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LL      IIIIII  BBBB8888  EEEEEEEEEEE  MM      MM      000000  DDDDDDDDD  HH      HH
LL      II      BB      BB  EE      EE  MMMM  MMMM  00      00  DD      DD  HH      HH
LL      II      BB      BB  EE      EE  MMMM  MMMM  00      00  DD      DD  HH      HH
LL      II      BB      BB  EE      EE  MM  MM  MM  00      00  DD      DD  HH      HH
LL      II      BBBB8888  EEEEEEEEE  MM      MM  00      00  DD      DD  HHHHHHHHHH
LL      II      BBBB8888  EEEEEEEEE  MM      MM  00      00  DD      DD  HHHHHHHHHH
LL      II      BB      BB  EE      EE  MM      MM  00      00  DD      DD  HH      HH
LL      II      BB      BB  EE      EE  MM      MM  00      00  DD      DD  HH      HH
LL      II      BB      BB  EE      EE  MM      MM  00      00  DD      DD  HH      HH
LL      II      BB      BB  EE      EE  MM      MM  00      00  DD      DD  HH      HH
LLLLLLLLLLLL IIIIII  BBBB8888  EEEEEEEEEEE  MM      MM      000000  DDDDDDDDD  HH      HH
LLLLLLLLLLLL IIIIII  BBBB8888  EEEEEEEEEEE  MM      MM      000000  DDDDDDDDD  HH      HH
                                         ....
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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
LLLLLLLLLLLL IIIIII  SSSSSSSS
LLLLLLLLLLLL IIIIII  SSSSSSSS
```


(2)	45	Edit History
(3)	51	DECLARATIONS
(4)	92	LIBSEMODH - Extended multiply and integerize

```
0000 1 .TITLE LIBSEMODH - Extended multiply and integerize H
0000 2 .IDENT /1-002/ ; File: LIBEMODH.MAR Edit: SBL1002
0000 3
0000 4
0000 5 *****
0000 6 *
0000 7 * COPYRIGHT (c) 1978, 1980, 1982, 1984 BY
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0000 23 * SOFTWARE ON EQUIPMENT WHICH IS NOT SUPPLIED BY DIGITAL.
0000 24 *
0000 25 *
0000 26 *****
0000 27
0000 28
0000 29 ++
0000 30 FACILITY: General Utility Library
0000 31
0000 32 ABSTRACT:
0000 33
0000 34 Extend precision of multiplier, multiply by multiplicand
0000 35 and extract integer and fractional portion of result.
0000 36
0000 37 ENVIRONMENT: User Mode, AST Reentrant
0000 38
0000 39 --
0000 40 AUTHOR: Steven B. Lionel, CREATION DATE: 31-July-1979
0000 41
0000 42 MODIFIED BY:
0000 43
```


LIBSEMODH
1-002

- Extended multiply and integerize H^{E 6}
Edit History

16-SEP-1984 00:01:28 VAX/VMS Macro V04-00 Page 2
6-SEP-1984 11:06:21 [LIBRTL.SRC]LIBEMODH.MAR;1 (2)

0000 45 .SBTTL Edit History
0000 46 : 1-001 - Original. SBL 31-July-1979
0000 47 : 1-002 - Use local handler to insure that exceptions other than those documented
0000 48 : as statuses are resigalled. SBL 25-Sept-1980
0000 49 :

```
0000 51      .SBTTL  DECLARATIONS
0000 52  ::
0000 53  :: INCLUDE FILES:
0000 54  ::
0000 55      $CHFDEF      ; Condition handling macros
0000 56      $SSDEF       ; System symbol definitions
0000 57  ::
0000 58  :: EXTERNAL SYMBOLS:
0000 59  ::
0000 60
0000 61      .EXTRN  LIB$SIG_TO_RET      ; Library routine to convert a signal
0000 62      ; to error return to caller
0000 63      ; of LIB$MODH.
0000 64      ; R0 = signaled condition
0000 65
0000 66
0000 67  ::
0000 68  :: MACROS:
0000 69  ::
0000 70
0000 71  ::
0000 72  :: EQUATED SYMBOLS:
0000 73  ::
0000 74
00000004 0000 75      mulr = 4      ; multiplier
00000008 0000 76      mulrx = 8     ; multiplier extension
0000000C 0000 77      muld = 12     ; multiplicand
00000010 0000 78      int = 16      ; integer portion returned
00000014 0000 79      fract = 20    ; fractional portion returned
0000 80
0000 81  ::
0000 82  :: OWN STORAGE:
0000 83  ::
0000 84
0000 85  ::
0000 86  :: PSECT DECLARATIONS:
0000 87  ::
00000000 0000 88      .PSECT _LIB$CODE      PIC, USR, CON, REL, LCL, SHR, -
0000 89      EXE, RD, NOWRT, LONG
0000 90
```



```
0000 92 .SBTTL LIB$EMODH - Extended multiply and integerize
0000 93 :++
0000 94 : FUNCTIONAL DESCRIPTION:
0000 95 :
0000 96 : LIB$EMODH provides the functionality of the VAX hardware
0000 97 : instruction EMODH to high-level language users.
0000 98 :
0000 99 : The floating point multiplier extension operand (second operand)
0000 100 : is concatenated with the floating point multiplier (first
0000 101 : operand) to gain 15 additional low order fraction bits.
0000 102 : The multiplicand operand is multiplied by the extended
0000 103 : multiplier operand. After multiplication, the integer
0000 104 : portion is extracted and a 128 bit floating point number is
0000 105 : formed from the fractional part of the product by truncating
0000 106 : extra bits. The multiplication is such that the result is
0000 107 : equivalent to the exact product truncated to a fraction
0000 108 : field of 128 bits. Regarding the result as the sum of an
0000 109 : integer and fraction of the same sign, the integer operand
0000 110 : is replaced by the integer part of the result and the
0000 111 : fraction operand is replaced by the rounded fractional
0000 112 : part of the result.
0000 113 :
0000 114 : CALLING SEQUENCE:
0000 115 :
0000 116 : status.wlc.v = LIB$EMODH (mulr.rh.r, mulrx.rw.r, muld.rh.r,
0000 117 : int.wl.r, fract.wh.r)
0000 118 :
0000 119 : INPUT PARAMETERS:
0000 120 :
0000 121 : mulr.rh.r - floating point multiplier
0000 122 : mulrx.rw.r - word to be appended to multiplier fraction
0000 123 : muld.rh.r - floating point multiplicand
0000 124 :
0000 125 : IMPLICIT INPUTS:
0000 126 :
0000 127 : NONE
0000 128 :
0000 129 : OUTPUT PARAMETERS:
0000 130 :
0000 131 : int.wl.r - integer portion of result
0000 132 : fract.wh.r - fractional portion of result
0000 133 :
0000 134 : IMPLICIT OUTPUTS:
0000 135 :
0000 136 : NONE
0000 137 :
0000 138 : FUNCTION VALUE:
0000 139 :
0000 140 : SSS_NORMAL - successful execution
0000 141 : SSS_INTOVF - integer overflow or floating overflow
0000 142 : SSS_FLTUND - floating underflow
0000 143 : SSS_ROPRAND - reserved operand
0000 144 :
0000 145 : SIDE EFFECTS:
0000 146 :
0000 147 : All other exceptions are signalled.
0000 148 :
```

```
0000 149 ;--
0000 150
4000 0000 151 .ENTRY LIB$EMODH, ^M<IV> ; Entry point
0002 152
6D 16'AF 9E 0002 153 MOVAB B^HANDLER, (FP) ; Enable local handler to
0006 154 ; process exceptions
0006 155
10 BC 0C BC 08 BC 04 BC 74FD 0006 156 EMODH @mulr(AP), - ; perform multiplication
14 BC 0010 ;
0012 157 @mulrx(AP), - ; trap on exception to
0012 158 @muld(AP), - ; handler which will
0012 159 @int(AP), - ; unwind a return error
0012 160 @fract(AP) ; condition in R0 to
0012 161 ; caller of LIB$EMODH.
0012 162
50 01 9A 0012 163 MOVZBL #1, R0 ; success status code
0015 164
04 0015 165 RET ; return
0016 166
0000 0016 167 HANDLER:
0018 168 .WORD 0
0018 169
0018 170 ;+
0018 171 ; If the exception is one of the documented exceptions for this routine,
0018 172 ; call LIB$SIG_TO_RET to return it as a status. Otherwise, resignal.
0018 173 ; Also, resignal if the depth is not zero.
0018 174 ;--
0018 175
50 08 AC D0 0018 176 MOVL CHF$MCHARGLIST(AP), R0 ; Get mechanism vector address
08 A0 D5 001C 177 TSTL CHF$MCH_DEPTH(R0) ; Is depth zero?
32 12 001F 178 BNEQ 90$ ; If not, resignal
51 04 AC D0 0021 179 MOVL CHF$SIGARGLIST(AP), R1 ; Get signal vector address
50 04 A1 D0 0025 180 MOVL CHF$SIG_NAME(R1), R0 ; Get signalled condition
047C 8F 50 B1 0029 181 CMPW R0, #SS$_INTOVF ; Compare conditions
1B 13 002E 182 BEQL 10$ ; If it matches, don't resignal
049C 8F 50 B1 0030 183 CMPW R0, #SS$_FLTUND
14 13 0035 184 BEQL 10$
0454 8F 50 B1 0037 185 CMPW R0, #SS$_ROPRAND
0D 13 003C 186 BEQL 10$
04C4 8F 50 B1 003E 187 CMPW R0, #SS$_FLTUND_F
0E 12 0043 188 BNEQ 90$
04 A1 049C 8F 3C 0045 189 MOVZWL #SS$_FLTUND, CHF$SIG_NAME(R1) ; Change fault code to trap code
00000000'GF 6C FA 004B 190 10$: CALLG (AP), G^LIB$SIG_TO_RET ; Return signal as a status
50 0918 8F 3C 0052 191 RET
04 0053 192 90$: MOVZWL #SS$_RESIGNAL, R0 ; Resignal condition
0058 193 RET
0059 194
0059 195
0059 196 .END
```


LIBSEMODH
Symbol table

I 6
- Extended multiply and integerize H

16-SEP-1984 00:01:28 VAX/VMS Macro V04-00
6-SEP-1984 11:06:21 [LIBRTL.SRC]LIBEMODH.MAR;1

Page 6
(4)

CHFSL_MCHARGLST = 00000008
CHFSL_MCH_DEPTH = 00000008
CHFSL_SIGARGLST = 00000004
CHFSL_SIG_NAME = 00000004
FRACT = 00000014
HANDLER = 00000016 R 02
INT = 00000010
LIBSEMODH = 00000000 RG 02
LIBSIG_TO_RET ***** X 00
MULD = 0000000C
MULR = 00000004
MULRX = 00000008
SS\$_FLTUND = 0000049C
SS\$_FLTUND_F = 000004C4
SS\$_INTOVF = 0000047C
SS\$_RESIGNAL = 00000918
SS\$_ROPRAND = 00000454

+-----+
! Psect synopsis !
+-----+

PSECT name	Allocation	PSECT No.	Attributes
. ABS .	00000000 (0.)	00 (0.)	NOPIC USR CON ABS LCL NOSHR NOEXE NORD NOWRT NOVEC BYTE
\$ABSS	00000000 (0.)	01 (1.)	NOPIC USR CON ABS LCL NOSHR EXE RD WRT NOVEC BYTE
_LIB\$CODE	00000059 (89.)	02 (2.)	PIC USR CON REL LCL SHR EXE RD NOWRT NOVEC LONG

+-----+
! Performance indicators !
+-----+

Phase	Page faults	CPU Time	Elapsed Time
Initialization	30	00:00:00.03	00:00:01.67
Command processing	111	00:00:00.30	00:00:02.18
Pass 1	190	00:00:02.72	00:00:09.17
Symbol table sort	0	00:00:00.42	00:00:01.16
Pass 2	51	00:00:00.58	00:00:01.34
Symbol table output	4	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	390	00:00:04.08	00:00:15.55

The working set limit was 1200 pages.
21526 bytes (43 pages) of virtual memory were used to buffer the intermediate code.
There were 30 pages of symbol table space allocated to hold 428 non-local and 2 local symbols.
196 source lines were read in Pass 1, producing 13 object records in Pass 2.
9 pages of virtual memory were used to define 8 macros.

+-----+
! Macro library statistics !
+-----+

Macro library name

Macros defined

_S255\$DUA28:[SYSLIB]STARLET.MLB;2

5

486 GETS were required to define 5 macros.

There were no errors, warnings or information messages.

MACRO/ENABLE=SUPPRESSION/DISABLE=(GLOBAL,TRACEBACK)/LIS=LIS\$:LIBEMODH/OBJ=OBJ\$:LIBEMODH MSRC\$:LIBEMODH/UPDATE=(ENH\$:LIBEMODH)

0206 AH-BT13A-SE
VAX/VMS V4.0

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