CONTROL DATA
CORPORATION

SALES TECHNICAL MEMORANDUM

SUBJECT: FORTRAN Extended 6400/6500/6600-12

Date: 12 May 1967

ANALYST: J. O. Neuhaus

Expiration Date: 1 January 1968

During the 1966 replanning cycle, certain software systems were determined to be of primary importance for the extension of the product life of the 6000 computer series. One of these was a new FORTRAN compiler which would generate object code to exploit more fully the great computational capabilities of the machine lines. This STM deals primarily with the language of FORTRAN Extended and the criteria used in determining this language. The content of this STM was orally presented to the VIM organization in San Francisco in April, 1967.

Although object code efficiency is the objective of overwhelming importance, additional guidelines and objectives have been followed in determining what the product should be. In order for the compiler to be worthwhile in extending the product life of the 6000 series, it must be made available to the field as soon as possible. In order to be usable by all our customers, it must be conservative of compilation space and compilation time. In order to satisfy the requirements of some of our biggest users, especially those with multi-computer installations, the language must be at least USASI (formerly ASA) FORTRAN. The justification for adding any language extension should be that it leads to greater hardware exploitation or that it helps minimize the conversion problems in transferring programs written in FORTRAN Version 2 and other FORTRAN's to the new compiler.

FORTRAN Extended Language Selection Criteria

In the process of defining the FORTRAN Extended language, each candidate not specifically required by the USASI standard was measured against eight criteria:

1. Relation to standard FORTRAN - Is it well defined and, if so, is it compatible with USASI FORTRAN?
2. Conversion assistance - Does it simplify the process of converting programs written for other FORTRAN compilers, especially FORTRAN 2.0?

3. Execution speed - Is its implementation compatible with the goal of high object code efficiency? Would it enhance execution speeds?
4. Additional capability - Is the facility one which cannot be obtained conveniently using language features already defined?
5. Machine exploitation - Does it provide greater access to hardware and operating system features?
6. Future support - Should it be perpetuated in future Control Data FORTRAN systems rather than be a probable candidate for future compatibility and conversion problems?
7. Compiler performance - Is its implementation compatible with the objectives of small compilation space and fast compilation speed?
8. Schedule - Can it be implemented in time for the scheduled release?

Any feature which was rejected solely because it could not be implemented in time for the scheduled release was noted and will become a candidate for future consideration. Some features of FORTRAN 2.0 have not been included in the FORTRAN Extended Language. A conversion guide giving complete details of the conversion process will be published in July, sufficiently in advance of the release of FORTRAN Extended that any program modification required can be done before the system is received by the field.

Program Modes

One category of the language, that of program modes under FORTRAN 2.0, deserves special mention. Although the default declaration, that is, the standard mode of compilation, is FORTRAN IV, provision is made for compilation of FORTRAN II and so-called FORTRAN VI programs and subprograms. In addition, an option on the compiler control card allows for USASI execution time I/O list/format interaction and conversions. To reduce implementation time and compiler space, these mode declarations were removed and each language feature evaluated against the criteria given above. A special attempt was made to retain as many of the features as possible for compatibility purposes. Some examples might be in order here. Under FORTRAN II, reordering of COMMON storage because of EQUIVALENCE statements is allowed; under FORTRAN IV and USASI FORTRAN it is forbidden. Thus, this feature was not included. The FORTRAN II statements READ, PRINT, and PUNCH, unlike the other input-output statements, do not require that the programmer supply a logical unit number. They have been retained in FORTRAN Extended.

Declarative Statement Positioning

Another area of interest is the rather strict positioning of declarative statements specified by USASI FORTRAN and required by FORTRAN Extended. Under FORTRAN 2.0, a declarative (COMMON, DIMENSION, EQUIVALENCE, "type", EXTERNAL) appearing after the first executable statement or arithmetic statement function will cause a non-fatal diagnostic and will allow, possibly erroneous, attempt at loading. Under FORTRAN Extended, all such statements must precede the first executable statement or arithmetic statement function or DATA statement. This allows the compiler to execute in much smaller space and provides better diagnostics.

Communication Between Subprograms

A final realm of incompatibility concerns mixed FORTRAN/assembly language subprogram decks. The new assembly language is COMPASS, not ASCENT; a translator is provided to accept ASCENT source input and provide COMPASS source output. Of greater consequence is the change in parameter association. Under FORTRAN 2.0, parameter addresses are passed in B registers (for the first six) or stored in an area local to the subprogram (for the remainder). To allow greater utilization of B registers and to minimize indirect addressing for faster execution under FORTRAN Extended, a different method of parameter association is being implemented. Only the location of an actual parameter list is transmitted to the called subprogram and addresses are substituted into those instructions for which there is greater payoff in execution speed. A COMPASS macro will be provided to allow an assembly language program currently working under FORTRAN 2.0 to interface with a FORTRAN Extended calling program with minimal change. The effect of the macro will be that parameter addresses will be moved at subprogram initialization time from a FORTRAN Extended parameter list into the B registers and local storage expected from a FORTRAN 2.0 call.

Language Features Removed or Modified

Feature*	Reason for Change	Alternative Facility or Action
Removed FORTRAN II Column 1 designators D,E,F,B (1.1)	Compiler space and speed, development time, language ambiguities.	Type statements for D,I; EXTERNAL for F; masking operators for B.
Removed leading 0 octal constant form (2.2.1,2.3.2)	Ambiguity in representation, compiler space and speed.	Trailing B form of octal constant.
Changed machine representation of logical value (2.3.7,2.4.5,3.3,6.2,6.2.3) no conversion between logical and other operands (3.1,2.4.2,4.3)	Improved execution speed, ambiguity in expression evaluation.	Diagnostic will be given by compiler.
Removed ASSIGNed GO TO without branch list	Object code efficiency - prohibits accurate flow tracing.	Branch list with ASSIGNed GO TO; compiler diagnostic.
Removed diagnostic for object time attempt to branch outside computed GO TO list	Object code efficiency.	Branches to first or last statement number if control value is too small or too large, respectively.
Removed S-suffix type of parameter for statement label (7.4); modified DUMP, PDUMP (7.10)	Compiler development and execution time, usable only in DUMP, PDUMP, or assembly language subprograms.	ASSIGN statements; DUMP and PDUMP modified to accept ASSIGNed variables.
Modified E and D output format (9.3.1, 9.3.7,9.4.2), USASI unlimited group format repeats (9.6.1)	USASI FORTRAN compatibility, currently available under FORTRAN 2.0 switch (9.8).	If other format required, use 1P scaling. Unlimited repeat is identical if final group is to be repeated.
Removed FORTRAN II READ/WRITE (INPUT/ OUTPUT) TAPE statements (10.1,10.2)	Compiler development time; equivalent, more concise alternative.	USASI READ/WRITE (u(,f)) statements.
Removed I/O status and machine condition checking statements (10.3)	Compiler development time, compiler space, compilation speed.	Library functions, e.g. IF(IOCHK(i)) instead of IF(IOCHECK,i).
Removed DVCHK library routine for testing illegal divide	Operation not in traditional fashion on 6000 hardware; customer requests; future support.	LEGVAR to test whether named operand is legitimate
Changed RANF behavior dependency on value of argument	In-line code in Extended; faster execution.	RANF for next, RANGET for last, random number; RANSET for restart.
Removed FORTRAN II library function names, function typing	Reduction of special names list; ambiguity in typing; compiler simplification	Standard names, e.g. SIN for SINF; type statements or standard naming conventions for real or integer functions.
Changed compiler call card	New features, new options.	FTN rather than RUN control card.

* section numbers refer to the reference manual for FORTRAN 2.0, Publication Number 60174900, October, 1966.

CONTROL DATA
CORPORATION

SALES TECHNICAL MEMORANDUM

Subject: FORTRAN Extended Version 1.0

6400/6500/6600-15
Date: 28 July 1967

Analyst: J. F. Thorlin

Expiration Date: 1 January 1968

FORTRAN Extended Version 1.0 is now in the final debugging stage and is scheduled for release to the field in September.

The performance of the generated code is expected to exceed our projected speed improvement ratio of 2.5 over the object code generated by the FORTRAN 2.2 compiler.

The reference manual and conversion guide will be available in the field prior to release.

Speed Comparison of FORTRAN Version 2.2 and FORTRAN Extended

Attached is the output of FORTRAN Extended from compiling a series of DO loops. These DO loops, with the exception of problem number 1, were selected because they were taking up the most time in benchmark comparisons where the 6600 was not doing well. One of the DO loops accounted for over 40% of the compute time of the benchmark. The FORTRAN Extended listing attached, from which the timings were generated, are actual output of the compiler in its current state of development. These times will be improved somewhat before the system is released.

The following table summarizes the relative performance of the two systems. For FORTRAN Extended (FTNX), the code selection is for the 6600 with standard optimization. The total code sizes are 84 words for FTNX, 126 words for FORTRAN 2.2.

Problem No.	RUN 2.2	FTNX	RUN/FTNX
#1			
Time	56	37	1.5
Size	4.75	2.75	1.73
NOPs	0	0	
Instructions	14	10	1.4
Operations	14	10	1.4
#2			
Time	462	165	2.8
Size	37.5	16.5	2.67
NOPs	5	3	1.66
Instructions	103	50	2.06
Operations	108	53	2.04
#3			
Time	205	35	5.86
Size	15.75	3.5	4.5
NOPs	5	1	5.0
Instructions	45	12	3.75
Operations	50	13	3.84
#4			
Time	353	94	3.76
Size	31.5	8	3.94
NOPs	10	0	
Instructions	80	26	3.08
Operations	90	26	3.46
#5			
Time	232	46	5.05
Size	195	4.5	4.33
NOPs	9	1	9
Instructions	49	15	3.27
Operations	58	16	3.62

Time - minor cycles on the 6600 (100 ns)

Size - words

NOPs - number of 4600 codes in the loop

Instructions - number of executable instructions produced in the loop

Operations - NOPs + Instructions

For the timings, it is assumed that no conditional jumps within the loop are taken but that the terminal jump is taken.

```
 SUBROUTINE  BNCHMRK          FORTRAN EXTENDED V1.0
  14.57.36.                  PAGE NO.   1

                      SUBROUTINE   BNCHMRK
                     DIMENSION C(10,10),A(10,10),B(10,10)
                     DIMENSION GG(10),PA(10,10),HH(10),OO(10),ZETA(10,10),HHP(10)
                     DIMENSION VA(10,10,10),UA(10,10,10)
05                   DIMENSION VRDFR(10,10),RM(10,10,10),RMCNGS(10),VRDFT(10,10),T(10,1
                    X0,10),TCNGSV(10)
                     DIMENSION RAD(10,10,10)
                C    STUDY REPORT PROBLEM NO. 1
                     DO 1 K=1,M
10                    1  C(I,J)=C(I,J)+A(I,K)*B(K,J)
                C   STUDY REPORT PROBLEM NO. 2
                       DO 517 I=3,IPA
                       R=GG(I)*PA(I+       1,J)-HH(I)*PA(I,J)
                      1+OO(I)*PA(I-1,J)+(PA(I,J+1)
15                    2+PA(I,J-1)-2.*PA(I,J))/DSSQ-ZETA(I,J)
                       PA(I,J)=PA(I,J)+R*HHP(I)
                       IF(ABS(R).GT.ABS(CRIT3))NN=NN+1
                     517 CONTINUE
                C   STUDY REPORT PROBLEM NO. 3
20                     DO 526 K=1,KM
                       UA(I,K,J)=UA(I,K,J)+SFU
                     526 VA(I,K,J)=VA(I,K,J)+SFV
                C STUDY REPORT PROBLEM NO. 4   ***********
                       DO 200 K=1,KMAX
25                     VRDFR(I,K)=VRDFR(I,K)+(RM(I,K,JP)-(RM(I,K,JM)+(RMCNGS(K))))
                      200  VRDFT(I,K)=(T(I,K,JP)-(T(I,K,JM)+TCNGSV(K)))*PSIJMC
                C STUDY REPORT PROBLEM NO. 5  *********************
                       DO 14 K=1,KMAX
                       RADCNG=RAD(I,K,J)*FPSIJ
30                     TCNGSV(K)=TCNGSV(K)+RADCNG
                      14   T(I,K,JP)=T(I,K,JP)+RADCNG
                       END

CARD NO.  SEVERITY          DIAGNOSTIC

      32      I      A        UNDEFINED VARIABLE
      32      I      B        UNDEFINED VARIABLE
      32      I      GG       UNDEFINED VARIABLE
      32      I      HH       UNDEFINED VARIABLE
      32      I      OO       UNDEFINED VARIABLE
      32      I      ZETA     UNDEFINED VARIABLE
      32      I      HHP      UNDEFINED VARIABLE
      32      I      RM       UNDEFINED VARIABLE
      32      I      RMCNGS   UNDEFINED VARIABLE
      32      I      RAD      UNDEFINED VARIABLE
      32      I      J        UNDEFINED VARIABLE
      32      I      DSSQ     UNDEFINED VARIABLE
      32      I      CRIT3    UNDEFINED VARIABLE
      32      I      SFU      UNDEFINED VARIABLE
      32      I      SFV      UNDEFINED VARIABLE
      32      I      JP       UNDEFINED VARIABLE
      32      I      JM       UNDEFINED VARIABLE
      32      I      RSIJMC   UNDEFINED VARIABLE
      32      I      FPSIJ    UNDEFINED VARIABLE
```

```
                                        IDENT   BNCHMRK
                              013352    PROGRAM LENGTH

                                        BLOCKS

                    000000    000002    PROGRAM*    LOCAL
                    000002    000124    CODE.       LOCAL
                    000126    000024    DATA.       LOCAL
                    000152    013200    DATA..      LOCAL

                                        ENTRY POINTS

                                           000001 BNCHMRK

000000  0216031015221300000B              TRACE, VFD 60/7LBNCHMRK
000001                                    ENTRY, BSS 0
                                            ENTRY   BNCHMRK
000001                                    BNCHMRK  BSS 1
                                            USE CODE.
                                            USE DATA.
                                            USE DATA..
000152                                    C         BSS 144B
000316                                    A         BSS 144B
000462                                    B         BSS 144B
000626                                    GG        BSS 12B
000640                                    PA        BSS 144B
001004                                    HH        BSS 12B
001016                                    OO        BSS 12B
001030                                    ZETA      BSS 144B
001174                                    HHP       BSS 12B
001206                                    VA        BSS 1750B
003156                                    UA        BSS 1750B
005126                                    VRDFR     BSS 144B
005272                                    RM        BSS 1750B
007242                                    RMCNGS    BSS 12B
007254                                    VRDFT     BSS 144B
007420                                    T         BSS 1750B
011370                                    TCNGSV    BSS 12B
011402                                    RAD       BSS 1750B
                                            USE DATA.
000126                                    SAVEAO.     BSS     1
000127                                    K           BSS     1
000130                                    M           BSS     1
000131                                    I           BSS     1
000132                                    J           BSS     1
000133                                    IPA         BSS     1
000134                                    R           BSS     1
000135                                    DSSQ        BSS     1
000136                                    CRIT3       BSS     1
000137                                    NN          BSS     1
000140                                    KM          BSS     1
000141                                    SFU         BSS     1
000142                                    SFV         BSS     1
000143                                    KMAX        BSS     1
000144                                    JP          BSS     1
000145                                    JM          BSS     1
000146                                    PSIJMC      BSS     1
```

```
000147                              RADCNG    BSS    1
000150                              FPSIJ     BSS    1
000151  1721400000000000000B       CON, DATA 1721400000000000000B
                                      USE       CODE,
000002  74700                     * SX7 A0
             5170000126 +             SA7 SAVEA0,
                  0000002 +   .1      EQU *
                    46000           NO
000003  5150000132 *                 SA5 J
                  5140000130 +      SA4 M
000004  10055                       BX0 X5
             5130000131 +           SA3 I
                    22704           LX7 X4,B0
000005  20003                       LX0 3B
             6223000315 +           SB2 X3+A-1B
                    20501           LX5 1B
000006  20703                       LX7 3B
             36605                  IX6 X0+X5
                  6140000001        SB4 1B
000007  20401                       LX4 1B
             36063                  IX0 X6+X3
                  6216000450 +      SB1 X6+B-12B
000010  36674                       IX6 X7+X4
             6230000137 +           SB3 X0+C-13B
                    36063           IX0 X6+X3
000011  6270000303 +                SB7 X0+A-13B
                  6150000012        SB5 12B
000012                              )AA BSS 0
000012  56520                     * SA5 B2
             56410                  SA4 B1
                  40054             FX0 X5*X4
                    56330           SA3 B3
000013  66252                       SB2 B5+B2
             66141                  SB1 B4+B1
                  30730             FX7 X3*X0
                    24607           NX6 B0,X7
000014  56630                       SA6 B3
             0672000012 +           GE B7,B2,)AA
                    46000           NO
000015  5150000126 *                 SA5 SAVEA0,
                  53050             SA0 X5
                    74700           SX7 A0
000016  54750                       SA7 A5
                  0000016 +   .517      EQU *
000017  5150000132 *                 SA5 J
                  6130000156        SB3 HH-GG
000020  6140000170                  SB4 00-GG
                  6150000346        SB5 HHP-GG
000021  6160000002                  SB6 2B
                  10055             BX0 X5
                    20501           LX5 1B
000022  20003                       LX0 3B
             36705                  IX7 X0+X5
                  6217000631 +      SB1 X7+PA-7B
000023  5150000133 +                SA5 IPA
                  6120000630 +      SB2 GG+2B
000024  6275000625 +                SB7 X5+GG-1B
```

```
                    5100000151 +    SA0 CON,
000025                              )AB BSS 0
000025  5151777776                 + SA5 B1-1B
                    5141000011      SA4 B1+11B
000026  5131777764                  SA3 B1-13B
                    54200           SA2 A0
                         30043      FX0 X4*X3
000027  5140000135 +                SA4 DSSQ
                    40625           FX6 X2*X5
                         56324      SA3 B2+B4
000030  24200                       NX2 B0,X0
                  57116             SA1 B1-B6
                    31026           FX0 X2-X6
                         56223      SA2 B2+B3
000031  24600                       NX6 B0,X0
                  40031             FX0 X3*X1
                    5131000167      SA3 B1+ZETA-PA+1B
000032  44164                       FX1 X6/X4
                  56420             SA4 B2
                    31603           FX6 X0-X3
                         56310      SA3 B1
000033  24006                       NX0 B0,X6
                  40625             FX6 X2*X5
                    56225           SA2 B2+B5
                         40443      FX4 X4*X3
000034  5130000136 +                SA3 CRITS
                    30110           FX1 X1*X0
                         10033      BX0 X3
000035  24101                       NX1 B0,X1
                  30661             X6 X6*X1
                    21073           AX0 73B
                         13103      BX1 X0-X3
000036  24006                       NX0 B0,X6
                  31640             FX6 X4-X0
                    24706           NX7 B0,X6
                         40072      FX0 X7*X2
000037  30650                       FX6 X5*X0
                  10477             BX4 X7
                    5170000134 +    SA7 R
000040  21473                       AX4 73B
                  13047             BX0 X4-X7
                    24706           NX7 B0,X6
                         31610      FX6 X1-X0
000041  54750                       SA7 A5
                  0326000044 +      PL X6,GL1,
                         46000      NO
000042  5150000137 +                SA5 NN
                    7100000001      SX0 1B
000043  36750                       IX7 X5+X0
                  54750             SA7 A5
000044                             GL1, BSS 0
000044  6122000001                 + SB2 B2+1B
                    6111000001      SB1 B1+1B
000045  0672000025 +                GE B7,B2,)AB
                    5150000126 +    SA5 SAVEA0,
000046  53050                       SA0 X5
                  74700             SX7 A0
```

```
                    54750          SA7 A5
                       0000046 +   .526      EQU *
                        46000      NO
000047  5140000132 +               SA4 J
                    5130000140 +   SA3 KM
000050  7100000144                SX0 144B
                    27704          PX7 B0,X4
                         10633     BX6 X3
000051  27400                      PX4 B0,X0
             5120000131 +          SA2 I
                         42074     DX0 X7*X4
000052  20603                      LX6 3B
             6120001750            SB2 UA-VA
                         36702     IX7 X0+X2
000053  20301                      LX3 1B
             6217003011 +          SB1 X7+UA-145B
                         36763     IX7 X6+X3
000054  36670                      IX6 X7+X0
             6130000142 +          SB3 SFV
                         36062     IX0 X6+X2
000055  6270002777 +               SB7 X0+UA-157B
                    6140000001     SB4 SFV-SFU
000056  6150000012                 SB5 12B
000057                            )AC BSS 0
000057  56510                     + SA5 B1
             57434                 SA4 B3-B4
                  30054            PX0 X5*X4
                       24700       NX7 B0,X0
000060  57312                      SA3 B1-B2
             56530                 SA5 B3
                  30035            PX0 X3*X5
                       56710       SA7 B1
000061  24600                      NX6 B0,X0
             57612                 SA6 B1-B2
                  66151            SB1 B5+B1
                       46000       NO
000062  0671000057 +               GE B7,B1,)AC
                    5150000126 +   SA5 SAVEA0,
000063  53050                      SA0 X5
             74700                 SX7 A0
                  54750            SA7 A5
                       0000063 +   .200      EQU *
000064  5150000145 +              + SA5 JM
                    7100000144     SX0 144B
000065  27705                      PX7 B0,X5
             5150000131 +          SA5 I
                         27600     PX6 B0,X0
000066  42076                      DX0 X7*X6
             6150002126            SB5 VRDFT-VRDFR
                         36745     IX7 X4+X5
000067  6160002126                 SB6 T-RM
                    6110007242 +   SB1 RMCNGS
000070  6227005125 +               SB2 X7+RM-145B
                    5150000144 +   SA5 JP
000071  7170000144                 SX7 144B
                    27605          PX6 B0,X5
                         27507     PX5 B0,X7
```

```
000072  42765                       DX7 X6*X5
              5150000131 +          SA5 I
                    36675           IX6 X7+X5
000073  5140000143 +                SA4 KMAX
                    6245005125 +    SB4 X5+VRDFR+1B
000074  6236005125 +                SB3 X6+RM+145B
                    6274007241 +    SB7 X4+RMCNGS+1B
000075  5100000146 +                SA0 PSIJMC
000076                             )AD BSS 0
000076  56520                    + SA5 B2
              56410                 SA4 B1
                    30054           FX0 X5*X4
                          24600     NX6 B0,X0
000077  56326                       SA3 B2+B6
              5151002126            SA5 B1+TCNGSV+RMCNGS
                          56430     SA4 B3
000100  30035                       FX0 X3*X5
              56536                 SA5 B3+B6
                    56340           SA3 B4
                          24200     NX2 B0,X0
000101  31046                       FX0 X4*X6
              54400                 SA4 A0
                    6111000001      SB1 B1+1B
000102  31652                       FX6 X5*X2
              24500                 NX5 B0,X0
                    6122000012      SB2 B2+12B
000103  24006                       NX0 B0,X6
              30635                 FX6 X3*X5
                    6133000012      SB3 B3+12B
000104  40704                       FX7 X0*X4
              56745                 SA7 B4+B5
                    24706           NX7 B0,X6
                          56740     SA7 B4
000105  6144000012                  SB4 B4+12B
                    0671000076 +    GE B7,B1,)AD
000106  5150000126 +                SA5 SAVEA0,
                    53050           SA0 X5
                          74700     SX7 A0
000107  54750                       SA7 A5
                       0000107 +  ,14      EQU *
              5140000144 +          SA4 JP
                          27004     PX0 B0,X4
000110  5130000132 +                SA3 J
                    7160000144      SX6 144B
000111  27706                       PX7 B0,X6
              5140000131 +          SA4 I
                          42607     DX6 X0*X7
000112  27003                       PX0 B0,X3
              5130000143 +          SA3 KMAX
                          42207     DX2 X0*X7
000113  36064                       IX0 X6+X4
              6273011367 +          SB7 X3+TCNGSV+1B
                          36724     IX7 X2+X4
000114  6210007253 +                SB1 X0+T-145B
                    6237011235 +    SB3 X7+RAD-145B
000115  6140000001                  SB4 1B
                    6150000147 +    SB5 RADCNG
```

```
EQ 1       BNCHMRK

000116  6160000001                  SB6 EPSIJ-RADCNG
                  6120011370 +       SB2 TCNGSV
000117                              )AE BSS 0
000117  56530                     + SA5 B3
             56456                  SA4 B5+B6
                  40754             FX7 X5*X4
                       56320        SA3 B2
000120  56510                       SA5 B1
             6133000012             SB3 B3+12B
                       30037        FX0 X3*X7
000121  24600                       NX6 B0,X0
             56750                  SA7 B5
                  30057             FX0 X5*X7
                       24700        NX7 B0,X0
000122  56620                       SA6 B2
             66242                  SB2 B4+B2
                  56710             SA7 B1
                       46000        NO
000123  0672000117 +                EQ B7,B2,)AE
                  7101000012        SX0 B1+12B
000124  5150000126 +                SA5 SAVEA0,
                  53050             SA0 X5
                       46000        NO
000125  0400000001 +                EQ ENTRY,
013352                              END

                       040267     UNUSED STORAGE          297 STATEMENTS       52  SYMBOLS
```

1 BNCHMRK

SYMBOLIC REFERENCE TABLE

A	0000316	PROGRAM*	000005,	000011			
B	0000462	PROGRAM*	000007				
BNCHMRK	0000001	PROGRAM*					
C	0000152	PROGRAM*	000010				
CON.	0000151	PROGRAM*	000024				
CRIT3	0000136	PROGRAM*	000034				
DSSQ	0000135	PROGRAM*	000027				
ENTRY.	0000001	PROGRAM*	000125				
FPSIJ	0000150	PROGRAM*	000116				
GG	0000626	PROGRAM*	000017,	000020,	000020,	000023,	000024
GL1.	0000044	PROGRAM*	000041				
HH	0001004	PROGRAM*	000017				
HHP	0001174	PROGRAM*	000020				
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