APPLICATIONS

Manufacturer
Scientific.

NUMERICAL SYSTEM

Internal number system  Binary
Binary digits per word  40
Binary digits per instruction  40
Instructions per word  1
Instructions decoded  256
Arithmetic system  Fixed point
Instruction type  Modified two-address
Number range  \(-1 \leq n \leq +1\)

A separate arithmetic unit is proposed for floating point operation.

ARITHMETIC UNIT

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Microsec</td>
<td>Microsec</td>
</tr>
<tr>
<td>Add time</td>
<td>11.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Mlt time</td>
<td>285</td>
<td>278</td>
</tr>
<tr>
<td>Div time</td>
<td>285</td>
<td>278</td>
</tr>
<tr>
<td>Construction</td>
<td>Vacuum tubes and crystal diodes</td>
<td></td>
</tr>
<tr>
<td>Arithmetic mode</td>
<td>Parallel</td>
<td></td>
</tr>
<tr>
<td>Timing</td>
<td>Asynchronous</td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>Concurrent</td>
<td></td>
</tr>
</tbody>
</table>

Multiply times given are maximum, minimum time is 120 microseconds.

STORAGE

<table>
<thead>
<tr>
<th>Media</th>
<th>Words</th>
<th>Digits</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic Core</td>
<td>4,096</td>
<td>42/word</td>
<td>2.5</td>
</tr>
<tr>
<td>Magnetic Tape</td>
<td>(4 \times 10^6)</td>
<td>41/word</td>
<td>5 minutes</td>
</tr>
</tbody>
</table>

A complete core memory cycle is 15 microseconds.
INPUT
Media Speed  
Paper Tape 200 char/sec

OUTPUT
Media Speed  
Paper Tape 60 char/sec  
Magnetic Tape (Narrow) 3,000 char/sec  
Magnetic Tape (Buffer) 200,000 char/sec

CIRCUIT ELEMENTS ENTIRE SYSTEM
Tubes 2,900  
Tube types 18  
Crystal diodes 2,700  
Magnetic cores 163,860  
Separate cabinets 6

CHECKING FEATURES
Parity check on paper tape.  
Parity check on magnetic tape.  
Redundancy check by double writing of information.

POWER, SPACE AND WEIGHT
Power, computer 35 KVA  
Air conditioned by building system.

PRODUCTION RECORD
Produced 1  
Operating Under test

COST, PRICE AND RENTAL RATE
Approximate cost of basic system $500,000. Approximate cost of additional equipment $235,000.

PERSONNEL REQUIREMENTS
Daily Operation  
Engineers 4  
Tech and Operators 2
3-8 Hour shifts 1 6
The one 8-hour shift requirement is for testing period; the 3-8 hour shift is for operation.

FUTURE PLANS
Plan to add 4 x 10^6 words magnetic tape storage. A CRT curve plotter is planned. A floating point arithmetic unit is planned.

INSTALLATIONS
Argonne National Laboratory
University of Chicago
Lemont, Illinois
GUIDANCE FUNCTION

GUIDANCE FUNCTION Computer

MANUFACTURER
Northrop Aircraft, Incorporated

NUMERICAL SYSTEM

<table>
<thead>
<tr>
<th>Internal number system</th>
<th>Binary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary digits per word</td>
<td>42</td>
</tr>
<tr>
<td>Binary digits per instruction</td>
<td>6</td>
</tr>
<tr>
<td>Instructions per word</td>
<td>1</td>
</tr>
<tr>
<td>Instructions decoded</td>
<td>22</td>
</tr>
<tr>
<td>Arithmetic system</td>
<td>Fixed point</td>
</tr>
</tbody>
</table>

Number range $-1 \leq n \leq +1$

ARITHMETIC UNIT

<table>
<thead>
<tr>
<th>Operation</th>
<th>Synchronous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media</td>
<td>Words</td>
</tr>
<tr>
<td>Magnetic Drum</td>
<td>2,112</td>
</tr>
<tr>
<td>Digits</td>
<td>88,704</td>
</tr>
</tbody>
</table>

A moving head is used in conjunction with the magnetic drum for the main storage. Thus, random access time will vary from 0 to 2 seconds.

INPUT

<table>
<thead>
<tr>
<th>Media</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Tape</td>
<td>1.5 sec/word</td>
</tr>
<tr>
<td>Typewriter (Flexowriter)</td>
<td>1.5 sec/word</td>
</tr>
</tbody>
</table>

Picture by Northrop Aircraft, Incorporated

"GUIDANCE FUNCTION"
OUTPUT

Media
Paper Tape
Keyboard (Flexowriter)

Speed
1.5 sec/word
Manual

Flexowriter operating speed is 132 millisec/character.

CIRCUIT ELEMENTS ENTIRE SYSTEM

Tubes
292

Tube types
11

Crystal diodes
4,500
2,100 Functional

Types of tubes used are 6B2, 6AV6, 12AT7, 5651, 5670, 5687, 5727, 5751, 6005, 6012, 6080.

Separate cabinets
1

CHECKING FEATURES

A built in tester for plug in units is utilized.

POWER, SPACE AND WEIGHT

Power, computer
8 Kw

Space, computer
90 cu ft, 18 sq ft

Weight, computer
2,700 lbs

Size, computer
3 by 5 by 6 ft

Power required is 3 phase, 60 cycle. The air conditioner is a self contained forced air unit.

PERSONNEL REQUIREMENTS

Daily Operation

Engineers
Tech and Operators

1-6 Hour shift
1
1

INSTALLATIONS

Northrop Aircraft, Incorporated
Hawthorne, California