



DATA GENERAL CORPORATION—SOUTHBORO, MASS. 01772 (617) 485-9100

PROGRAM LIBRARY LISTING

PROGRAM LIBRARY¹

INTRODUCTION

This booklet contains an abstract of each program currently available to members of the Data General User's Group. Orders for programs should specify the name(s) and catalog number(s) of the program(s) requested. For orders under \$50.00, a check or money order must be included. For any order of \$50.00 or more, a company purchase order will be accepted. Unless otherwise specified, programs will be supplied on paper tape, and the cost will be \$10.00 for documentation and tapes, or \$2.00 for documentation only. The charge for all games is \$5.00 each.

The User's Group Program Library functions as a clearinghouse and distributor of User programs. No technical or programming assistance is available. If a program does not work as described in the abstract, the problem should be fully documented and sent to the User's Group Administrator, Data General Corp., Southboro, MA 01772. Such critiques will be forwarded to the program author for comment. If a program is not usable in the form supplied and described in the documentation, it will be removed from the Library.

The description and availability of the programs contained in this Library are subject to change without notice. Distribution will be in accordance with the current policy of the Data General User's Group.²

¹ PROGRAM LIBRARY

Data General Corp. warrants only that the programs supplied are duplicates of the programs submitted by the author listed. Therefore, Data General will not be liable for any special, indirect, or consequential damages arising out of, or in connection with, the use of any of the materials.

² LICENSED PROGRAMS

As indicated herein, the availability of certain User's Group Programs is contingent upon the execution of a Data General Corp. Program License Agreement, Program Availability Schedule, and applicable documents. Programs in this category are identified by the letters "LP" following the catalog number.

PROGRAM DELINEATIONS

In order to make the identification of a particular type of program convenient for the User, the following classification system has been adopted.

COMMUNICATIONS - Programs used to transmit or control data flow from the originating point via common carrier or private communications lines to a remote location for processing or distribution. Also includes communications between processors.

COMPUTATIONAL - Programs used in computing for applications such as scientific, engineering, bio-medical, military, aerospace, and all other non-manufacturing areas.

DATA PROCESSING - Programs which facilitate the handling and sorting of data.

EDUCATIONAL - Programs that are specifically useful to educational institutions. Generally these programs relate to the instructional process, administrative procedures and courseware. Programs that educators or students also will find useful will be listed in other categories, especially Computational, Games, and Utilities.

GAMES - Programs that assist familiarization with the computer due to their interactive nature. Includes games for the inexperienced as well as the sophisticated programmer.

INSTRUMENTATION AND CONTROL - Programs which will be utilized directly in on-line control of continuous or batch manufacturing processes, or associated with the support of general manufacturing activity, and other non-scientific data acquisition and control systems.

UTILITIES - Programs which facilitate the generation and operation of other programs, e.g., interpreters, editors, assemblers, simulators, I/O handlers. Also the facilitation of the movement of data, for example: tape to disk, disk to tape, disk to disk, etc.

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COMMUNICATIONS

Program No. 056

RTOS 2702 EMULATOR (.IBM)

Hardy J. Pottinger
University of Missouri - Rolla
Rolla, Missouri

.IBM is a special purpose software driver for the DGC 4025 360/370 Interface unit designed to be used with the DGC Real Time Operating System. It is designed to emulate the functional characteristics of an IBM 2702 with a Telegraph Type II adapter. This includes recognizing and responding to the channel command set for the 2702, providing ending status to commands and terminating READ operations on receipt of certain control characters. Data is transferred to and from the host in the byte multiplex mode. Calling sequences for .IBM are similar to other RTOS device handlers and are outlined in the .IBM user's manual.

4K read/write memory and RTOS are required. Necessary peripheral is the 4025 360/370 interface. The program is written in Assembly language.

Document X Tape X

COMPUTATIONAL

Program No. 001

FAST FOURIER TRANSFORM AND INVERSE

Charles S. Cox and Ronald Stutheit
Scripps Institute of Oceanography
University of California
San Diego, California

This potentially reentrant program is in subroutine form and may be called from a main program. The JSR statement is followed by the following parameters: forward (F(N*T))/inverse (F(L*T)) transform switch (0 or 1); number of sample points; the real parts of the input series. When control returns from the subroutine, the transformed data will have replaced the input data.

The number of sample points must be an integer power of 2, up to 1024 complex values. Trigonometric¹⁰ computations are performed by table look-up, and input data is scaled, to reduce the possibility of overflow, with the scaling factor retained to allow for restoration of the output series.

Storage: 610₁₀ words (6 on page 0, 348 for routine, 236 for cosine table).

Document X Tape X

Program No. 005

EIGENVALUE SOLUTION PROGRAM

Professor James A. Leone
Canisius College
Buffalo, New York

Using the Jacobi method of Eigenvalue solution, this BASIC program, written to run on Multi-User Basic (DGC #091-000026) solves for the eigenvalues and eigenvectors of any N×N matrix. The utilization of the matrix manipulation capability in this 71-statement program enables data to be supplied in one DATA statement:
E.G. 540 DATA N,A(1,1), A(2,1),...,A(N,N).

A printout of the A matrix's eigenvalues and associated eigenvectors is produced in a form suitable for such scientific applications as chemistry, physics, and the mathematical sciences.

Document X Tape

Program No. 013

BCD TO BINARY CONVERSION BY RADIX REDUCTION

This assembly language routine reduces the 4-digit BCD value in ACO to an equivalent binary representation, replacing the original BCD value in ACO. The packed BCD string is treated as a binary value with an "expanded" radix. The routine reduces the radix of each digit until the converted value is obtained. This technique is considerably faster than the isolation of each digit followed by the binary reconstruction. This 12 (decimal) word routine has the following execution times: NOVA = 101.1 us; NOVA 1200 = 31.95 us; SUPER-NOVA = 21.0 us; NOVA 800 = 19.2 us; SUPERNOVA SC = 12.6 us.

Document X Tape

Program No. 022

FOCAL LENGTH BY MICROSCOPE METHOD

R. C. Bell
Vari-Tech Company
Grand Rapids, Michigan

Using approximate thick lens equations for symmetric lenses, this BASIC program calculates the focal length of symmetric lenses from four microscope measurements from a micrometer indicating microscope. Printout includes the average and standard deviation of the centered focal lengths of a batch of lenses.

Document X Tape X

Program No. 025

CONVERSION OF LINEAR ENGLISH MEASUREMENT VALUES TO METRIC EQUIVALENTS

M. Cook
Bovay Engineers, Inc.
Houston, Texas

This BASIC language program converts English Linear Measurement values into their Metric System equivalents. Since the computer will not accept any fractional values except those expressed in decimal form, all input data must be expressed as whole feet and/or inches, and decimal fractions thereof.

Four input options are accepted. Data may be entered in feet only (to the nearest whole foot or decimal fraction thereof); feet and inches only (to the nearest whole inch or decimal fraction thereof); inches only, (to the nearest whole inch or decimal fraction thereof); or in miles and/or fractions, thereof.

COMPUTATIONAL (Cont.)

Output may be obtained in Millimeters, Centimeters, Meters, or Kilometers, by entering the proper value of B when starting a run.

Another feature of this program gives it capability to convert long strings of values and identifying the results by groups.

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Program No. 026

CONVERSION OF METRIC LINEAR MEASUREMENTS TO ENGLISH EQUIVALENTS

M. Cook
Bovay Engineers, Inc.
Houston, Texas

This BASIC program converts Metric linear measurements, millimeters, centimeters, meters, or kilometers into the English linear measurement equivalent of inches or feet. Provision is made for 17 different conversion options. The user may have his output in inches, to the nearest inch. In this case, the computer will round off all fractional values; those less than 1/2 are truncated; those greater than 1/2 are raised to the next whole number. Decimal values may be obtained, or common fractions to the nearest 1/2, 1/4, 1/8, 1/16, 1/32, or 1/64. If the output is desired in feet, feet and inches, or feet, inches, and fractions thereof (decimal or common) similar options may be had.

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Program No. 040

POLYNOMIAL CURVE FIT (POLYFIT)

Frank D. Whisler
U. S. Dept. of Agriculture
U. S. Water Conservation Lab.
4331 East Broadway
Pheonix, AZ 85040

POLYFIT will fit least-square polynomials to bivariate data using an orthogonal polynomial method. Limits are 11th-degree fit and a maximum of 100 data points. The program allows user to specify the lowest degree polynomial to be fit, and then fits the polynomials in order of ascending degree. At each stage, the index of determination (r2) is printed, and the user has the choice of going to the next higher degree fit, seeing either of two summaries of fit at that stage,

or of stopping the program.

POLYFIT is written in extended BASIC and requires only a teletype for operation.

Document X Tape X

Program No. 044

CURVEFIT

Frank D. Whisler
U. S. Dept. of Agriculture
U. S. Water Conservation Lab
4331 East Broadway
Pheonix, AZ 85040

CURVEFIT will determine which of 6 curves best fits the User's data using a least squares linearized fit. The program accepts up to 200 observations on 2 variables.

The program is written in Extended BASIC and requires only a teletype for operation.

Document X Tape X

Program No. 045

ARCTANGENT

Timothy J. Mulrooney
Naval Underwater Systems Center
Newport, RI

This program will take the fixed point single precision ARCTANGENT of the sin (t)/cos (t) and return the result in AC3 in the range $-\pi \leq \theta \leq \pi$. ARCTANGENT is called as a subroutine with the sin(t) in ACO and cos(t) in ACL. Return to instruction following call with AC3=ARCTANGENT.

Either Hardware Multiply/Divide or Software Multiply/Divide is necessary. ARCTANGENT is written in assembly language.

Document X Tape X

Program No. 050

RTLAB

Gary Olson, George Moeller, Kevin Laxar
Naval Submarine Medical Research Lab.
Naval Submarine Base
Groton, CT 06340

RTLAB is a package of 20 relocatable assembly language routines for on-line

experimentation in discrete-trial behavioral experiments where classification of response or reaction time are dependent variables. The routines of RTLAB perform such functions as entering and storing parameters, preparing an appropriately counterbalanced sequence of trials for each subject, controlling the presentation and timing of the events on each trial, scoring and storing subject's responses, providing summary statistics for a subject when the session is over, and transferring data to an appropriate storage medium. The package is constructed to allow maximum User flexibility, especially in mating RTLAB with the User's experimental task and specific instrumentation. RTLAB is not designed for time-sharing between several subject stations.

8K of memory is necessary. Only peripheral required is a teletype, others are up to the User.

Document X Tape X

Program No. 053

SINGLE PRECISION AND DOUBLE PRECISION
BCD TO BINARY

A. Zwahlen
Oy Stromberg Ab
Electronics Group
Helsinki, Finland

This assembly language subroutine converts either an 8-digit BCD-value in ACØ, AC1 (double precision, entry: BCDBD) or a 4-digit BCD-value in ACØ (single precision, entry: BCDBS) into its equivalent binary representation replacing the BCD-value. The radix reduction algorithm (User's Group program no. 013) is used to convert a single precision 4-digit value. In double precision conversion, the high order part is converted first, then multiplied by 10000 (decimal) and the converted low order part is added to obtain the final result. The routine is not re-entrant. This 36 (decimal) word routine may be loaded anywhere in core and has the following execution times:

single precision: NOVA 1200: 35,85 us
 NOVA 800: 21,6 us

Double precision: NOVA 1200: 225,55 us
 NOVA 800: 129 us

8K of memory is needed.

Document X Tape X

DATA PROCESSING

Program No. 039

Program No. 055

SYSTEM DIRECTORY SORTER (DSORT)

FLOATING POINT SORT

Bill McAndrew
Automatic Electronic Systems Inc.
5455 Pare Street
Montreal, Quebec
Canada

This is a callable, relocatable, overlay-able subroutine written in Fortran. Its function is to take a tag file loaded onto any disk by the User and arrange that tag file in either ascending or descending order. The ordered information is left on the input file.

This program is used to sort the listing of the system directory (SYS. DR) into alphabetical order. This allows for easy reference to all files stored on disk.

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Program calculates the file attributes; an octal word count for each file, and formats the output onto the lineprinter.

This NOVA language program may be run on all DOS driven NOVA computers where the system includes a lineprinter. Available core must be large enough to hold at least 1/2 of SYS. DR file.

Document X Tape X

EDUCATION

Program No. 006

SIMUL-8

SIMUL-8 is a Simple Emulator for the 8 which will run programs, on the NOVA family of computers, written for up to a 4K version of the emulated computer. SIMUL-8 simulates configurations including interrupts, ASR-33 Teletype, High Speed Reader, and High Speed Punch. SIMUL-8 occupies approximately 1K of core, with the remainder used as a virtual memory of the emulated computer. Thus, a 3K program written for the emulated computer will run on a 4K NOVA computer. SIMUL-8 loads, starts, and executes object programs of 12-bit word length instructions of the type used by the emulated computer. (The version of SIMUL-8 provided in the User's Group Library emulates up to a 4K machine and requires a minimum NOVA configuration of 8K plus Teletype.)

Document X Tape X

Program No. 023 (LP)

SINGLE USER BASIC WITH MATRICES AND STRINGS

This version of BASIC is a modification of Data General's Time Sharing BASIC as described in the pamphlet called NOVA Line Time Sharing Basic. The communications multiplexer handler has been removed and replaced with a handler that operates the console teletype only.

The Time Sharing Basic pamphlet should be consulted for the operation of this version of BASIC. It gives the operator all the program control commands described on page 3 of the pamphlet. An additional command (control P) can be used instead of a carriage return to have a listing made to the line printer, i.e., LIST +P, or the results could be put to the line printer, i.e., RUN +P.

Document X Tape X

Program No. 033

EMUL-8

Eb Wulff
68 Lucinda Avenue
Wahroonga 2076, Australia

This emulator of a PDP-8/S/L/I computer runs on any NOVA with 8K of memory (min. 5K). Most instructions are emulated in 20 - 25 US. on a SUPER-NOVA computer. The Emulator is organized so that the operator can carry out all control functions required for a PDP-8 from the NOVA console. In particular, it is possible to stop a PDP-8 program.

Allowance has been made for the special ASR33 Teletypes used on PDP-8 computers. The address space is 4K 12 bit words.

This version was modified extensively to adopt fast routines used in SIMUL-8, while retaining the machine-like operation and the fast interrupt scheme of earlier EMUL-8's

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Program No. 043

INCREMENTAL PLOTTER SUBROUTINES FOR BASIC

Christer Berg
Oy Stromberg Ab
P. O. Box 118
00101 Helsinki, Finland

This program extends BASIC with plotting capabilities by use of the CALL statement. Six calls are available: program initialization, XY-movements both absolute relative, pen up/down, ASCII character drawing, and coordinate inquiry. Program loading is described in the Extended Basic Manual.

Two sets of tapes are available with this program:

REV 05 - for use with SINGLE USER BASIC WITH CALL (User's Group Program #002)

REV 06 - for Extended Basic and Time Share Basic

When ordering, please specify which REV you want.

Document X Tape X

EDUCATION (Cont.)

Program No. 051

BASIC RENUMBERER

Walter E. Wahnsiedler
Northwestern University
Materials Science Department
Evanston, Illinois

This assembly language program will renumber BASIC source code with evenly spaced line numbers, the starting number and spacing at the User's option. A new input tape is created for BASIC, permitting easier editing of programs under development and producing better appearing finished programs. References in the code (GOSUB, GOTO, THEN) are updated as the tape is punched.

SOS REV08 is necessary to recompile; Teletype is sufficient, but program supports high-speed reader and punch.

Document X

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GAMES

Program No. 027

BASIC FOOTBALL AND BASEBALL GAMES

This set of BASIC language programs may be run on Data General's Single User or Time Shared Basic Interpreters. The set of two tapes includes one Baseball Game and one Football Game (as played by American rules). A Canadian Football Game may be substituted for the American Football Game upon request.* The programs are supplied as BASIC source tapes and each program is self-explanatory.

Document X Tape X

* Full set of three (3) game program tapes \$15.00

Program No. 058

BATNUM

This BASIC language program may be run on Data General's Single User or Multi User Basic Interpreters. BATNUM is a number elimination game; see how many tries it takes you to guess the correct number. The program is supplied as a BASIC source tape and is self-explanatory. The charge is \$5.00

Document Tape X

Program No. 059

SLOT

This BASIC language program may be run on Data General's Single User or Multi User Interpreters. SLOT is a game that simulates the operation of a slot machine. The Program is supplied as a BASIC source tape and is self-explanatory. The charge is \$5.00

Document Tape X

Program No. 060

KINGDOM

This game simulates a feudal society. The player is a land owner and must make yearly decisions concerning planting, sale of crops, and use of peasants. See how many years you can stay in power. Be careful, your peasants don't like to be starved, and your neighbors are jealous of your estate.

REV01 of this program is in binary format

REV 02 is a BASIC source tape.

Make sure to specify which REV you want when ordering. Individually, the charge is \$5.00; for both the charge is \$10.00.

Document Tape X

Program No. 061

QUEEN

This BASIC language program may be run on Data General's Single User or Multi User Basic Interpreters. QUEEN is a game to simulate a chess problem. The program is supplied as a BASIC source tape and is self-explanatory. The charge is \$5.00.

Document Tape X

Program No. 062

BLACKJACK

This BASIC language program may be run on Data General's Single User or Multi User Basic Interpreters. This program simulates a Blackjack game, allowing players to bet. The program is supplied as a BASIC source tape and is self-explanatory. The charge is \$5.00.

Document Tape X

Program No. 064

TURTLE RACE

This BASIC language program may be run on Data General's Single User or Multi User Basic Interpreters. Pick your favorite turtle, make a bet, then watch them run(?). The program is supplied as a BASIC source tape and is self-explanatory. However, TURTLE RACE requires the use of a CRT for operation. The charge is \$5.00.

Document Tape

Program No. 065

LUNAR

This BASIC language program may be run on Data General's Single User or Multi User Basic Interpreters. LUNAR is a simulation of a spaceship landing on

GAMES (Cont.)

the moon. You are the astronaut and must guide your craft to a safe landing. The program is supplied as a BASIC source tape and is self-explanatory. The charge is \$5.00.

Document _____ Tape X

Program No. 066

HORSEERACE

This BASIC language program may be run on Data General's Single User or Multi User Basic Interpreters. The program simulates a horserace. Make your bet, and then they're off! All your favorites: Man O'War, Seabiscuit, Citation, are there. The program is supplied as a BASIC source tape and is self-explanatory. This game requires the use of a CRT. The charge is \$5.00

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Program No. 067

HEMAN

This BASIC language program may be run on Data General's Single User or Multi User Basic Interpreters. Can you make the bell ring and win a cigar? For this game it is the RETURN key, not a sledge hammer, that measures your strength. The program is supplied as a BASIC source tape and is self-explanatory. A CRT is necessary. The charge is \$5.00

Document _____ Tape X

Program No. 015

PIN LIST SYSTEM

Bob Williams
W. W. Witt Associates
5827 Star Lane
Houston, Texas

The Pin List System is designed to allow documentation and implementation of logic systems which use wirewrap interconnections. The name and location of each pin is entered on line into the computer. A paper tape is then made of this source list. The source list is then re-entered to produce a sorted listing and a sorted paper tape, both sorted by name and location. The name-sort is used for wirewrapping, and the location-sort is used for error checking and debugging. A system including 4K Nova-line computer is capable of accepting up to 400 individual points, with expansion being a function of core. The two supplied programs generate the pin list, sort, and punch tapes sorted by name and location respectively.

Document X Tape X

Program No. 019

WIRE LIST LAYOUT PROGRAM

The wire list generation system is designed to allow the user to quickly layout the wiring list for a group of printed circuit cards that have wire wrap interconnections. The existing system allows the wiring list for eight 86 pin cards to be generated. Each pin is described by six ASCII characters. The program has nine commands:

- BLANKS - Blank the storage area.
- ENTER - Enter data through the teletype.
- READ - Read data from the high-speed reader.
- CHANGE - Change data from the teletype.
- DELETE - Delete a card entry from the table.
- LIST - List all card data on the teletype.
- LIST 1 - List one card data on the teletype.

- PUNCH - Punch data on the high-speed punch.
- WIRE - Layout an optimized wiring diagram.

This program is supplied as five source tapes and a binary tape. It operates in 4096 words of core memory using all locations up to 7630(8).

Document X Tape X

Program No. 024

CONDUCTOR SELECTION PROGRAM FOR LOW VOLTAGE THREE PHASE SYSTEMS

W. L. Bacica
Bovay Engineers, Inc.
Houston, Texas

This BASIC language program selects either copper conductor or copper feeder duct busway to satisfy the data supplied. Data consists of the following:

- L: Three phase volt-amp load
- V: Line to line voltage
- F: Load power factor in decimal form
- B: Circuit length in feet
- M: Maximum tolerable voltage drop in percent

Two steps are involved in selecting the proper conductor. The first involves a calculation of the load current and an initial selection of a conductor to satisfy this ampacity. Secondly, the conductor is checked to satisfy the maximum tolerable voltage drop. If the voltage drop is excessive, the program finds the first larger size that satisfies the drop requirement. This conductor (or busway) is the desired result of the program.

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UTILITIES

Program No. 002 (LP)

BASIC INTERPRETER SYSTEM WITH CALL

This modified version of the DGC single User BASIC Program (091-000018) features a CALL statement which may be used for calling assembly-language statements from a BASIC program.

The user's subroutine is pre-assembled and loaded utilizing the specified subroutine format. The modified BASIC program is then loaded, with data switch 1 set up while the tape is loading--this tells the program that a user's subroutine is in core and location 10 contains a pointer to the S/R starting address. The CALL statement is of the form

100 CALL S/R#, P1, P2, P3
E.G. 210 CALL 2,A (2), B
Storage: 6K or more

Document X Tape X

Program No. 003

TELETYPE TAPE EDIT

Dr. R. A. Koster
Narisco
Anaheim, California

This is a paper tape editing program which can co-exist in a 4K system with the Paper Tape Assembler (DGC 091-000002) by residing in the symbol table space. Without affecting the assembler, a paper tape may be edited on the teletype by loading the original tape in the teletype reader, starting the tape edit program, and turning on the teletype punch. With data switch 15 up, a single character is copied only when any one of the other 15 data switches is inverted. Thus, toggling a data switch copies at a controlled rate to permit omission or insertion of characters.

Storage: 14₁₀ words

Document X Tape _____

Program No. 004

BEAP EDITOR/ASSEMBLER PROGRAM

Robert C. Baskin

BEAP is a combination editor and assembler program with primary applications on systems having only a teletype for I/O. BEAP's 10 keyboard commands enable the programmer to enter his source program into a storage buffer

from either the teletype keyboard or reader, examine, modify, output, and assemble the source program in the buffer any number of times without reloading BEAP or the source program.

Programs may be written and debugged in locations 0 through 77 and 7100 thru 7600 without affecting BEAP, the storage buffer, or the binary and bootstrap loaders. BEAP requires approximately 1500₁₀ words of storage and has a buffer capacity of 3700 characters.

Document X Tapes X

Program No. 006

SIMUL-8

SIMUL-8 is a Simple Emulator for the 8 which will run programs, on the NOVA family of computers, written for up to a 4K version of the emulated computer. SIMUL-8 simulates configurations including interrupts, ASR-33 Teletype, High Speed Reader, and High Speed Punch. SIMUL-8 occupies approximately 1K of core, with the remainder used as a virtual memory of the emulated computer. Thus, a 3K program written for the emulated computer will run on a 4K NOVA computer. SIMUL-8 loads, starts, and executes object programs of 12-bit word length instructions of the type used by the emulated computer. (The version of SIMUL-8 provided in the User's Group Library emulates up to a 4K machine and requires a minimum NOVA configuration of 8K plus Teletype.)

Document X Tape X

Program No. 007

BINARY TAPE DIS-ASSEMBLER

Joseph W. Hays
San Antonio College
San Antonio, Texas

This program dis-assembles an absolute binary object tape and produces a mnemonic listing. The input must be format acceptable by the Binary Loader (DGC 091-000004), loaded in the Teletype reader. The output is listed on the Teletype with the absolute address, octal contents, and mnemonic equivalent. Memory Reference Instructions with an index of one are further deciphered to reference an absolute address. This program requires about 1000₁₀ words of storage.

Document X Tape X

UTILITIES (Cont.)

Program No. 008 (LP)

RELOCATABLE EXTENDED FLOATING POINT
INTERPRETER

J. D. Wright
McMaster University
Hamilton, Ontario
Canada

This version of the Extended Floating Point Interpreter (DGC 091-000013) is in standard relocatable binary format for use as a subroutine to be read in by the Relocatable Loader (DGC 091-000016.) This version of the Interpreter will operate with the DGC Disk Operating System if inserted into the SYS.LB File. Absolute locations 4, 5, 6, and 7 have been replaced by page zero relocatable entries called LOC4, LOC5, LOC6, LOC7. Thus FETR and FINI must now become, for example, JSR @ LOC4 and JSR @ LOC5 respectively. The user simply provides pointers to GET and PUT character routines in locations 40 and 41 respectively.

Document X Tape X

PROGRAM NO. 009 (LP)

A CARD READER VERSION OF THE NOVA
RELOCATABLE ASSEMBLER

Joe Sukonik
Calma Corporation
Sunnyvale, California

This version of the Nova Relocatable Assembler (DGC 091-000017) contains an additional input assignment allowing the source program to be input from the card reader. On input, card data is translated from IBM 029 format to ASCII. Absolute location 6571 can be set to the number of columns to be ignored at the end of the card--this is preset at 20. This allows the end of the card to carry sequence numbers, or other identifiers, without causing the assembler to flag them as errors. Minimum configuration of 8K memory is required.

Document X Tape X

Program No. 010

PUNCH CARD TO TAPE CONVERTER

Joe Sukonik
Calma Corporation
Sunnyvale, California

This program converts cards punched in IBM 029 format to ASCII formatted

punched paper tape. If data switch 0 is up, output is directed to the high speed punch. Absolute locations 15134, 15135, and 15136 may be initialized to contain the following information, respectively: number of columns of the card to be converted; number of columns at the beginning of the card to be ignored; number of lines per page--between Form Feed punches. Version supplied resides in the upper 4K module of an 8K system configuration (S. A. -- 15000).

Document X Tape X

Program No. 011

NOVA MAGNETIC TAPE INPUT/OUTPUT SYSTEM

George U. Ramos
GTE Sylvania Inc.
Mountain View, California

This system program enables core images to be stored on, and retrieved from, magnetic tape by simple teletype commands. Communication with the system is by filename (operator generated). Tape searches are done for the filename, and files retrieved are loaded into core with termination options of HALT or automatic program start (analogous to start - block features of the DGC Binary Loader). The system is also stored on magnetic tape and is "booted" into core by a special bootstrap program which replaces the DGC Binary Loader in core and has a S.A. of X7777. Minimum system configuration is 8K of memory, teletype, and one 9-track magnetic tape unit.

Document X Tape X

Program No. 012

HOLLERITH TO ASCII CONVERSION SUBROUTINE

David L. Wasley
University of California
Berkeley, California

This assembly language subroutine, with a calling sequence of JSR HOLL, converts a 12-bit Hollerith code in ACO to its equivalent 8-bit, even parity ASCII code. The ASCII code is returned in ACO and all other accumulators are modified by the subroutine. The Hollerith code is assumed to be a card image, right justified, with the "12" punch in bit position 4. The 64 (decimal) word subroutine is self-contained and may be assembled anywhere in core.

Document X Tape X

UTILITIES (Cont.)

Program No. 014

EXEC

L. A. Fraser
Lenkurt Electric Co. of Canada, Ltd.
Burnaby, B. C.

This program, called EXEC, permits the loading of any non-DOS absolute binary program, as produced by the NOVA assemblers, from a Disk Operating System File. The program loaded may use locations 0 through 16 and 400 - 777, which are locations normally required by DOS. This program is supplied as a DOS dump tape and utilizes 440 words of core. The system command is EXEC file name, and the search is made for the extension .BN. Termination alternatives for manual and automatic program starting have been incorporated in EXEC.

Document X Tape X

Program No. 016 (LP)

QUICK LOAD LOADER

W. A. Foley
R. F. Halley
Astrophysics Research Corporation
Norco, California

This routine is a modification of Data General's "Self-Loading Bootstrap Loader," (Tape 081-000001-00) so that the bootstrap does not HALT after the loader is loaded but branches to the loader and begins execution. Thus, if this tape is copied onto the beginning of an absolute binary tape, any binary tape may be loaded using the hardware bootstrap feature of the NOVA computers.

Document X Tape X

Program No. 017

INPUT/OUTPUT PACKAGE

Dr. Charles S. Cox
University of California
San Diego, California

This is a package of ten sub-routines to facilitate I/O operations with the teletype. Subroutines are provided for 1) Character input from TTY; 2) Character output to TTY; 3) Generation of N spaces; 4) Generation of CR and LF; 5) Output of character string into storage; 7) Reading of a signed, single or double precision, octal or decimal numeral string from TTY and conversion into binary; 8) Branching

on reception of a break character; 9) Conversion of a binary number into signed or unsigned, decimal or octal, numeral string and printing on TTY; 10) Formatting of numbers generated by routine #9. These subroutines reside in 742 (Octal) memory locations.

Document X Tape X

Program No. 018

SELECTIVE CORE DUMP SUBROUTINE

This assembly language subroutine allows the user to selectively dump portions of core storage. There are two versions of the subroutine so that the output may be on the line printer or teletype. Two entry points are provided so that the user may obtain output in octal or decimal format. This relocatable subroutine takes 233 octal core locations.

Document X Tape X

Program No. 020 (LP)

OVERLAY EDITOR-ASSEMBLER SYSTEM

J. E. Pierce
Southwestern Steel Rolling Door Company
Dallas, Texas

An executive routine, a modified Data General editor, and a modified Data General absolute assembler make up this overlay system. The editor stores a text buffer in core and the assembler will assemble the contents of this text buffer. Routines have been added to the editor which facilitate source compression (by deleting comments) if core storage is not adequate. In between overlay operations other programs may be run in low core (at least up to address 4463) and the text buffer may still be recovered. Core above address 4463 is divided into the assembler user symbol table and the text buffer. The system may be run with a teletype and 4K of memory, but a high speed paper tape reader and at least 8K of memory allow convenient operation.

Document X Tape X

UTILITIES (Cont.)

Program No. 021 (LP)

RESUB

S. M. Heider
State University of New York at Buffalo
Buffalo, New York

RESUB, Relocatable Extended Single User Basic is Basic Interpreter System with features to allow concurrent operation with background programs. RESUB is a modified version of Data General's Time Share Basic. The following features should be useful in several single user applications:

1. Tape, Card, Dump, and Punch commands. These allow loading and dumping programs with user supplied routines.
2. Subroutine Call - RESUB'S SUBROUTINE call may be used as a console command. It is also possible to pass a string variable to a subroutine.
3. Stack processor for handling nested interrupts.
4. Provisions for handling background programs when Basic is not running or at bottom of interrupt stack.
5. Subroutines may be initialized at start up.
6. Location 20 contains address of first unused location in upper core.
7. Entry points are supplied for setting Run Time accumulator, substituting line printer for teletype, etc.
8. No location below 20 is used until RESUB is started. Consequently, it should be possible to load under DOS.

RESUB is supplied as a relocatable object tape about 14,000 (octal) words long. About 20 words in page zero are available.

The minimum configuration required for using RESUB is an 8K NOVA computer built by Data General with a standard teletype interface. It is advisable to have at least a 12K core.

RESUB will function as a stand alone program. Externals are checked before they are used. Instructions and a sample subroutine program are supplied.

Document X Tape X

Program No. 023 (LP)

SINGLE USER BASIC WITH MATRICES AND STRINGS

This version of BASIC is a modification of Data General's Time Sharing BASIC as described in the pamphlet called NOVA Line Time Sharing Basic. The communications multiplexer handler has been removed and replaced with a handler that operates the console teletype only.

The Time Sharing Basic pamphlet should be consulted for the operation of this version of BASIC. It gives the operator all the program control commands described on page 3 of the pamphlet. An additional command (control P) can be used instead of a carriage return to have a listing made to the line printer, i.e., LIST ↑P, or the results could be put to the line printer, i.e., RUN ↑P.

Document X Tape X

Program No. 028 (LP)

MACHINE LANGUAGE I/O SUBROUTINES FOR T. S. BASIC

R. M. Thomas
GTE Automatic Electric (Canada) Ltd.
Brockville, Ontario
Canada

These subroutines allow TIME-SHARED BASIC users to manipulate data in binary or other arbitrary formats such as EIA, and to read and punch character string data using the high-speed reader and punch or a teletype reader/punch.

Manipulation of binary or other data is achieved by unpacking 8-bit characters into equivalent strings of ASCII 1's and 0's which can be manipulated in BASIC. Results can be repacked for compact storage or output.

The machine-language subroutines are accessed using CALL statements in BASIC. A version of TIME-SHARED BASIC incorporating these subroutines is available; it occupies about 150 extra words of core, but is otherwise identical to normal TIME-SHARED BASIC.

The supplied program includes the modified DGC Time-Shared Basic (091-000026) with the machine language subroutines.

Documentation X Tape X

UTILITIES (Cont.)

Program No. 029

MACRO

Donald Allan
Westcoast Transmission Company
Vancouver, B. C.
Canada

MACRO is a program for processing assembly language source code to allow the user to define and use macro instructions. The program is supplied as a DGC DOS Dump Tape entitled MACRO.SV.

If a user writes source code in a file called X and runs the MACRO program, the MACRO program will read source code from X, translate the macro instructions to normal assembly language and write the normal assembly source code into an intermediate file called X.MC. When all code from the input file X has been processed, the MACRO program will overlay the assembler to assemble the program and write the binary data in file X.RB.

Lines of source code from X which are intended to be input to the macro program but not to the assembler (i.e., macro definitions and instructions) are converted to comments by prefixing them with a semi-colon.

Document X Tape X

Program No. 030

DOS TTY PAGE SIMULATOR

Michael Haines
North Vancouver, B. C.
Canada

This program, as supplied, is for operation under the DGC Disc Operating System. This program provides paging simulation for printouts to the Teletype (\$TTO), such that only 60 lines of printout appear on the 66 line, 11 inch page. This provides a vertical output format similar to that on a line printer. The program is supplied on a DGC DOS Dump Tape LI.SV.

Document X Tape X

Program No. 031

NOVA OPERATING SYSTEM PROGRAM

Timothy Mulrooney, Sr.
Naval Underwater Systems Center
Newport, Rhode Island

This program, written for the Data General NOVA series of minicomputers, is used along with other user programs to list, enter, or fill core, and to read, punch, copy, or verify paper tapes. It can also jump completely out of itself to a user program somewhere else in core. The eight available commands provide for specified core dump, core modification (individual and block), core to binary format punch, tape copy and verify, core compare, and program start-up. Program resides in the 1K below Binary Loader. Minimum configuration is CPU with 4K of memory, Teletype ASR, and/or high speed paper tape reader. Tapes include ASCII source and binary for an 8K system; changing 3 instructions in the source tape configures the program to any core size.

Documentation X Tape X

Program No. 032 (LP)

LHS DISK SWAPPING T. S. BASIC

Phil Levy
University of California
Berkeley, California

The version of Time-Shared Basic developed at the Lawrence Hall of science is designed to allow an 8K CPU with a disc to give users a large (slightly less than 2,000 words) block in which to write programs. The system is based on disc resident user blocks. One user in core at a time. The system will support 8 users (this can be expanded, if there is a need) with approximately 1,950 words per user.

In addition to this major change, other minor changes have been made. These include 1) command changes: SIZE LENGTH, NEW SCRATCH, etc. 2) all commands need to be only 3 letters in length 3) the commands requiring a statement number (LIST, PUN, REN) expect the number to follow a dash e. g., LIS-10, REN-10, 5. All these changes are explained in enclosed literature.

I. Hardware Required

Nova, NOVA 1200, NOVA 800, SUPERNOVA, or SUPERNOVA SC with:

- 1) at least 8K memory,
- 2) 4026 teletype multiplexer,
- 3) 4027 and/or 4028 interfaces to meet user's needs,

UTILITIES (Cont.)

- 4) 4019 disc control, and
- 5) 4019A, B, or C disc.

Program No. 035

Document X Tape X

CORE COMPARE AND LOAD

Eb Wulff
68 Lucinda Avenue
Wahroonga 2076, Australia

Program No. 033

EMUL-8

Eb Wulff
68 Lucinda Avenue
Wahroonga 2076, Australia

This is a program which compares absolute binary paper tapes with the contents in core locations. Any differences are printed out:
address core value tape value
This version also corrects any differences, in other words, the core values are restored to the values on tape.

This emulator of a PDP-8/S/L/I computer runs on any NOVA with 8K of memory (min. 5K). Most instructions are emulated in 20-25 US. on a SUPERNOVA computer. The Emulator is organized so that the operator can carry out all control functions required for a PDP-8 from the NOVA console. In particular it is possible to stop a PDP-8 program.

Program is supplied in bootstrap format.

Document X Tape X

Program No.036

Allowance has been made for the special ASR 33 Teletypes used on PDP-8 computers. The address space is 4K 12 bit words.

BINARY TAPE MAPPER

Eb Wulff
68 Lucinda Avenue
Wahroonga 2076, Australia

This version was modified extensively to adopt fast routines used in SIMUL-8, while retaining the machine-like operation and the fast interrupt scheme of earlier EMUL-8's.

The Binary Tape Mapper will print the starting and finishing addresses of all non-contiguous blocks on the tape. The end block address is also printed.

Document X Tape X

Program No. 034

Note: Only tapes without "fill" blocks are read by this program.
(Compatible with Vers. 1 of Loader)

DISSASSEMBLER II

Eb Wulff
68 Lucinda Avenue
Wahroonga 2076, Australia

Document X Tape X

This assembly language program reads absolute binary tapes on the fastest paper tape reader and prints address, octal value and assembly mnemonic with octal memory on the input reader. Load another tape and press continue.

Program No. 038

BINARY TAPE MERGER

Eb Wulff
68 Lucinda Avenue
Wahroonga 2076, Australia

This disassembler prints a number of unfamiliar mnemonics. These mnemonics are mostly IF constructs and all the common relations are handled this way. If these mnemonics are not wanted, change location 1437 to 000000. This is done most easily by punching a one-word tape containing 1437/0. This is then merged using the Binary Tape Merger (User's Group Program #038) with the Disassembler II binary tape.

The Binary Tape Merger Program allows the merging of a number of absolute binary tapes into one composite absolute binary tape. The output tape is punched in increasing address order and contains data for all those addresses defined in the input tapes.

Document X Tape X

Document X Tape X

UTILITIES (Cont.)

Program No. 039

SYSTEM DIRECTORY SORTER (DSORT)

Bill McAndrew
Automatic Electronic Systems Inc.
5455 Pare Street
Montreal, Quebec
Canada

This program is used to sort the listing of the system directory (SYS.DR) into alphabetical order. This allows for easy reference to all files stored on disk.

Program calculates the file attributes; an octal word count for each file, and formats the output onto the lineprinter.

This NOVA language program may be run on all DOS driven NOVA computers where the system includes a lineprinter. Available core must be large enough to hold at least 1/2 of SYS. DR file.

Document X Tape X

Program No. 041 (LP)

COMBO

Stephen Heider
Department of Physics
State University of New York at Buffalo
Buffalo, NY 14214

COMBO facilitates editing and assembly of programs on NOVA systems with at least 8K of core. This program contains modified versions of the Extended Assembler and Editor programs. Additional Editor commands have been incorporated to control the Assembler as well as I/O device selection. Assembler input may be either from the Edit Buffer or from paper tape. The user determines the symbol table size at startup. Additional features make it possible to punch library tapes and to obtain partial listings.

Minimum peripheral required is Teletype, but COMBO will support high-speed paper tape reader and punch as well as lineprinter.

Document X Tape X

Program No. 043

INCREMENTAL PLOTTER SUBROUTINES FOR BASIC

Christer Berg
Oy Stromberg Ab
P. O. Box 118
00101 Helsinki, Finland

This program extends BASIC with plotting capabilities by use of the CALL statement. Six calls are available: program initialization, XY-movements both absolute relative, pen up/down, ASCII character drawing, and coordinate inquiry. Program loading is described in the Extended Basic Manual.

Two sets of tapes are available with this program:

REV 05 - for use with Single User Basic with Call (User's Group Program #002)

REV 06 - for Extended Basic and Time Share Basic

When ordering, please specify which REV you want.

Document X Tape X

Program No. 047

OCTAL DUMP

This program, written entirely in DG Fortran IV, allows selective dumping of RDOS/DOS Disk files, in an octal format, to any specified listing device or file.

Document X Tape X

Program No. 049

ASSEMBLER SOURCE PROGRAM ANALYZER

Bruce K. Ray
Polymorphic Computer Systems
P. O. Box 3581
Boulder, CO 80303

This ALGOL program scans an assembler source program and tabulates the number of instructions of each NOVA instruction type used. Group percentage usage as well as actual instruction type count is given as output.

Operating Instructions - Load the ASCII tape and compile the program according to the supporting operating systems procedures. After the object is loaded and started, the file name of the assembler program to be analyzed,

UTILITIES (Cont.)

including any extentions, is requested.
After the program analyzes the source
file, the statistics are printed.

Program No. 055

FLOATING POINT SORT

This is a callable, relocatable
overlay-able subroutine written in
Fortran. Its function is to take a
tag file loaded onto any disk by the
User and arrange that tag file in
either ascending or descending order.
The ordered information is left on
the input file.

Any Algol supportable memory is
sufficient for program operation, and it
will run under DOS, RDOS, or SOS.

Document X Tape X

Program No. 051

BASIC RENUMBERER

Walter E. Wahnsiedler
Northwestern University
Materials Science Department
Evanston, Illinois

Document X Tape X

This assembly language program will
renumber BASIC source code with evenly
spaced line numbers, the starting number
and spacing at the User's option. A new
input tape is created for BASIC, permit-
ting easier editing of programs under
development and producing better appearing
finished programs. References in the
code (GOSUB, GOTO, THEN) are updated as
the tape is punched.

SOS REV 08 is necessary to recompile.
Teletype is sufficient, but program
supports high speed reader and punch.

Document X Tape X

Program No. 054

MINI EDITOR II

Eb Wulff
68 Lucinda Avenue
Wahroonga 2076, Australia

The Mini Editor can be used to edit
paper tapes on a teletype with reader
and punch. It requires only 100 octal
words of memory and can thus be used
while the paper tape assembler is in
memory in a 4K NOVA.

A tape is not available, but a
complete listing is included in
documentation.

Document X Tape