
</table>

There is no predetermined grouping of equipment. Any combination of above is available depending on customers needs. Rates subject to change.

Government Sample
U. S. Navy Aviation Supply Office
Prime shift monthly rental rate for system is $50,200.

Industrial Sample
Bank of America
Rental rate is $9,900 for basic system and $15,475 per month for additional equipment.

Commonwealth Edison Company of Chicago
DeS- Unit Monthly Rental

<table>
<thead>
<tr>
<th>Serial No.cription</th>
<th>Quantity</th>
<th>Rate (Primary Shift)</th>
</tr>
</thead>
<tbody>
<tr>
<td>702</td>
<td>1</td>
<td>$9,900</td>
</tr>
<tr>
<td>712</td>
<td>2</td>
<td>770</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,540</td>
</tr>
</tbody>
</table>
2nd and 3rd Shift Rental charged at 50% of above rates.

General Electric Company, Hanford Atomic Products Operation
Rental rate is $34,900/month for system, including average extra shift rental. Rental rate for punched card machines, including extra shift but excluding key punch and verifiers is $3,175 per month.

PERSONNEL REQUIREMENTS

<table>
<thead>
<tr>
<th>Daily Operation</th>
<th>Engineers</th>
<th>Operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>One 8-Hour Shift</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Two 8-Hour Shifts</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Three 8-Hour Shifts</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

The operators are divided as follows: For first shift, 3 are on main frame, 3 auxiliary and 3 supervisory. For second shift, 3 main frame operators are required and for the third shift three operators are required for the main frame.

Industrial Sample
Bank of America

<table>
<thead>
<tr>
<th>Daily Operation</th>
<th>Engineers</th>
<th>Tech or Operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>One 8-Hour Shift</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Two 8-Hour Shifts</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Three 8-Hour Shifts</td>
<td>9</td>
<td>15</td>
</tr>
</tbody>
</table>

Commonwealth Edison Company of Chicago
Three 8-Hour shifts require 9 engineers and 18 technician-operators.

General Electric Company, Hanford Atomic Products Operation
Three 8-Hour shifts require 5 engineers and 8 technician-operators. The engineers are employed by IBM. Personnel covers operation on a 7-day-a-week basis.

RELIABILITY AND OPERATING EXPERIENCE

Government Sample
U. S. Navy Aviation Supply Office
Approximate reliability is 0.85, where reliability is obtained by subtracting the sum of Machine Error Time, the Unscheduled Maintenance Time and the Tape Trouble Time. From the Available Time and dividing the difference by the Available Time. The above figure is based on the period from July to September 1956.

Industrial Sample
Bank of America
Average error-free running period 2 hours
Good time 12.56 hours/day
Attempted to run time 14.13 hours/day
Operating ratio (Good/Average period) 0.89
Figures based on period 1 July 1956 to 30 September 1956.
Acceptance test 20 August 1955.

Of the 0.11 lost in the operating ratio above, approximately 0.037 was due to main frame down time, 0.037 was due to tape unit down time, 0.050 to corrective restart time and 0.006 was due to tape remake time.

Chrysler Corporation Service Parts Warehouse
Productive time, maximum 0.94
Productive time, minimum 0.78
Based on period 5 April 1956 to 27 September 1956.
System accepted 22 August 1955.

Commonwealth Edison Company of Chicago
Average error-free running period 4-6 hours estimate
Good time 18 hours
Attempted to run time 20 hours
Operating ratio (Good/Average period) 0.90
Figures based on period 1 October 1956 to 31 December 1956.
Acceptance test 1 July 1955

General Electric Company, Hanford Atomic Products Operation
Average error-free running period 60 hours
Good time 1,275 hours
Attempted to run time 1,503 hours
Operating ratio (Good/Average period) 0.81
Figures based on period 1 August 1956 to 14 October 1956.
Acceptance test 1 July 1955

Core storage unit installed July 1956. Preventive maintenance is scheduled 4 hours/day for 4 days per week. Over the weekend 60 hours elapse between scheduled maintenance sessions.

The Prudential Insurance Company of America
It is expected that conversion from electrostatic storage to core storage will further reduce unscheduled maintenance from an overall average of 5.8% experienced between 14 November 1955 and 31 August 1956. Two-shift operation occurred during that period.

FUTURE PLANS

Industrial Sample
Commonwealth Edison Company of Chicago
System will be replaced by an IBM Type 705 Electronic Data Processing Machine in March 1957.

INSTALLATIONS

Government Sample
U. S. Navy Aviation Supply Office
Philadelphia 11, Pennsylvania

Industrial Sample
Bank of America
500 Howard Street
San Francisco, California

Chrysler Corporation
Detroit 31, Michigan

Commonwealth Edison Company
72 West Adams Street
Chicago 90, Illinois
ADDITIONAL FEATURES AND REMARKS

Manufacturer
Inter-tape-card-printer conversion.
Rental rates include servicing, educational assistance through a 702 school, special representatives and programming service.

System is being replaced by the Type 705.
Autocoder system is used.
Component units, which have various functions, are housed in a half-dozen or more separate cabinets, the number of each type depending upon the user's needs. The use of these separable units allows freedom in the design of the data processing system. Essential components include the arithmetical and logical unit, the operator's control console, magnetic tape units, an input card reader, and an output printer and card punch. Often a magnetic drum will also be included in an installation, or several drums might be used.