```
MMM          MMM  TTTTTTTTTTTTTTT   HHH          HHH  RRRRRRRRRRR     TTTTTTTTTTTTTTT   LLL
MMM          MMM  TTTTTTTTTTTTTTT   HHH          HHH  RRRRRRRRRRRR    TTTTTTTTTTTTTTT   LLL
MMM          MMM  TTTTTTTTTTTTTTT   HHH          HHH  RRRRRRRRRRRR    TTTTTTTTTTTTTTT   LLL
MMMMMM    MMMMMM        TTT         HHH          HHH  RRR         RRR       TTT         LLL
MMMMMM    MMMMMM        TTT         HHH          HHH  RRR         RRR       TTT         LLL
MMMMMM    MMMMMM        TTT         HHH          HHH  RRR         RRR       TTT         LLL
MMM   MMM   MMM         TTT         HHH          HHH  RRR         RRR       TTT         LLL
MMM   MMM   MMM         TTT         HHH          HHH  RRR         RRR       TTT         LLL
MMM   MMM   MMM         TTT         HHH          HHH  RRR         RRR       TTT         LLL
MMM         MMM         TTT         HHHHHHHHHHHHHHHH  RRRRRRRRRRR           TTT         LLL
MMM         MMM         TTT         HHHHHHHHHHHHHHHH  RRRRRRRRRRRR          TTT         LLL
MMM         MMM         TTT         HHHHHHHHHHHHHHHH  RRRRRRRRRRRR          TTT         LLL
MMM         MMM         TTT         HHH          HHH  RRR   RRR             TTT         LLL
MMM         MMM         TTT         HHH          HHH  RRR   RRR             TTT         LLL
MMM         MMM         TTT         HHH          HHH  RRR   RRR             TTT         LLL
MMM         MMM         TTT         HHH          HHH  RRR      RRR          TTT         LLL
MMM         MMM         TTT         HHH          HHH  RRR      RRR          TTT         LLL
MMM         MMM         TTT         HHH          HHH  RRR      RRR          TTT         LLL
MMM         MMM         TTT         HHH          HHH  RRR         RRR       TTT         LLLLLLLLLLLLLLLL
MMM         MMM         TTT         HHH          HHH  RRR         RRR       TTT         LLLLLLLLLLLLLLLL
MMM         MMM         TTT         HHH          HHH  RRR         RRR       TTT         LLLLLLLLLLLLLLLL
```

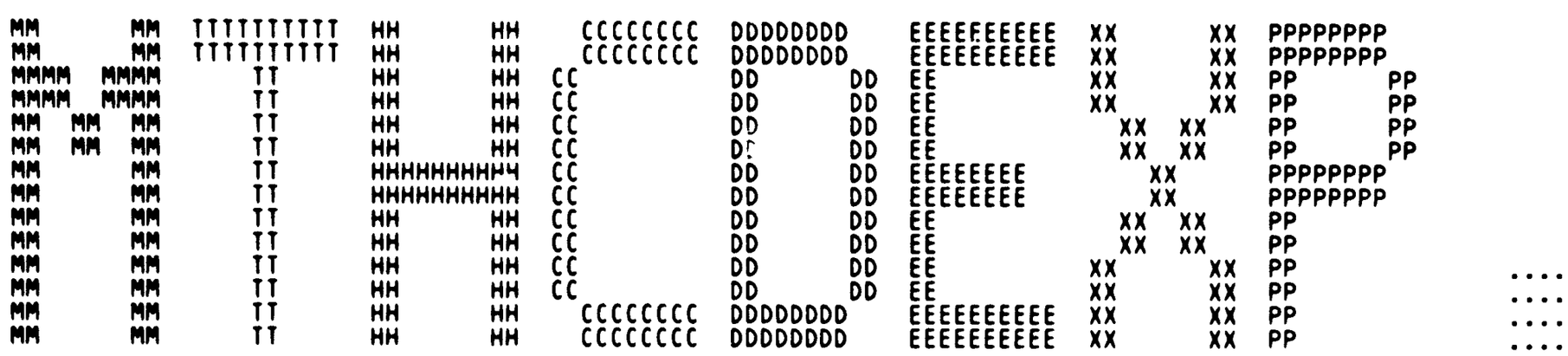
MM MM TTTTTTTTTT HH HH CCCCCCCC DDDDDDDD EEEEEEEEEE XX XX PPPPPPPP
MM MM TTTTTTTTTT HH HH CCCCCCCC DDDDDDDD EEEEEEEEEE XX XX PPPPPPPP
MMMM MMMM TT HH HH CC DD DD EE XX XX PP PP
MMMM MMMM TT HH HH CC DD DD EE XX XX PP PP
MM MM MM TT HH HH CC DD DD EE XX XX PP PP
MM MM MM TT HH HH CC DD DD EE XX XX PP PP
MM MM TT HHHHHHHHHH CC DD DD EEEEEEEE XX PPPPPPPP
MM MM TT HHHHHHHHHH CC DD DD EEEEEEEE XX PPPPPPPP
MM MM TT HH HH CC DD DD EE XX XX PP
MM MM TT HH HH CC DD DD EE XX XX PP
MM MM TT HH HH CC DD DD EE XX XX PP
MM MM TT HH HH CC DD DD EE XX XX PP
MM MM TT HH HH CCCCCCCC DDDDDDDD EEEEEEEEEE XX XX PP
MM MM TT HH HH CCCCCCCC DDDDDDDD EEEEEEEEEE XX XX PP
LL IIIIII SSSSSSSS
LL IIIIII SSSSSSSS
LL II SS
LL II SS
LL II SS
LL II SS
LL II SSSSSS
LL II SSSSSS
LL II SS
LL II SS
LL II SS
LL II SS
LLLLLLLLLL IIIIII SSSSSSSS
LLLLLLLLLL IIIIII SSSSSSSS

Table of contents

```
0000     1          .TITLE  MTH$CDEXP       D COMPLEX*16 Exponential
0000     2          .IDENT  /1-002/         ; File: MTHCDEXP.MAR Edit:RNH1002
0000     3
0000     4  ;
0000     5  ;*****************************************************************************
0000     6  ;*                                                                           *
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0000    24  ;*                                                                           *
0000    25  ;*                                                                           *
0000    26  ;*****************************************************************************
0000    27  ;
0000    28  ;
0000    29  ; FACILITY: MATH LIBRARY
0000    30  ;++
0000    31  ; ABSTRACT:
0000    32  ;       Perform D COMPLEX*16 exponentiation: e**(r,i)
0000    33  ;
0000    34  ;
0000    35  ;--
0000    36  ;
0000    37  ; VERSION: 1
0000    38  ;
0000    39  ; HISTORY:
0000    40  ;
0000    41  ; AUTHOR:
0000    42  ;       Steven B. Lionel, 20-July-1979
0000    43  ;
0000    44  ; MODIFIED BY:
0000    45  ;
0000    46  ;
0000    47  ;
```

```
0000     49          .SBTTL  HISTORY         ; Detailed Current Edit History
0000     50
0000     51
0000     52 ; Edit History
0000     53 ;
0000     54 ; 1-001 - Adapted from MTH$CEXP version 1-002.  SBL 20-Ju'y-1979
0000     55 ; 1-002 - Changed shared external references to G^ RNH 25-Sep-81
```

```
                     57          .SBTTL  DECLARATIONS
                     58
                     59 ;
                     60 ; INCLUDE FILES:
                     61 ;
                     62
                     63 ;
                     64 ; EXTERNAL SYMBOLS:
                     65          .DSABL  GBL
                     66          .EXTRN  MTH$DSIN_R7
                     67          .EXTRN  MTH$DCOS_R7
                     68          .EXTRN  MTH$DEXP_R7
                     69
                     70 ;
                     71 ; MACROS:
                     72 ;        NONE
                     73
                     74 ;
                     75 ; PSECT DECLARATIONS:
00000000             76          .PSECT  _MTH$CODE       PIC, SHR, LONG, EXE, NOWRT
                     77
                     78 ;
                     79 ; EQUATED SYMBOLS:
                     80 ;
                     81
                     82 ;
                     83 ; OWN STORAGE:
                     84 ;        NONE
```

```
                     0000    86          .SBTTL  MTH$CDEXP - perform D COMPLEX*16 exponentiation
                     0000    87
                     0000    88 ;++
                     0000    89 ; FUNCTIONAL DESCRIPTION:
                     0000    90 ;
                     0000    91 ;       The result of the operation e ** (r, i) is computed
                     0000    92 ;       by:
                     0000    93 ;
                     0000    94 ;       result = (EXP(r) * COS(i), EXP(r) * SIN(i))
                     0000    95 ;
                     0000    96 ; CALLING SEQUENCE:
                     0000    97 ;       CALL MTH$CDEXP (result.wdc.r, arg.rdc.r)
                     0000    98 ;
                     0000    99 ;
                     0000   100 ; INPUT PARAMETERS:
00000008             0000   101 ;       arg     = 8             ; D COMPLEX*16 argument by reference
                     0000   102 ;
                     0000   103 ; IMPLICIT INPUTS:
                     0000   104 ;       NONE
                     0000   105 ;
                     0000   106 ; OUTPUT PARAMETERS:
00000004             0000   107 ;       result  = 4             ; D COMPLEX*16 result by reference
                     0000   108 ;
                     0000   109 ; IMPLICIT OUTPUTS:
                     0000   110 ;       NONE
                     0000   111 ;
                     0000   112 ; COMPLETION CODES:
                     0000   113 ;       NONE
                     0000   114 ;
                     0000   115 ; SIDE EFFECTS:
                     0000   116 ;       Signals:        MTH$_SINSIGLOS  if |i| > 2*PI*2**31.
                     0000   117 ;                       Floating Overflow if r > 88.028
                     0000   118 ;
                     0000   119 ;--
                     0000   120
                     0000   121
                 00FC 0000   122          .ENTRY  MTH$CDEXP,      ^M<R2,R3,R4,R5,R6,R7>
                     0002   123          MTH$FLAG_JACKET                 ; resignal
                     0002
  6D  00000000'GF    9E 0002              MOVAB   G^MTH$$JACKET_HND, (FP)
                     0009                                                ; set handler address to jacket
                     0009                                                ; handler
                     0009
                     0009   124
    50    08 BC    7D 0009   125          MOVQ    @arg(AP), R0            ; R0-R1 = real part
  00000000'GF      16 000D   126          JSB     G^MTH$DEXP_R7           ; R0-R1 = EXP(r)
     7E    50    7D 0013   127          MOVQ    R0, -(SP)               ; Save it on the stack
                     0016   128
    50    08 AC    D0 0016   129          MOVL    arg(AP), R0             ; R0 is address of arg
                     001A   130
    50    08 A0    7D 001A   131          MOVQ    8(R0), R0               ; R0-R1 = imaginary part
     7E    50    7D 001E   132          MOVQ    R0,-(SP)                ; Save imaginary part
  00000000'GF      16 0021   133          JSB     G^MTH$DCOS_R7           ; R0-R1 = COS(i)
04 BC 08 AE    50 65 0027   134          MULD3   R0, 8(SP), @result(AP)  ; Store real part
     50    8E    7D 002D   135          MOVQ    (SP)+, R0               ; Get imaginary part again
  00000000'GF      16 0030   136          JSB     G^MTH$DSIN_R7           ; R0-R1 = SIN(i)
    52    04 AC    D0 0036   137          MOVL    result(AP), R2          ; Address of result
```

```
                08 A2    8E    50    65  003A    138         MULD3   R0, (SP)+, 8(R2)        ; Store imaginary part
                                     04  003F    139         RET
                                         0040    140
                                         0040    141
                                         0040    142         .END
```

```
ARG             = 00000008
MTH$$JACKET_HND  ********    X   01
MTH$CDEXP        00000000 RG    01
MTH$DCOS_R7      ********    X   00
MTH$DEXP_R7      ********    X   00
MTH$DSIN_R7      ********    X   00
RESULT          = 00000004
```

Psect synopsis

PSECT name	Allocation	PSECT No.	Attributes
. ABS .	00000000 (0.)	00 (0.)	NOPIC USR CON ABS LCL NOSHR NOEXE NORD NOWRT NOVEC BYTE
_MTH$CODE	00000040 (64.)	01 (1.)	PIC USR CON REL LCL SHR EXE RD NOWRT NOVEC LONG

Performance indicators

Phase	Page faults	CPU Time	Elapsed Time
Initialization	33	00:00:00.11	00:00:00.74
Command processing	130	00:00:00.73	00:00:05.53
Pass 1	81	00:00:00.68	00:00:03.80
Symbol table sort	0	00:00:00.00	00:00:00.00
Pass 2	40	00:00:00.45	00:00:02.60
Symbol table output	2	00:00:00.02	00:00:00.02
Psect synopsis output	2	00:00:00.01	00:00:00.01
Cross-reference output	0	00:00:00.00	00:00:00.00
Assembler run totals	290	00:00:02.02	00:00:12.75

The working set limit was 900 pages.
2344 bytes (5 pages) of virtual memory were used to buffer the intermediate code.
There were 10 pages of symbol table space allocated to hold 7 non-local and 0 local symbols.
202 source lines were read in Pass 1, producing 11 object records in Pass 2.
1 page of virtual memory was used to define 1 macro.

Macro library statistics

Macro library name	Macros defined
_255DUA28:[SYSLIB]STARLET.MLB;2	0

0 GETS were required to define 0 macros.

There were no errors, warnings or information messages.

```
MACRO/ENABLE=SUPPRESSION/DISABLE=(GLOBAL,TRACEBACK)/LIS=LIS$:MTHCDEXP/OBJ=OBJ$:MTHCDEXP MSRC$:MTHJACKET/UPDATE=(ENH$:MTHJACKET)+MSRC
```

MTH4OVPI
LIS

MTHABS
LIS

MTHAINT
LIS

MTHAMOD
LIS

MTHERR
SDL

MTHASIN
LIS

MTHCDABS
LIS

MTHATAN
LIS

MTHATANH
LIS

MTHCDLOG
LIS

MTHJACKET
MAR

MTHBITOPS
LIS

MTHALOG
LIS

MTHDEF
FOR

MTHANINT
LIS

MTHCABS
LIS

MTHACOS
LIS

MTHCDEXP
LIS