The current estimate for the main storage requirement for the LITTLE-written SETL run time library is about 132,000 octal (46,080 decimal). This is equal to the size required to execute a short SETL program, as the code (BALM-machine instructions) resides in the storage heap, and an allowance has been included for the heap (10000 decimal for stack plus heap). The figure is contingent upon the LITTLE compiler's being modified to reuse compiler-generated temporaries. If this is not done, approximately 30,000 (octal) should be added.

The storage is used roughly as follows:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>LITTLE code for SRTL</td>
<td>71,200</td>
</tr>
<tr>
<td>System routines and I/O buffers</td>
<td>13,220</td>
</tr>
<tr>
<td>Data (mostly heap space)</td>
<td>25,100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>131,520</strong></td>
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</tbody>
</table>

A more detailed estimate is given on the following pages. A suffix of "e" denotes an estimated value. For the others, the figure was obtained from a load map, and rounded to the nearest multiple of eight.

Note that better LITTLE code generation might reduce the LITTLE code by 1/3, or approximately 23K. It appears therefore that a minimal system close to 100K might be within reach.
### SRTL Routines

<table>
<thead>
<tr>
<th>NAME</th>
<th>DESCRIPTION</th>
<th>OCTAL SIZE</th>
<th>SUB-TOTALS</th>
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<tbody>
<tr>
<td>START</td>
<td>ENTRY POINT, INITIALIZER</td>
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</tr>
<tr>
<td>BALMINT</td>
<td>BALM INTERPRETER MAIN ROUTINE</td>
<td>4160</td>
<td></td>
</tr>
<tr>
<td>PACKER</td>
<td>PACKS BALM MACHINE INSTRUCTIONS</td>
<td>530</td>
<td></td>
</tr>
<tr>
<td>EOJSTAT</td>
<td>PRINTS END OF JOB STATISTICS</td>
<td>360</td>
<td>6210</td>
</tr>
<tr>
<td>NOSPACE</td>
<td>TERMINATES JOB DUE TO LACK OF SPACE</td>
<td>10</td>
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</tr>
<tr>
<td>GETSTG</td>
<td>STORAGE ALLOCATION ROUTINE</td>
<td>40</td>
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</tr>
<tr>
<td>NOSPACE</td>
<td>TERMINATES JOB DUE TO LACK OF SPACE</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>GETSTG</td>
<td>STORAGE ALLOCATION ROUTINE</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>NOSPACE</td>
<td>TERMINATES JOB DUE TO LACK OF SPACE</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MARKBLK</td>
<td>GARBAGE COLLECTOR, MARKING PHASE</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>AUXSTKO</td>
<td>GARBAGE COLLECTOR, AUXILIARY STACK OVERFLOW</td>
<td>10</td>
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<tr>
<td>ADFJPTR</td>
<td>GARBAGE COLLECTOR, ADJUST POINTS IN STACK WD.</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>ADJFJPTR</td>
<td>GARBAGE COLLECTOR, ADJUST ONE POINTER</td>
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<tr>
<td>GARBCOL</td>
<td>GARBAGE COLLECTOR, MAIN ROUTINE</td>
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</tr>
<tr>
<td>GENINT</td>
<td>GENERATE INTEGER</td>
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<td>120</td>
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<tr>
<td>GENINT</td>
<td>GENERATE SHORT INTEGER</td>
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<tr>
<td>GENREAL</td>
<td>GENERATE REAL (FLOATING POINT)</td>
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<tr>
<td>GENBOOL</td>
<td>GENERATE BOOLEAN STRING</td>
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<td>120</td>
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<tr>
<td>GENCHAR</td>
<td>GENERATE CHARACTER STRING</td>
<td>210</td>
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<tr>
<td>GENLABL</td>
<td>GENERATE LABEL OBJECT</td>
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<tr>
<td>GENSUBR</td>
<td>GENERATE SUBROUTINE OBJECT</td>
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</tr>
<tr>
<td>GENFUN</td>
<td>GENERATE FUNCTION OBJECT</td>
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<tr>
<td>GENPAIR</td>
<td>GENERATE SPECIAL PAIR</td>
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<tr>
<td>GENTUP</td>
<td>GENERATE TUPLE</td>
<td>60</td>
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<tr>
<td>GENSET</td>
<td>GENERATE SET</td>
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<td>220</td>
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<tr>
<td>INCHAR</td>
<td>SETL CHARACTER STRING TO INTEGER CONVERSION</td>
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<tr>
<td>RELCHAR</td>
<td>SETL CHARACTER STRING TO REAL CONVERSION</td>
<td>400e</td>
<td>1170</td>
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<td>BSTCHAR</td>
<td>SETL CHARACTER STRING TO BOOLEAN STRING CONVERSION</td>
<td>410</td>
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<tr>
<td>CHARCNV</td>
<td>SETL OBJECT TO CHARACTER STRING CONVERSION</td>
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<tr>
<td>CHARINT</td>
<td>SETL INTEGER TO CHARACTER STRING CONVERSION</td>
<td>130</td>
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<tr>
<td>CHARREL</td>
<td>SETL REAL TO CHARACTER STRING CONVERSION</td>
<td>700e</td>
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<tr>
<td>CHARBST</td>
<td>SETL BOOLEAN STRING TO CHARACTER STRING CONVERSION</td>
<td>760</td>
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<tr>
<td>CHARCST</td>
<td>SETL CHARACTER STRING TO CHARACTER STRING CONVERSION</td>
<td>540</td>
<td></td>
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<tr>
<td>CHARBLK</td>
<td>SETL BLANK ATOM TO CHARACTER STRING CONVERSION</td>
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<tr>
<td>CHARLAB</td>
<td>SETL LABEL TO CHARACTER STRING CONVERSION</td>
<td>30e</td>
<td></td>
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<tr>
<td>CHARSUB</td>
<td>SETL SUBROUTINE TO CHARACTER STRING CONVERSION</td>
<td>30e</td>
<td></td>
</tr>
<tr>
<td>CHARFUN</td>
<td>SETL FUNCTION TO CHARACTER STRING CONVERSION</td>
<td>30e</td>
<td></td>
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<tr>
<td>CHARUND</td>
<td>SETL UNDEFINED ATOM TO CHARACTER STRING CONVERSION</td>
<td>30</td>
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<tr>
<td>CHARTUP</td>
<td>SETL TUPLE TO CHARACTER STRING CONVERSION</td>
<td>20</td>
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<tr>
<td>CHARSET</td>
<td>SETL SET TO CHARACTER STRING CONVERSION</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>LEFTPAD</td>
<td>MAKES A SETL STRING, LEFT PADDLED WITH BLANKS</td>
<td>300</td>
<td>3620</td>
</tr>
<tr>
<td>TokerREAD</td>
<td>LEXICAL SCANNER FOR THE INPUT (READ) ROUTINE</td>
<td>450</td>
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<tr>
<td>CHRNEXT</td>
<td>GETS NEXT CHARACTER FOR TokerREAD</td>
<td>140</td>
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<tr>
<td>PUTCHAR</td>
<td>ADDS LAST CHARACTER READ TO A STRING FOR TokerREAD</td>
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<tr>
<td>FULLTOK</td>
<td>HOUSEKEEPING ROUTINE FOR TokerREAD</td>
<td>70</td>
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<tr>
<td>ENDFILE</td>
<td>TESTS FOR END OF FILE; RETURNS SETL TRUE OR FALSE</td>
<td>10e</td>
<td>1040</td>
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<tr>
<td>PRINTER</td>
<td>INITIALIZE I/O ROUTINES</td>
<td>50</td>
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<tr>
<td>PRINTC</td>
<td>PRINTS AN ITEM WITH AN ABBREVIATION LABEL</td>
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<tr>
<td>CHAROUT</td>
<td>CONVERTS OBJECTS TO CHARACTER STRINGS AND PRINTS THEM</td>
<td>1110</td>
<td></td>
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<tr>
<td>POST</td>
<td>WRITES OUT AN ARBITRARILY LONG CHARACTER STRING</td>
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<tr>
<td>OUTSTR</td>
<td>WRITES OUT A CHARACTER STRING ON ONE LINE</td>
<td>140</td>
<td>2320</td>
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<tr>
<td>ERRIMP</td>
<td>ERROR MESSAGE WRITER</td>
<td>10e</td>
<td></td>
</tr>
</tbody>
</table>
ERRTYPE  ERROR MESSAGE WRITER
ERRVAL   ERROR MESSAGE WRITER
ERREMSG  ERROR MESSAGE WRITER
ERRIMPL  ERROR MESSAGE WRITER
ERRMIX   ERROR MESSAGE WRITER
DISPLAY  INTERNAL TO OCTAL OR HEX CONVERSION
HASH     HASHING ROUTINE
ATOM     SETL ATOM, X
NELT     SETL X, EQL, Y, MAIN ROUTINE
EQUAL    SETL X, EQ, Y, COMPARES ATOMS
EQQBASIC SETL X, EQ, Y, COMPARES ATOMS
ELMT     SETL X = S, MAIN ROUTINE
ELMTBST  SETL X = S, S A BOOLEAN STRING
ELMTCST  SETL X = S, S A CHARACTER STRING
ELMTTUP  SETL X = S, S A TUPLE
ELMTSET  SETL X = S, S A SET
ELSSMP   SETL X = S, S A SET, X NOT A TUPLE OF LENGTH ≥ 3
ELSTUP   SETL X = S, S A SET, X A TUPLE
ELMDELETE SETL S = S WITH, X, MAIN ROUTINE
AUDMENT  SETL S = S WITH, X, MAIN ROUTINE
AUDGOK   SETL S = S WITH, X, ARGUMENTS OK (NOT CHECKED)
AUDSIMP  SETL S = S WITH, X, X NOT A TUPLE OF LENGTH ≥ 3
AUDTUP   SETL S = S WITH, X, X A TUPLE
TUPSPLIT BREAKS UP A TUPLE
SETNTH2  SETL SX2, MAIN ENTRY
SET1SMP  SETL SX2, X NOT A TUPLE OF LENGTH ≥ 3
EXPAND   DOUBLES THE SIZE OF A HASH TABLE
DIMINIS  SETL S = S LESS, X, MAIN ROUTINE
DIMINOK  SETL S = S LESS, X, ARGUMENTS OK (NOT CHECKED)
DIMSIMP  SETL S = S LESS, X, X NOT A TUPLE OF LENGTH ≥ 3
DIMTUP   SETL S = S LESS, X, X A TUPLE
CONTRACT HALVES THE SIZE OF A HASH TABLE
DIFSET   SETL S = S LESF, X, MAIN ROUTINE
DIMFAOK  SETL S = S LESF, X, ARGUMENTS OK
ARB      SETL ARB, X, MAIN ROUTINE
ARBBSTR  SETL ARB, S, S A BOOLEAN STRING
ARCSTR   SETL ARB, S, S A CHARACTER STRING
ARBSTUP  SETL ARB, S, S A TUPLE
ARBSSTP  SETL ARB, S, S A SET
ARBSMP   SETL ARB, S, S A SET, TUPLES OF LENGTH ≥ 3 NOT REBUILT
NEXT     SETL ITERATION = X = S, MAIN ROUTINE
NEXTBIT  VXX = S, S A BOOLEAN STRING
NEXTCHR  VXX = S, S A CHARACTER STRING
NEXTCM   VXX = S, S A TUPLE
NEXTMEM  VXX = S, S A SET
NEXTMAAA ALLOCATES AN ADDRESS BLOCK FOR NEXTMEM
OFSET    SETL F(X), RETRIEVAL, MAIN ROUTINE
OFFST   SETL F(X), RETRIEVAL, F A BOOLEAN STRING
OFFST   SETL F(X), RETRIEVAL, F A CHARACTER STRING
OFFSET   SETL F(X), RETRIEVAL, F A TUPLE
OFFN     SETL F(X), RETRIEVAL, F A SET
OFA      SETL F(X), RETRIEVAL
OFAN     SETL F(X), RETRIEVAL
OFB      SETL F(S), RETRIEVAL, MAIN ROUTINE
OFFBOOL  SETL F(S), RETRIEVAL, S A BOOLEAN STRING
OFFCHAR  SETL F(S), RETRIEVAL, S A CHARACTER STRING
OFFTP    SETL F(T), RETRIEVAL, T A TUPLE
OFFSET   SETL F(S), RETRIEVAL, S A SET
OFFN     SETL F(S1, ..., SN), RETRIEVAL
SOF      SETL F(X), STORAGE, MAIN ROUTINE
SOPBSTR SETL F(X), STORAGE, F A BOOLEAN STRING 360
SOFSTR SETL F(X), STORAGE, F A CHARACTER STRING 420
SOFUPU SETL F(X), STORAGE, F A TUPLE 260
SOFSET SETL F(X), STORAGE, F A SET 130
SOFNL SETL F(X1,...,XN), STORAGE 120
SOFA SETL FSi2 Storage 240
SOFFAN SETL FSi1,...,XN2, STORAGE 270
SONB SETL F[S1], STORAGE 320
SOBN SETL F[S1],...,SN1, STORAGE 450
DIMFN CHANGES A FUNCTION SO THAT FSi1,...,XN2 IS NULL 1170
COPY COPIES ANY SETL OBJECT 400
COPY SET COPIES ANY SETL OBJECT BUT ONLY ONE LEVEL DEEP 160
HEAD SETL HD, X 50
TAIL SETL TL, X 110
PLUS SETL X + Y, MAIN ROUTINE 160
ADD SETL X + Y, TUPLES 120
ADDREAL SETL X + Y, REALS 620
CONCATB SETL X + Y, BOOLEAN STRINGS 630
CONCATC SETL X + Y, CHARACTER STRINGS 650
CONCATT SETL X + Y, TUPLES 220
AUITION SETL X + Y, SETS (UNION) 70
MINUS SETL X - Y, MAIN ROUTINE 120
SUBREAL SETL X - Y, REALS 20
BOOLEFF SETL X - Y, BOOLEAN STRINGS 130
SETDIF SETL X - Y, SETS 100
PMINUS SETL X (PREFIX MINUS) 70
MULT SETL X * Y, MAIN ROUTINE 220
MULTI SETL X * Y, INTEGERS 610
MULTR SETL X * Y, REALS 20
REPBBOOL SETL X * Y, X AN INTEGER, Y A BOOLEAN STRING 370
REPCHAR SETL X * Y, X AN INTEGER, Y A CHARACTER STRING 400
INTSECT SETL X * Y, SETS (INTERSECTION) 160
DIVIDE SETL X / Y, MAIN ROUTINE 110
DIVINT SETL X / Y, INTEGERS 1270
DIVREAL SETL X / Y, REALS 20
DIVBOOL SETL X / Y, BOOLEAN STRINGS (Y OR, NOT, Y) 120
SYMDIFF SETL X / Y, SETS (SYMMETRIC DIFFERENCE) 30
DSLASH SETL X / Y, MAIN ROUTINE 100
ABS SETL ABS. X (ABSOLUTE VALUE) 70
INITLOG INITIALIZER FOR BOOLAND, BOOLOR, AND BOOLEX 300
BOOLAND SETL X AND, Y 160
BOOLOR SETL X OR, Y 160
BOOLEX SETL X EXOR, Y (ALSO WRITTEN X//Y) 160
BOOLIMP SETL X IMPLIES, Y 160
BOOLNOT SETL NOT, X 140
TYPE SETL TYPE, X 40
PAIR SETL PAIR, X 30
NEWAT SETL NEHAT. (NEW ATOM) 30
MIN SETL X MIN. Y 50
MAX SETL X MAX. Y 50
BOT SETL BOT, X (FLOOR) 50
TOP SETL TOP, Y (CEILING) 50
SUBSTR SETL SIIII, RETRIEVAL, MAIN ROUTINE 120
SUBBOOL SETL SIIII, RETRIEVAL, S A BOOLEAN STRING 420
SUBCHAR SETL SIIII, RETRIEVAL, S A CHARACTER STRING 620
SUBTUP SETL SIIII, RETRIEVAL, S A TUPLE 160
VPSUBST VERIFIES PARAMETERS FOR SUBBOOL, ETC. 120
SSSUBSTR SETL SIIII, STORAGE, MAIN ROUTINE 110
SSSUBBOOL SETL SIIII, STORAGE, S A BOOLEAN STRING 230
SSSUBCHAR SETL SIIII, STORAGE, S A CHARACTER STRING 220
VPSUBS VERIFIES PARAMETERS FOR SSUBSTR, ETC.

DEC SETL DEC, X (INTEGER/CHAR, STRING DECIMAL CONVERSION) 60

OCT SETL OCT, X (INTEGER/CHAR, STRING OCTAL CONVERSION) 60

BITR SETL BITR, X, MAIN ROUTINE 60e

BITRINT SETL BITR, X, X AN INTEGER (CONVERTS TO A BOOLEAN STRING) 40e

BITRSET SETL BITR, X, X REAL (BITR, BOT, X) 30e

BITRBS SETL BITR, X, X A BOOLEAN STRING (CONVERTS TO INTEGER) 40e 350

LE SETL X LE, Y, MAIN ROUTINE 110

LEINT SETL X LE, Y, INTEGERS 240

LREAL SETL X LE, Y, REALS 20e

LEBSTR SETL X LE, Y, BOOLEAN STRINGS (X IMPLIES Y EVERYWHERE) 320

LESET SETL X LE, Y, SETS (SUBSET TEST) 70e

GE SETL X GE, Y, MAIN ROUTINE 60e

GEINT SETL X GE, Y, INTEGERS 240

GEREAL SETL X GE, Y, REALS 20e

GEBSR SETL X GE, Y, BOOLEAN STRINGS 320e

GESP SETL X GE, Y, SETS (SUPERSET TEST) 70e

LT SETL X LT, Y, MAIN ROUTINE 60

LTINT SETL X LT, Y, INTEGERS 30

LTTREAL SETL X LT, Y, REALS 20e

LTBSR SETL X LT, Y, BOOLEAN STRINGS 320e

LTSET SETL X LT, Y, SETS (PROPER SUBSET TEST) 70e

GT SETL X GT, Y, MAIN ROUTINE 60

GTINT SETL X GT, Y, INTEGERS 30

GTREAL SETL X GT, Y, REALS 20e

GTBSR SETL X GT, Y, BOOLEAN STRINGS 320e

GTSET SETL X GT, Y, SETS (PROPER SUPERSET TEST) 70e 3250

POW SETL POW, (POWER SET) 70e

NPW SETL NPW(N, S) 100e

NEXPOW ITERATOR FOR POW 120e

NEXNPW ITERATOR FOR NPW 300e 610

RANDOM SETL RANDOM, X, MAIN ROUTINE 60e

RANINT SETL RANDOM, X, X AN INTEGER 60e

RANREAL SETL RANDOM, X, X A REAL 40e

RANBOOL SETL RANDOM, X, X A BOOLEAN STRING 20e

RANCHAR SETL RANDOM, X, X A CHARACTER STRING 20e

RANTUPLE SETL RANDOM, X, X A TUPLE 20e

RANSET SETL RANDOM, X, X A SET 60e

RANBASE BASIC RANDOM NUMBER GENERATOR 440

EXP SETL X EXP, Y, MAIN ROUTINE 140

EXP II SETL X EXP, Y, INTEGERS 550

EXPI SETL X EXP, Y, X REAL, Y AN INTEGER 100e

EXPR SETL X EXP, Y, X REALS 500e

EXPIR SETL X EXP, Y, X AN INTEGER, Y REAL 30e 1540

ALLOBIT ALLOCATES SPACE FOR A BOOLEAN STRING 40

ALLOCSTR ALLOCATES AND INITIALIZES A SETL LONG CHAR. STRING 40

ALLOCOD ALLOCATES SPACE FOR A CODE BLOCK 20

ALLOTUP ALLOCATES SPACE FOR A TUPLE 40

TUPADD1 SETL T(N+1) = X 140

NORMALize NORMALIZES AN INTEGER 220

FORCEL CONVERTS AN INTEGER TO LONG FOR 50

LASTSUB SETS MAXXXZX AND MAXXXXYY (MUST BE LAST) 10 620
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCOPE</td>
<td>SYSTEM, GETBA, SIO</td>
<td>2600</td>
</tr>
<tr>
<td>LITTLE</td>
<td>INOUT, CALLRUN, READIOR, ETC., ETIME, PRTIME</td>
<td>570</td>
</tr>
<tr>
<td>SCOPE</td>
<td>CPC, ACGOER, REMARK, ABORT, BACCHK, SBARGS, FTNBIN</td>
<td>460</td>
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<tr>
<td>SCOPE</td>
<td>ENDFIL, INPUTB, INPUTC, KODER, KRAKER, OUTPTB, OUTPTC, REWINM, LDRUSX</td>
<td>3630</td>
</tr>
<tr>
<td>LITINIT</td>
<td>Main program, includes I/O buffers</td>
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<tr>
<td>DATA</td>
<td>Miscellaneous variables, compiler temporaries</td>
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<tr>
<td>STORAGE</td>
<td>Heap plus stack, at 10,000 decimal</td>
<td>23400e</td>
</tr>
<tr>
<td></td>
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<td>25100</td>
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<tr>
<td></td>
<td><strong>Grand Total:</strong></td>
<td><strong>131,520</strong></td>
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