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PROGRAM ABSTRACTS

The programs described by the following abstracts are available from the Program Library of Data General Corporation. The numbers given are document identification codes for the programs. Address all correspondence concerning this software to:

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SECTION 1

SYSTEM ROUTINESCASSETTE
1

093-000001

BOOK
1

✓ Binary Punch

The Binary Punch Program is a NOVA utility routine that punches operator specified ranges of memory in binary format acceptable as input to the Binary Loader. The program uses either the highspeed paper tape punch or the Teletype ASR punch. It is available in two binary versions which, after loading, reside in different areas of memory. It is also available as an ASCII source tape to enable the user to change the origin and reassemble the program. The routine requires 146 (octal) words of storage. Its speed is limited by the output device, i. e., the paper tape punch or Teletype.

✓ Bootstrap Loader

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093-000002

1

The Bootstrap Loader is a short routine used to load Binary Loader into memory. The Bootstrap requires 15 (octal) words and 2 temporary locations. Its speed is limited by the input device.

✓ Binary Loader

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093-000003

3 1

The Binary Loader is a routine used to load absolute binary tapes produced as output by the Assembler. The Loader is 120 (octal) words in length, 116 of which immediately precede the Bootstrap. The speed of the Loader is limited by the speed of the input device.

✓ Core Compare

1

093-000004

1

The Core Compare Program is a NOVA / SUPERNOVA utility routine which compares a binary format tape read in on either the paper tape reader or the ASR reader with the contents of core memory. If there are any differences, the address, tape contents, and core contents are printed on the Teletype. Core contents are left unchanged. The routine requires 173 (octal) words of storage. Its speed is limited by the input and output devices.

✓ Single Precision Absolute Value

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093-000006

1

This routine computes the absolute value of a fixed point, single precision, two's complement number. The routine is 3 (octal) instructions long. Nova timing is 8.2μ seconds for $X \geq 0$, and 13.8μ seconds for $X < 0$. The Supernova execution time is 2.4μ seconds.

✓ Single Precision Signed Multiply

— 093-000007

2

This routine multiplies two fixed point, single precision, two's complement numbers to form a double precision, two's complement product. This routine consists of 16 (octal) words. Execution time in addition to unsigned multiply is 56.4μ seconds for the Nova and 11.8μ seconds for Supernova. Execution time in unsigned multiply is 340μ seconds for Nova and 69.6μ seconds for Supernova. Total average execution time is 396.4μ seconds for Nova and 81.4μ seconds for Supernova.

✓ Single Precision Signed Divide

— 093-000008

2

This routine divides a double precision, two's complement, fixed point number by a single precision, two's complement, fixed point number. The result is a single precision, two's complement quotient and a single precision, two's complement remainder. This routine consists of 45 (octal) words and the average execution time is 605μ seconds for Nova and 113.4μ seconds for Supernova.

✓ Double Precision Absolute Value

— 093-000009

2

This routine computes the absolute value of a fixed point, double precision, two's complement number. This routine consists of 6 instructions. Nova execution time is 8.2μ seconds for $X \geq 0$, and 19.4μ seconds for $X < 0$. Supernova execution time is 1.6μ seconds for $X \leq 0$, and 5.6μ seconds for $X < 0$.

✓ Double Precision Signed Multiply

— 093-000010

2

This routine multiplies two double precision, fixed point, two's complement numbers to form a quadruple precision, two's complement product. Double precision multiply and divide are one program. Both consist of 213 (octal) words with an average execution time of 1.62 milliseconds for Nova and .351 milliseconds for Supernova.

✓ Double Precision Signed Divide

— 093-000011

2

This routine divides a quadruple precision, two's complement dividend by a double precision, two's complement divisor. The results are a double precision quotient and a double precision remainder, both in two's complement notation. Both double precision multiply and divide are one program. Both consist of 213 (octal) words. Average execution time for signed double divide is 2.98 milliseconds for Nova and .8162 milliseconds for Supernova.

✓ Double Precision Addition

— 093-000012

2

This routine computes the sum of two double precision, two's complement numbers. It is 15 (octal) words in length. Execution time is 54.9μ seconds for Nova and 14.6μ seconds for Supernova.

- ✓ Double Precision Subtraction — 093-000013 2
- This routine performs a subtraction of two double precision, two's complement numbers. The routine is 15 (octal) words and has an execution time of 54.9 μ seconds for Nova and 14.2 μ seconds for Supernova.
- ✓ Double Precision Negate — 093-000014 2
- This routine negates a double precision, two's complement number. This routine consists of 4 words and the execution time is 13.8 μ seconds for Nova and 3.2 μ seconds for Supernova.
- ✓ Unsigned Multiply — 093-000015 2
- The multiply routine multiplies two unsigned, 16-bit numbers to form an unsigned 32-bit product. The routine is 14 (octal) words and has an average execution time of 340 μ seconds for Nova and 69.6 seconds for Supernova.
- ✓ Unsigned Divide — 093-000016 2
- This routine divides an unsigned, single precision divisor into an unsigned, double precision dividend to form a single precision quotient and a single precision remainder. It is 21 (octal) words and the average execution time is 483 μ seconds for Nova and 84.8 μ seconds for Supernova.
- ✓ Paper Tape Assembler 1 093-000017 2
- The Assembler is a two-pass, symbolic routine producing absolute binary output and an assembly listing. Pseudo commands are available to alter the origin, change the radix, and define new operation codes. Source input is free-form using special characters to delimit labels and comments. Assembly speed is entirely I/O limited. The Assembler is approximately 5000 (octal) words in length and uses the remaining locations for symbol table storage.
- ✓ Editor 1 093-000018 2
- The Editor is a routine allowing for editing of paper tape input to produce updated paper tape output. It is most commonly used to modify program source tapes in preparation for a new assembly. The Editor executes simple command strings requested from the teletype to modify text on either a character or a line level. The location of text is facilitated by means of string searches. The program is less than 2000 (octal) words in length and is I/O depended for timing.

✓ BEAP EDITOR/ASSEMBLER 1 1

✓ Floating Point Interpreter

1

093-000019

/ 3

The Floating Point Interpreter is a program designed to expand the instruction set to include over thirty-five additional instructions. These instructions cover a wide range of floating point operations, floating point conversions, and transcendental function operations. Numbers are represented in floating hexadecimal, providing the user with seven significant digits and an approximate range in magnitude of $10^{** -78}$ to $10^{** +75}$. The Basic Floating Point Interpreter is 2000 (octal) locations in length. The Extended version is approximately 3500 (octal) locations in length.

✓ Debugger II

1

093-000020

3

Debugger II is a software routine that allows for simultaneous operation of up to four breakpoints. Virtually no restrictions are applied to their placement or use. Debugger II can interface with any type of routine, including those using the interrupt hardware. This program consists of less than 1400 (octal) instructions.

✓ Logical Exclusive OR

— 093-000021

3

This routine computes the logical exclusive OR of two 16-bit numbers. It is 7 words in length and execution time is 34.0μ seconds for Nova and 5.6μ seconds for Supernova.

✓ Logical Inclusive OR

— 093-000022

- / 3

This routine computes the logical inclusive OR of two 16-bit numbers. It is 5 words long and the execution time is 25.6μ seconds for Nova, and 4.0μ seconds for Supernova.

✓ Single Precision BCD to Binary

— 093-000023

3

This routine converts a four digit (16-bit) number to BCD to its binary equivalent. This routine is 53 (octal) words and 1.034 milliseconds is the execution time for Nova and .1632 milliseconds for Supernova.

✓ Single Precision Binary to BCD

— 093-000024

3

This routine converts a single precision binary number to its four digit BCD equivalent. The routine is 41 (octal) instructions with an execution time of $(273.8 + (N * 14.1)) \mu$ seconds for Nova and $44.0 + N * 3.2 \mu$ seconds for Supernova where N is the sum of the digits of the result.

✓ Single Precision ASCII Decimal to Binary

— 093-000025

3

This routine converts an ASCII character string of decimal digits to its single precision binary equivalent. This routine consists of 65 (octal) words with an approximate execution time of $(110 + (I * 82.2)) \mu$ seconds for Nova and $(25.0 + (I * 18.0)) \mu$ seconds for Supernova, where I is the number of digits in the input.

✓ Single Precision Binary to ASCII Decimal

— 093-000026 3

This routine converts a single precision, two's complement binary number to a string of ASCII characters representing its equivalent decimal value. This routine is 51 (octal) words and has an execution time of $(378.3 + (N * 14.1)) \mu$ seconds for Nova and $(35.4 + (N * 4.0)) \mu$ seconds for Supernova, where N is the sum of the digits of the result.

✓ ASCII Octal to Single Precision Binary

— 093-000027 3

This routine converts an ASCII character string consisting of octal digits to a single precision binary number. This routine consists of 42 (octal) instructions and execution time is $(63.0 + (I * 70.2)) \mu$ seconds for Nova, and $(9.6 + (I * 15.0)) \mu$ seconds for Supernova, where I represents the number of digits in the input.

✓ Single Precision Binary to ASCII Octal

— 093-000028 3

This routine converts a 16-bit binary number to a string of ASCII characters representing the octal equivalent of the binary value. This routine consists of 27 (octal) words. Execution time is $(367.6 + (N * 20.0)) \mu$ seconds for Nova, and $(56.2 + (N * 4.0)) \mu$ seconds for Supernova, where N is the sum of the digits of the result (the sum expressed in decimal).

✓ Double Precision BCD to Binary

— 093-000029 3

This routine converts a double precision binary number to its eight digit BCD equivalent. It consists of 76 (octal) words and execution time is 2.174 milliseconds for Nova and .4944 milliseconds for Supernova.

✓ Double Precision Binary to BCD

— 093-000030 3

This routine converts a double precision binary number to its eight digit BCD equivalent. The routine consists of 57 (octal) words and has an average execution time (including the divide) of $(1018 + (14.1 * N)) \mu$ seconds for the Nova and $(104.2 + (3.2 * N)) \mu$ seconds for Supernova, where N is the sum of the digits of the result.

✓ Double Precision ASCII Decimal to Binary

— 093-000031 3

This routine converts an ASCII character string of decimal digits to a double precision, two's complement number. This routine is 77 (octal) words in length with an approximate execution time of $(124.7 + (I * 125.5)) \mu$ seconds for Nova and $(26.6 + (I * 26.0)) \mu$ seconds for Supernova, where I is the number of digits in the input.

✓ Double Precision Binary to ASCII Decimal

— 093-000032 3

This routine converts a double precision, two's complement binary number to a string of ASCII characters representing its equivalent decimal value. This routine consists of 112 (octal) words. Execution time is $(1.061 + (N * .047))$ milliseconds for Nova and $(.2234 + (N * .0104))$ milliseconds for Supernova, where N is the sum of the digits of the result.

✓ Parity Generator

— 093-000033

3

This routine computes the even parity bit over a 16-bit number and returns the bit in Carry. It is 16 (octal) words in length and has an average execution time of 215.4μ seconds for Nova and 60.8μ seconds for Supernova.

✓ Binary to Gray Code

— 093-000034

3

This routine converts a 16-bit binary number to its Gray Code equivalent. This routine has 13 (octal) instructions with an execution time of 50.3μ seconds for Nova and 9.6μ seconds for Supernova.

✓ Gray Code to Binary

— 093-000035

3

This routine converts a 16-bit Gray Code number to its binary equivalent. It is 22 (octal) instructions long with an execution time of 536.4μ seconds for Nova and 102.4μ seconds for Supernova.

✓ Random Number Generator

— 093-000036

3

This routine generates a (pseudo) random sequence of integers in the range $0 \leq N \leq 2^{16} - 1$. It contains 36 (octal) words with an execution time of 244.7μ seconds for Nova and 54.4μ seconds for Supernova.

✓ Floating Point to Octal

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093-000037

3

This routine converts a number expressed in floating point notation to its internal two word octal representation. The routine is 205 (octal) words in length and execution time is limited by teletype output speed.

✓ Debugger I

— 093-000038

3

Debugger I is a software debugging routine that allows for simultaneous operation of one breakpoint. Virtually no restrictions are applied to their placement or use. Debugger I can interface with any type of routine, including those using the Nova interrupt hardware. Debugger I requires only 192 (decimal) locations.

✓ Relocatable Loader

1

093-000039

3

This program is used to load binary tapes produced as output by the Relocatable Assembler. The loader accepts any number of relocatable binary tapes as input, resolves external displacement and normal externals, and maintains an entry symbol table that can be printed on demand. This routine consists of less than 2200 (octal) instructions.

✓ Extended Assembler

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093-000040

4

The Extended Assembler, like the basic Assembler, converts symbolic assembly statements into machine language code. In addition to basic Assembler features, the Extended Assembler provides relocation, interprogram communication, conditional assembly, and more powerful number definition facilities. It contains about 7000 (octal) instructions and uses the remainder of memory for symbol table storage.

Relocatable Math Library File

093-000041

4

This document provides a brief description of all the routines available using Data General's math library tape 099-000001. These descriptions are in alphabetical order according to function. All the information necessary to "CALL" these routines is provided in this document. For further reference and a listing of a particular routine, the user should consult the appropriate DGC write-up.

Single User Basic

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093-000042

4

Single User BASIC is a dedicated interpretive system that allows conversational entry and execution of programs written in the BASIC language as developed by Dartmouth College. It includes use of all elementary and advanced BASIC statements as defined in BASIC Programming by J. G. Kemeny and T. E. Kurtz (copyright 1967 by John Wiley & Sons, Inc.), but does not include matrix manipulation functions. The Data General implementation also permits execution of certain statements in a "desk calculator" or "keyboard" mode which is most useful in testing or debugging programs as well as in performing simple computations or evaluating complex formulas without the necessity of writing a program. The system will operate in a 4K or larger memory configuration and requires a teletypewriter for input/output. This program consists of less than 10,000 (octal) instructions.

Debug III

-

093-000044

4

Debug III is a routine used for symbolic debugging of user programs. This program contains approximately 4000 (octal) instructions.

SECTION 1.1

OPTIONAL PROGRAMS

Data Communications Multiplexor Handler

093-000045

This program is used in conjunction with the Multiplexor (type 4026) to service up to 16 full-duplex teletypes on a character basis. It uses 711 (octal) locations of alterable storage, and locations 40, 41, and 45 (octal).

Incremental Plotter Subroutine

093-000047

This routine consists of two sections:

(1) A Line Generator:

This subroutine allows the caller to move the plotter pen from its current position to a new position along a linear path. The pen may be moved in either the up or down state. The new pen position is specified either by (A) absolute X, Y coordinates, (B) incremental X, Y coordinates or (C) an absolute Y coordinate and a previously specified standard X increment. The caller may, at any time, reset the coordinate origin or obtain the absolute X, Y coordinates of the current pen position.

(2) A Character Generator:

This subroutine uses the line generator to implement the standard ASCII character set. The caller may dynamically specify the size and orientation of each character.

The Plotter Subroutine uses less than 2500 (octal) locations.

DIAGNOSTIC ROUTINES

Logic Test

097-000001

Logic Test is maintenance program designed to test the Nova central processor. It is a gate by gate check of the processor logic. The program does not assume any I/O equipment and does not, therefore, test most features of the processor I/O logic. This program is less than 2000 locations (octal).

Memory Checkerboard II*

097-000002

4

Checkerboard II is a maintenance program designed to produce worst case noise conditions on the memory sense/inhibit wires. The program should be run to check proper operation of sense amps, inhibit drivers, and memory currents. This program is less than 200 (octal) locations in length.

Exerciser*

1

097-000004

4

Exerciser is a maintenance program designed to test for reliable operation of the processor instructions and the paper tape equipment. The program can exercise the teletype reader/punch, high speed reader/punch, the real time clock, and the instruction repertoire. The devices to be used are selected by console switches and are serviced via the interrupt system. It requires less than 3300 (octal) locations.

Power Shut Down Test*

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097-000005

4

This program is a maintenance program designed to test the power monitor and autorestart option. The program also tests for memory retention upon power shut down. It can be used with or without the power monitor option. It uses about 1000 (octal) locations.

* NOTE: Single asterisk after program title from hereon denotes that the diagnostic is applicable to both NOVA and SUPERNOVA.

Instruction Timer

097-000006

The Instruction Timer Program checks the CPU clock circuits by timing the instruction set. The 100 Millisecond teletype clock is used for calibration and is assumed accurate. It consists of less than 3300 (octal) instructions.

Address Test*

097-000007 -1 4

Memory Address Test is a maintenance program designed to detect malfunctions in the memory address selection logic. The program fills memory with an address pattern. Successful read back of the pattern is proof that all locations can be properly addressed. It contains less than 20 (octal) locations.

Teletype Test II

097-000009

Teletype Test II is a maintenance program designed to detect malfunctions in the teletype logic, interrupt system, and the I/O bus logic. The program may be used to test teletype models ASR33, KSR33, and KSR35. The program contains routines to punch and read random data, echo typed keys, and punch from the switch register. It contains less than 2500 (octal) instructions.

Memory Checkerboard III*

097-000014 4

Checkerboard III is a maintenance program designed to produce worse case noise conditions on the sense/inhibit wires. The program should be run to insure proper operation of sense amps, inhibit drivers, and memory currents. This program contains less than 1000 (octal) locations.

SECTION 2.1

OPTIONAL DIAGNOSTIC PROGRAMS

Real Time Clock Test*

097-000003

The Real Time Clock Test is a maintenance program designed to test the real time clock logic. If the program is used without a teletype, the crystal frequency is not checked for accuracy. The program is designed for either 50 or 60 Hertz line interrupts. This routine has less than 1500 (octal) instructions.

Reader/Punch Test*

BOOK 4

~~097-000068~~
#96-000162-06

High Speed Reader/Punch Test is a maintenance program designed to test the type 4012A high speed punch and the type 4011A or 4011B high speed readers. Tapes can be punched or read on the teletype if one of the high speed devices does not exist in the user's system. It contains less than 2500 (octal) instructions.

Tape Unit Timing Test*

097-000011

Tape Unit Timing Test is a maintenance program designed to test the tape motion delays in the tape motion produced by the transport mechanics. Any transport that is ready and write enabled will be tested. There are less than 3500 (octal) instructions.

Disk Diagnostic*

097-000012

This program is a maintenance program designed to test the type 4019 disk file. This program has less than 4100 (octal) locations.

Disk Reliability*

097-000013

This program is designed to exercise type 4019 disk file and has less than 3500 (octal) instructions.

Incremental Plotter Test*

096-000001

The Incremental Plotter Test is a maintenance routine designed to test the logic and operation of Calcomp models 563, 502, 565, or Houston Instrument Model DP-1 incremental plotters. It consists of less than 2200 (octal) locations.

Communications Controller Test*

096-000002

This diagnostic is a gate by gate check of the 4015 controller logic. Each routine begins with an initializing subroutine (setup) and ends with an iteration subroutine (loop). Both setup and loop issue an I/O reset pulse. In most routines this pulse may be used to synchronize the scope. This routine has less than 5200 (octal) instructions.

Multiply/Divide Test

096-000003

This program contains numerous routines to test the various functions of the multiply/divide hardware. Hardware multiply and divide are compared with each other as well as with the software routines described in section 2.2 of the HOW TO USE THE NOVA manual. This program uses less than 22 (octal) locations.

Card Reader Test*

The Card Reader Test is a maintenance program designed to test the type 4016 card reader. The program reads and checks the data from a test deck of 80 column Hollarith cards. It consists of less than 2100 (octal) words.

DCM Diagnostic*

096-000011

The Data Communications Multiplexor Diagnostic is a maintenance program designed to test the type 4026 Data Communications Multiplexor hardware. The program requests operator parameters for the number of teletype lines, models and the device code. This program contains less than 2300 (octal) locations.

Type 4029 Communications Controller Test*

096-000018

The Type 4029 Communications Test is a maintenance program designed to test the type 4029 communications interface. The interface is tested via a test plug which permits sampling of the output line and simulation of the input line. This program contains less than 2600 (octal) locations.

Magnetic Tape Diagnostic*

097-000015

This diagnostic is provided to find hardcore problems that are related to basic operations of the tape control. It uses less than 4500 (octal) locations.

Magnetic Tape Reliability*

097-000016

The Tape Reliability is a maintenance program intended for rigorous testing of a system that has successfully run the diagnostic test and the timing test. This program uses less than 5100 (octal) locations.

SECTION 3

SUPERNOVA SYSTEM ROUTINES

✓ Selfloading Bootstrap and Binary Loader

083-000001

BOOK

1

The Selfload tape is used in conjunction with the program load feature of the Supernova to place an absolute binary loader in the highest locations of alterable storage. This program contains 40 (octal) instructions.

SECTION 4

SUPERNOVA DIAGNOSTIC ROUTINES

CASSETTE

BOOK

✓ Super Logic Test

1

087-000001

1

Super Logic Test is a maintenance program designed to test the Supernova Central Processing Unit. It is a gate test of the logic used to implement the Supernova instruction set. The test does not include any input-output optional equipment. It contains less than 2500 (octal) locations.

✓ Super Instruction Timer

1

087-000002

1

Super Instruction Timer is a maintenance program designed to test the CPU clock circuits of the Supernova by timing the instruction set. The 100 ms. teletype clock is used for calibration and is assumed accurate. It contains less than 3300 (octal) instructions.

✓ Super Teletype Test II

1

087-000003

1

This program is a maintenance program designed to detect malfunctions in the teletype logic, interrupt system, and the I/O bus logic. The program may be used to test teletype models, ASR33, KSR33, and KSR35. The program contains routines to punch and read random data, echo typed keys, punch from the switch register, etc. It contains less than 2500 (octal) instructions.

✓ SUPER I/O TESTER

FOR USE WITH SPECIAL BOARD.

— 095-000049-02 —

SECTION 4.1

OPTIONAL SUPERNOVA DIAGNOSTIC PROGRAMS

Super Memory Allocation & Protection

086-000002

This diagnostic program is a maintenance program designed to test the type 8008 allocation and protection option. This program uses less than 5000 (octal) locations.

Super Multiply/Divide Test

086-000004

This program contains numerous routines to test the various functions of the multiply divide hardware. Hardware multiply and divide are compared with each other as well as with the software routines described in section 2.2 of the HOW TO USE THE NOVA MANUAL. This program uses less than 2000 (octal) locations.

PROGRAMS

	CASSETTE	BOOK
FFT	1	1
SIMPLE PRINT ROUTINE	1	1
ENFORCER	1	BINDER
		1/196

SOFTWARE UPDATE FILE. 1971

ITEM 1

TAPE # 091-000-004-03

MANUAL # 093-000-003-03

BINARY LOADER CHANGED TO FIX COMPLICATION CONCERNING I/O RESET.

ITEM 2

TAPE # 091-000-016-02

NO MANUAL CHANGE

RELO. LOADER CHANGED TO ADD BUFFER ROOM.

ITEM 3

TAPES # 091-000-012-03

091-000-013-03

NO MANUAL CHANGES

BASIS FLOATING POINT & EXTENDED FLOATING POINT CHANGES TO CORRECT SQUARE OF .9999 AND MINOR CHANGE FOR ASSEMBLER.

ITEM 4 UPDATES FOR OPTIONAL PERIPHERAL

TAPE # 005-000-042-00

MANUAL # 097-000-020-00

A TO B CONVERTER DIAGNOSTIC IS A NEW PROGRAM COMPATIBLE FOR ALL NOVAS AND SUPERNOVAS.

ITEM 5

TAPE # 005-000-005-01

LISTING # 006-000-002-01

MEMORY ALLOCATION & PROTECTION DIAGNOSTIC CHANGED TO FIX A BUG CONCERNING THE ABSENCE OR PRESENCE OF MULTIPLY/DIVIDE OPTION.