ALGOL F

Level 2.1

360S-AL-531 ALGOL F Compiler
and
360S-LM-532 ALGOL F Library

Independent Component Release
for
MVS 3.8

January 4, 2018

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1. Introduction

1.1 Overview

The Algol F Level 2.1 Independent Component Release is a complete replacement of the previous release Level 2.0 which was a component of OS/360 Release 21. This ICR may be used to upgrade an existing Algol F installation at the Level 2.0 to Level 2.1. Alternatively it may be used to install the Algol F Compiler and the Library where the Compiler and the Library have not been previously installed. The ICR includes a number of programming enhancements to the Compiler and the Library. The Library routines have been updated for compatibility with the MVS JES2/3 environment.

2. Programming Enhancements

2.1 Compiler Enhancements

A new format heading identifies the release level of the Compiler and the time and date of the compilation.

Upper and lower case alphabetic characters may be used interchangeably in procedure names, identifier names and Algol Language defined symbols. All alphabetic characters are resolved to upper case except within strings where they retain their upper or lower case specification.

Examples

```
'begin'
'Array'
i
ToTal
```

The range of alphabetic characters is extended to include the national characters $, _, # and @. These national characters may be used wherever an alphabetic character is acceptable in procedure names and identifier names.

Examples

```
i_to_r
#sum
Amt$
@curr
```

The standard Algol array subscript definition of enclosing square brackets is supported.

Examples

```
'real' 'array' sum[0:10]
k := sum[i]
```

The operator ** may be used in place of ‘POWER’

Compiled Algol programs are identified by a translator ID of 360SAL531 and the date of compilation.

The semicolon count, wherever printed, is left zero suppressed for improved program readability.

2.2 Library Enhancements

The Library modules, specifically all the modules responsible for data management and the interface with the operating system, are compatible with MVS programming standards. JES2/3 SYSIN datasets are Opened for input only without the Point option set in the DCB MACRF field. JES2/3 SYSOUT datasets are Opened for output only without the Point option set in the DCB MACRF field. Previous techniques to avoid ABENDs when processing SYSIN or SYSOUT datasets are no longer required.

The semicolon count, wherever printed, is left zero suppressed for improved program readability.

3. Installing the ICR

3.1 Planning

Obtain the ICR which is packaged in Hercules Emulated Tape (HET) format with a VOLSER of ALGOLF.

The installation JCL and instructions are customized for an MVS 3.8 Turnkey system. If the target system is configured differently then the JCL can require modification to suit the system environment. The password for the Master Catalog of the target MVS system is required for the deletion and re-allocation of the SYS1.ALGLIB dataset due to its increased space requirements.

3.2 Installation

Step 1. Create the Master Catalog Alias Entry for the new HLQ of ALGOL.

Issue the following command at the TSO READY prompt:

```
DEFINE ALIAS(NAME('ALGOL') RELATE('SYS1.UCAT.MVS'))
```

This installation step will require the use of the Master Catalog password to create the alias for the new High Level Qualifier of ALGOL

Step 2. Load the CNTL data set from the ALGOLF distribution tape.

Now that the HLQ of ALGOL was created in the previous step the CNTL data set can be downloaded from the ALGOLF distribution tape using the IEBCOPY utility program to reload the data set.

```
REVEDIT  ALGOL.F.COMPILER.CNTL(INSTCNTL) - 2.01            COLUMNS 00001 00072
COMMAND ===>                                                  SCROLL ===> CS
  64KB ----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
000001 //T1INST  JOB  111,'INSTALL ALGOL CNTL', <-- CUSTOMIZE FOR INSTALLATION
000002 //             CLASS=S,MSGCLASS=C        <-- CUSTOMIZE FOR INSTALLATION
000003 //*
000004 //*
000005 //*********************************************************************
000006 //*
000007 //*            RESTORE ALGOL F LEVEL 2.1 CNTL DATA SET
000008 //*            360S-AL-531 ALGOL F COMPILER
000009 //*                 AND
000010 //*            360S-LM-532 ALGOL F LIBRARY
000011 //*            INDEPENDENT COMPONENT RELEASE
000012 //*
000013 //*********************************************************************
000014 //*
000015 //CNTL    EXEC PGM=IEBCOPY
000016 //SYSPRINT DD  SYSOUT=*
000017 //SYSUT1   DD  DSN=ALGOL.F.COMPILER.CNTL,UNIT=3400-6,VOL=SER=ALGOLF,
000018 //             DISP=OLD,LABEL=(1,SL)
000019 //SYSUT2   DD  DSN=ALGOL.F.COMPILER.CNTL,
000020 //             UNIT=3350,VOL=SER=MVSDLB,DISP=(,CATLG,DELETE),
000021 //             DCB=(DSORG=PO,BLKSIZE=3600,LRECL=80,RECFM=FB),
000022 //             SPACE=(TRK,(60,10,36))
000023 //SYSIN    DD  DUMMY
000024 //
```

Figure 1 JCL to install the CNTL data set

Before submitting the above JCL for execution, the input tape volume ALGOLF must be made available to MVS so that it can be read, when it is required, by the installation process. The following steps assume the use of device 480, defined as a tape drive in a Turnkey system:

Enter the following command from the Hercules console:

devinit 480 *d:|dirname1|dirname2|*ALGOLF.het {READONLY=1}

where *d:|dirname1|dirname2|* is the complete path to the Hercules Emulated Tape file where the ALGOLF tape file was placed when the installation package was unzipped. READONLY=1 can optionally be specified to prevent the tape file being overwritten.

Issue the following command from the MVS console:

V 480,online

Copy and paste the JCL shown above to a temporary PDS member, update the JOB statement to conform to the installation standards and submit the job.

The CNTL data set has now been loaded. Subsequent installations steps will be submitted from members contained in the CNTL data set.

Step 3. Install the Algol F Compiler and Algol F Library

The libraries can now be downloaded from the ALGOLF distribution tape using the IEBCOPY utility program to reload the data sets.

Member INSTALL in the ALGOL.F.COMPILER.CNTL data set contains the installation JCL.

```
REVEDIT  SYSD.ALGOLF.COMPILER.CNTL(INSTALL) - 2.02         COLUMNS 00001 00072
COMMAND ===>                                                  SCROLL ===> CS
  64KB ----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
****** ****ZAP****AUTOSAVE********** TOP OF DATA ******************************
000001 //T1ILM   JOB  111,'ALGOL F',          <-- CUSTOMIZE FOR INSTALLATION
000002 //             CLASS=S,MSGCLASS=C,      <-- CUSTOMIZE FOR INSTALLATION
000003 //             REGION=4096K,COND=(0,NE),MSGLEVEL=(1,1)
000004 //*
000005 //*            RESTORE LOAD MODULE LIBRARIES FOR
000006 //*            ALGOL F
000007 //*            360S-AL-531 ALGOL F COMPILER
000008 //*                 AND
000009 //*            360S-LM-532 ALGOL F LIBRARY
000010 //*            INDEPENDENT COMPONENT RELEASE
000011 //*
000012 //*            BEFORE SUBMITTING THIS JOB CUSTOMIZE THE SYMBOLIC
000013 //*            PARAMETERS TO CONFORM TO LOCAL STANDARDS
000014 //*
000015 //*            NOTE -
000016 //*            THIS JOB WILL ISSUE TWO REQUESTS FOR THE
000017 //*            MASTER CATALOG PASSWORD TO DELETE AND RE-ALLOCATE
000018 //*            SYS1.ALGLIB
000019 //*
000020 //INSTALL PROC OLINK='SYS2.LINKLIB',   <-- TARGET COMPILER LINKLIB
000021 //             OLIB='SYS1.ALGLIB',     <-- TARGET RESIDENT LIBRARY
000022 //             OLUNIT='3350',          <-- TARGET RESIDENT LIBRARY
000023 //             OLVOL='MVSRES',         <-- TARGET RESIDENT LIBRARY
000024 //             OPROC='SYS2.PROCLIB',   <-- TARGET PROCLIB
000025 //             OSAMP='SYS1.SAMPLIB',   <-- TARGET IVP SAMPLIB
000026 //             SOUT='*',               SYSOUT CLASS, DLFT TO MSGCLASS
000027 //             THLQ='ALGOL',           ADD ADDTNL PREFIX IF REQUIRED
000028 //             TUNIT='3400-6',         TAPE UNIT FOR DISTRIBUTION TAPE
000029 //             TVOL='ALGOLF'           VOLSER OF DISTRIBUTION TAPE
000030 //*
000031 //*********************************************************************
```

Figure 2 Algol F Compiler and Library Installation JCL

Edit the installation JCL to conform to installation standards and submit the job.

This job will copy the ALGOL F Compiler load modules to the SYS2.LINKLIB data set. The data set SYS1.ALGLIB will be deleted and then reallocated with additional space. As the data set SYS1.ALGLIB is cataloged in the Master Catalog this job will require the use of the Master Catalog password for the deletion step and again for the new allocation. The ALGOL F Library load modules will then be copied to the newly allocated SYS1.ALGLIB data set. The cataloged procedures, ALGOFC, ALGOFCG, ALGOFCL and ALGOFCLG, optimized for the MVS 3.8 environment, are copied to the SYS2.PROCLIB data set. The cataloged procedure ASMPROJ is also copied to the SYS2.PROCLIB data set for use, optionally, in building the Compiler and library from the provided source data sets. Four Installation Verification Programs, IEXSAMP1, IEXSAMP2, IEXSAMP3 and IEXSAMP4 are copied into the SYS1.SAMPLIB data set.

After the successful completion of this job the Algol F Compiler and Algol F Library have been installed. Section 3.4 discusses running the four Installation Verification Programs to verify the successful installation process.

3.3 Changing the Installation Default Compiler Options

The Algol F Compiler has been configured with options suitable for the MVS 3.8 environment –

```
ALGOL PUNCH=NODECK,                                    X
      TYPERUN=LOAD,                                    X
      SORCODE=EBCDIC,                                  X
      SORLIST=SOURCE,                                  X
      PRECISN=SHORT
```

The options may be changed by updating the Algol F Compiler options setting by use of the AMASPZAP utility program. Member IEXOPTNS in SYS1.SAMPLIB provides a sample job and an explanation of how to change the default options bit settings.

3.4 Running the Installation Verification Programs

The installation job installs four IVP programs, IEXSAMP1, IEXSAMP2, IEXSAMP3 and IEXSAMP4 into SYS1.SAMPLIB and the cataloged procedures to run them into SYS2.PROCLIB. Edit the JCL of the four jobs to conform to installation standards and submit them for processing. The IEXSAMP2 IVP will fail with a return code of 16 as a result of a deliberate divide by zero to prove the successful installation of the Algol F Library error handling module. The IEXSAMP4 job will execute for approximately four minutes on a 25 MIP MVS system. Samples of the expected output from all four jobs may be found in Appendix A, B, C and D.

4. Optional Materials

4.1 Program Source Material

The assembler source code and macro libraries for both the Algol F Compiler and the Algol F Library are provided on the ALGOLF distribution tape. The member INSTOPT in the ALGOL.F.COMPILER.CNTL data set contains the JCL to install the assembler source code and macro libraries.

```
REVEDIT  ALGOL.F.COMPILER.CNTL(INSTOPT) - 2.01            COLUMNS 00001 00072
COMMAND ===>                                                SCROLL ===> CS
****** ****ZAP****AUTOSAVE********** TOP OF DATA ****************************
000001 //T1SRC   JOB  111,'ALGOL F SRC',      <-- CUSTOMIZE FOR INSTALLATION
000002 //             CLASS=S,MSGCLASS=C      <-- CUSTOMIZE FOR INSTALLATION
000003 //*
000004 //*********************************************************************
000005 //*
000006 //*       INSTALL THE SOURCE DISTRIBUTION LIBRARIES FOR :-
000007 //*
000008 //*       IBM ALGOL F LEVEL 2.1
000009 //*
000010 //*       360S-AL-531 ALGOL F COMPILER
000011 //*            AND
000012 //*       360S-LM-532 ALGOL F LIBRARY
000016 //*********************************************************************
000018 //*      DELETE THE SOURCE LIBRARY DATA SETS
000020 //*********************************************************************
000022 //DELETE  EXEC PGM=IDCAMS
000023 //SYSPRINT DD  DUMMY
000024 //SYSIN    DD  *
000025    DELETE ALGOL.F.COMPILER.ASM
000026    DELETE ALGOL.F.COMPILER.MACLIB
000027    DELETE ALGOL.F.RUNTIME.ASM
000028    DELETE ALGOL.F.RUNTIME.MACLIB
000029    SET MAXCC = 0
000030 /*
000031 //ALGSRC  EXEC PGM=IEBCOPY
000032 //SYSPRINT DD  SYSOUT=*
000033 //*        INPUT DATA SETS
000034 //INCASM   DD  DSN=ALGOL.F.COMPILER.ASM,LABEL=(4,SL),
000035 //             UNIT=3400-6,VOL=SER=ALGOLF,DISP=(OLD,PASS)
000036 //INCMAC   DD  DSN=ALGOL.F.COMPILER.MACLIB,LABEL=(5,SL),
000037 //             UNIT=3400-6,VOL=SER=ALGOLF,DISP=(OLD,PASS)
000038 //INRTASM  DD  DSN=ALGOL.F.RUNTIME.ASM,LABEL=(6,SL),
000039 //             UNIT=3400-6,VOL=SER=ALGOLF,DISP=(OLD,PASS)
000040 //INRTMAC  DD  DSN=ALGOL.F.RUNTIME.MACLIB,LABEL=(7,SL),
000041 //             UNIT=3400-6,VOL=SER=ALGOLF,DISP=(OLD,PASS)
000042 //*        OUTPUT DATA SETS
000043 //OUTCASM  DD  DSN=ALGOL.F.COMPILER.ASM,DISP=(,CATLG),
  3350 //             UNIT=3350,VOL=SER=MVSDLB,SPACE=(TRK,(120,30,36)) <----
000045 //OUTCMAC  DD  DSN=ALGOL.F.COMPILER.MACLIB,DISP=(,CATLG),
  3350 //             UNIT=3350,VOL=SER=MVSDLB,SPACE=(TRK,(30,30,36))  <----
000047 //OUTRTASM DD  DSN=ALGOL.F.RUNTIME.ASM,DISP=(,CATLG),
  3350 //             UNIT=3350,VOL=SER=MVSDLB,SPACE=(TRK,(90,30,36))  <----
000049 //OUTRTMAC DD  DSN=ALGOL.F.RUNTIME.MACLIB,DISP=(,CATLG),
  3350 //             UNIT=3350,VOL=SER=MVSDLB,SPACE=(TRK,(30,30,36))  <----
000051 //SYSIN    DD  *
000052     COPY INDD=INCASM,OUTDD=OUTCASM
000053     COPY INDD=INCMAC,OUTDD=OUTCMAC
000054     COPY INDD=INRTASM,OUTDD=OUTRTASM
000055     COPY INDD=INRTMAC,OUTDD=OUTRTMAC
000056 /*
000057 //
```

Figure 3 Algol F Source Libraries Installation JCL

4.2 Building the Algol F Compiler and Algol F Library

If the optional assembler source code libraries has been installed then the Algol F Compiler and the Algol F Library can be built from the installed source code libraries.

The build process for the Algol F Compiler is a two step process. Member ASMCALL in the ALGOL.F.COMPILER.CNTL data set contains the JCL to assemble all of the Algol F Compiler assembler source modules into an object library. Member LINKC in the ALGOL.F.COMPILER.CNTL data set contains the JCL and the Linkage Editor control statements to Link Edit the Algol F Compiler object modules to create the Algol F Compiler load module library.

The build process for the Algol F Library is similar to the build process for the Algol F Compiler in that it is a two step process. Member ASMRTALL in the ALGOL.F.COMPILER.CNTL data set contains the JCL to assemble all of the Algol F Library assembler source modules into an object library. Member LINKRT in the ALGOL.F.COMPILER.CNTL data set contains the JCL and the Linkage Editor control statements to Link Edit the Algol F Library object modules to create the Algol F Library load modules.

Appendix A. IVP IEXSAMP1 Listing

```
                                    J E S 2   J O B   L O G


13.34.17 JOB 9290  IEF677I WARNING MESSAGE(S) FOR JOB T1IV1    ISSUED
13.34.17 JOB 9290  $HASP373 T1IV1    STARTED - INIT  6 - CLASS S - SYS SYSA
13.34.17 JOB 9290  IEF403I T1IV1 - STARTED - TIME=13.34.17
13.34.17 JOB 9290  IEFACTRT - Stepname  Procstep  Program   Retcode
13.34.17 JOB 9290  T1IV1      IVP1      ALGOL     ALGOL     RC= 0000
13.34.17 JOB 9290  T1IV1      IVP1      LKED      IEWL      RC= 0000
13.34.18 JOB 9290  T1IV1      IVP1      GO        GO        RC= 0000
13.34.18 JOB 9290  T1IV1      AMBLIST             AMBLIST   RC= 0000
13.34.18 JOB 9290  IEF404I T1IV1 - ENDED - TIME=13.34.18
13.34.18 JOB 9290  $HASP395 T1IV1    ENDED

   1     //T1IV1   JOB  111,'ALGOL F LVL2.1',   <-- CUSTOMIZE FOR SITE STANDARDS JOB 9290
         //             CLASS=S,MSGCLASS=C,     <-- CUSTOMIZE FOR SITE STANDARDS 00002001
         //             REGION=1024K,COND=(0,NE),MSGLEVEL=(1,1)                  00003001
         ***                                                                    00004001
         ***       IBM Algol F Level 2.1 IVP                                    00005001
         ***                                                                    00006001
         ***       360S-AL-531 Algol F Compiler                                 00007001
         ***            and                                                     00008001
         ***       360S-LM-532 Algol F Library                                  00009001
         ***                                                                    00010001
   2     //IVP1   EXEC  ALGOFCLG,PARM.GO='TRACE'                                00011001
         ***                                                                    00001001
         ********************************************************************** 00002001
         ***                                                                    00003001
         ***       IBM ALGOL F LEVEL 2.1                                        00004001
         ***                                                                    00005001
         ***       360S-AL-531 ALGOL F COMPILER                                 00006001
         ***            AND                                                     00007001
         ***       360S-LM-532 ALGOL F LIBRARY                                  00008001
         ***                                                                    00009001
         ***       COMPILE, LINK-EDIT AND EXECUTE A PROGRAM                     00010001
         ***                                                                    00011001
         ********************************************************************** 00012001
         ***                                                                    00013001
   3     XXALGOL   EXEC PGM=ALGOL,REGION=1024K                                  00014001
   4     XXSYSPRINT DD  SYSOUT=*                                                00015001
   5     XXSYSPUNCH DD  DUMMY                                                   00016001
   6     XXSYSLIN   DD  DSN=&&OBJECT,UNIT=VIO,SPACE=(3200,(20,10)),             00017001
         XX             DISP=(,PASS)                                            00018001
   7     XXSYSUT1   DD  UNIT=VIO,SPACE=(2048,(50,10))                           00019001
   8     XXSYSUT2   DD  UNIT=VIO,SPACE=(2048,(50,10))                           00020001
   9     XXSYSUT3   DD  UNIT=VIO,SPACE=(2048,(40,10))                           00021001
  10     //ALGOL.SYSIN  DD  *                                                   00012001
  11     XXLKED    EXEC PGM=IEWL,PARM='XREF,LIST,LET',COND=(5,LT,ALGOL),        00022001
         XX             REGION=1024K                                            00023001
  12     XXSYSPRINT DD  SYSOUT=*                                                00024001
  13     XXSYSLIB   DD  DSN=SYS1.ALGLIB,DISP=SHR                                00025001
  14     XXSYSLMOD  DD  DSN=&&GOSET(GO),UNIT=VIO,DISP=(,PASS),                  00026001
         XX             SPACE=(2048,(100,20,1))                                 00027001
  15     XXSYSUT1   DD  UNIT=VIO,SPACE=(2048,(100,20))                          00028001
  16     XXSYSLIN   DD  DSN=&&OBJECT,DISP=(OLD,DELETE)                          00029001
  17     XX         DD  DDNAME=SYSIN                                            00030001
  18     XXGO      EXEC PGM=GO,COND=((5,LT,ALGOL),(5,LT,LKED)),                00031001
         XX             REGION=1024K                                            00032001
  19     XXSTEPLIB  DD  DSN=&&GOSET,DISP=(OLD,PASS)                             00033001
  20     XXALGLDD01 DD  SYSOUT=*                                                00034001
  21     XXSYSPRINT DD  SYSOUT=*                                                00035001
  22     XXSYSUT1   DD  UNIT=VIO,SPACE=(1024,(20,10))                           00036001
  23     //AMBLIST  EXEC PGM=AMBLIST                                            00067001
         ***                                                                    00068001
         ***        DEMONSTRATE LANGUAGE TRANSLATOR ID FOR ALGOL F              00069001
         ***        PROGRAMS AND TIME OF COMPILATION                            00070001
         ***                                                                    00071001
  24     //SYSPRINT  DD  SYSOUT=*                                               00072001
  25     //SYSLIB    DD  DSN=&&GOSET,DISP=(OLD,PASS)                            00073001
  26     //SYSIN     DD  *                                                      00074001
 STMT NO. MESSAGE
-
   18     IEF686I DDNAME REFERRED TO ON DDNAME KEYWORD IN PRIOR STEP WAS NOT RESOLVED
IEF236I ALLOC. FOR T1IV1 ALGOL IVP1
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I DMY  ALLOCATED TO SYSPUNCH
IEF237I VIO  ALLOCATED TO SYSLIN
IEF237I VIO  ALLOCATED TO SYSUT1
```

```
IEF237I VIO  ALLOCATED TO SYSUT2
IEF237I VIO  ALLOCATED TO SYSUT3
IEF237I JES2 ALLOCATED TO SYSIN
IEF142I T1IV1 ALGOL IVP1 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB09290.SO0103                    SYSOUT
IEF285I   SYS12230.T133417.RA000.T1IV1.OBJECT     PASSED       *--------2
IEF285I   SYS12230.T133417.RA000.T1IV1.R0000001   DELETED      *--------0
IEF285I   SYS12230.T133417.RA000.T1IV1.R0000002   DELETED      *--------0
IEF285I   SYS12230.T133417.RA000.T1IV1.R0000003   DELETED      *-------13
IEF285I   JES2.JOB09290.SI0101                    SYSIN
IEF373I STEP /ALGOL   / START 12230.1334
IEF374I STEP /ALGOL   / STOP  12230.1334 CPU    0MIN 00.05SEC SRB    0MIN 00.00SEC VIRT   192K SYS   304K
*********************************************************************************************************************************
*     1. Jobstep of job: T1IV1       Stepname: ALGOL       Program name: ALGOL      Executed on 17.08.12 from 13.34.17 to 13.34.17 *
*         elapsed time  24:00:00,10                    CPU-Identifier:  SYSA           Page-in:      0                          *
*             CPU time  00:00:00,05              Virtual Storage used:    192K         Page-out:     0                          *
*           corr. CPU:  00:00:00,05   CPU time has been corrected by  1 / 1,0  multiplier                                       *
*                                                                                                                               *
*     I/O Operation                                                                                                             *
*     Number of records read via DD * or DD DATA:     53                                                                        *
*     DMY.......0 DMY.......0 FFF.......2 FFF.......0 FFF.......0 FFF......13 DMY.......0                                        *
*                                                                                                                               *
*                                      Charge for step (w/o SYSOUT):          0,08                                          *
*********************************************************************************************************************************
IEF236I ALLOC. FOR T1IV1 LKED IVP1
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I 148  ALLOCATED TO SYSLIB
IEF237I VIO  ALLOCATED TO SYSLMOD
IEF237I VIO  ALLOCATED TO SYSUT1
IEF237I VIO  ALLOCATED TO SYSLIN
IEF237I DMY  ALLOCATED TO
IEF142I T1IV1 LKED IVP1 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB09290.SO0104                    SYSOUT
IEF285I   SYS1.ALGLIB                             KEPT         *-------64
IEF285I   VOL SER NOS= MVSRES.
IEF285I   SYS12230.T133417.RA000.T1IV1.GOSET      PASSED       *-------18
IEF285I   SYS12230.T133417.RA000.T1IV1.R0000004   DELETED      *--------0
IEF285I   SYS12230.T133417.RA000.T1IV1.OBJECT     DELETED      *--------3
IEF373I STEP /LKED    / START 12230.1334
IEF374I STEP /LKED    / STOP  12230.1334 CPU    0MIN 00.05SEC SRB    0MIN 00.01SEC VIRT  1024K SYS   280K
*********************************************************************************************************************************
*     2. Jobstep of job: T1IV1       Stepname: LKED        Program name: IEWL       Executed on 17.08.12 from 13.34.17 to 13.34.17 *
*         elapsed time  24:00:00,08                    CPU-Identifier:  SYSA           Page-in:      0                          *
*             CPU time  00:00:00,06              Virtual Storage used:   1024K         Page-out:     0                          *
*           corr. CPU:  00:00:00,06   CPU time has been corrected by  1 / 1,0  multiplier                                       *
*                                                                                                                               *
*     I/O Operation                                                                                                             *
*     Number of records read via DD * or DD DATA:      0                                                                        *
*     DMY.......0 148......64 FFF......18 FFF.......0 FFF.......3 DMY.......0                                                   *
*                                                                                                                               *
*                                      Charge for step (w/o SYSOUT):          0,10                                          *
*********************************************************************************************************************************
IEF236I ALLOC. FOR T1IV1 GO IVP1
IEF237I VIO  ALLOCATED TO STEPLIB
IEF237I JES2 ALLOCATED TO ALGLDD01
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I VIO  ALLOCATED TO SYSUT1
IEF142I T1IV1 GO IVP1 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS12230.T133417.RA000.T1IV1.GOSET      PASSED       *--------0
IEF285I   JES2.JOB09290.SO0105                    SYSOUT
IEF285I   JES2.JOB09290.SO0106                    SYSOUT
IEF285I   SYS12230.T133417.RA000.T1IV1.R0000005   DELETED      *-------12
IEF373I STEP /GO      / START 12230.1334
IEF374I STEP /GO      / STOP  12230.1334 CPU    0MIN 00.05SEC SRB    0MIN 00.00SEC VIRT    28K SYS   300K
*********************************************************************************************************************************
*     3. Jobstep of job: T1IV1       Stepname: GO          Program name: GO         Executed on 17.08.12 from 13.34.17 to 13.34.18 *
*         elapsed time  24:00:00,07                    CPU-Identifier:  SYSA           Page-in:      0                          *
*             CPU time  00:00:00,05              Virtual Storage used:     28K         Page-out:     0                          *
*           corr. CPU:  00:00:00,05   CPU time has been corrected by  1 / 1,0  multiplier                                       *
*                                                                                                                               *
*     I/O Operation                                                                                                             *
*     Number of records read via DD * or DD DATA:      0                                                                        *
*     FFF.......0 DMY.......0 DMY.......0 FFF......12                                                                           *
*                                                                                                                               *
*                                      Charge for step (w/o SYSOUT):          0,08                                          *
*********************************************************************************************************************************
IEF236I ALLOC. FOR T1IV1 AMBLIST
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I VIO  ALLOCATED TO SYSLIB
IEF237I JES2 ALLOCATED TO SYSIN
IEF142I T1IV1 AMBLIST - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB09290.SO0107                    SYSOUT
```

```
IEF285I   SYS12230.T133417.RA000.T1IV1.GOSET           PASSED        *--------9
IEF285I   JES2.JOB09290.SI0102                         SYSIN
IEF373I STEP /AMBLIST / START 12230.1334
IEF374I STEP /AMBLIST / STOP  12230.1334 CPU    0MIN 00.02SEC SRB    0MIN 00.00SEC VIRT  1024K SYS   280K
*************************************************************************************************************************************
*     4. Jobstep of job: T1IV1       Stepname: AMBLIST     Program name: AMBLIST    Executed on 17.08.12 from 13.34.18 to 13.34.18 *
*         elapsed time  24:00:00,07                    CPU-Identifier:  SYSA           Page-in:      0                           *
*             CPU time  00:00:00,02               Virtual Storage used:   1024K         Page-out:      0                           *
*           corr. CPU:  00:00:00,02   CPU time has been corrected by  1 / 1,0  multiplier                                          *
*                                                                                                                                   *
*     I/O Operation                                                                                                                 *
*     Number of records read via DD * or DD DATA:      1                                                                            *
*     DMY.......0 FFF.......9 DMY.......0                                                                                           *
*                                                                                                                                   *
*                                       Charge for step (w/o SYSOUT):          0,03                                             *
*************************************************************************************************************************************
IEF285I   SYS12230.T133417.RA000.T1IV1.GOSET           DELETED
IEF375I  JOB /T1IV1   / START 12230.1334
IEF376I  JOB /T1IV1   / STOP  12230.1334 CPU    0MIN 00.17SEC SRB    0MIN 00.01SEC
```

```
             SC     SOURCE STATEMENT

                       'BEGIN'                                                    00013001
                        'COMMENT' TEST PROGRAM Q09                                00014001
                                  MODIFIED FOR IBM ALGOL F LEVEL 2.1 IVP          00015001
                                                                                  00016001
                                  GENERATE AND PRINTS THE FIRST TWENTY            00017001
                                  LINES OF PASCALS TRIANGLE                       00018001
                                                                                  00019001
                           THE K TH ELEMENT P(K,J) OF THE J TH LINE SHOULD BE     00020001
                           EQUAL TO THE SUM OF P(K-1,J-1) AND P(K,J-1) FOR K ¬= 0 00021001
                           AND K ¬= J. P(0,J)=P(J,J)=1                            00022001
                           THUS BY ADDING TWO BY TWO ALL ELEMENTS IN ONE LINE     00023001
                           PLACING EACH SUM BELOW AND BETWEEN THE TWO ELEMENTS THE00024001
                           NEXT LINE OF PASCALS TRIANGLE COULD BE EXPANDED ;      00025001
                                                                                  00026001
                       'INTEGER' l,k,n,i,m,Powerten;                              00027001
              1        'INTEGER' 'ARRAY' a[0:19];                                 00028001
              2        'BOOLEAN' c;                                               00029001
              3        SYSACT(1,6,120);                                           00030001
              4        SYSACT(1,8,62);                                            00031001
              5        SYSACT(1,12,1);                                            00032001
              6        SYSACT(1,2,56);                                            00033001
              7        OUTSTRING (1,'('Pascals Triangle')');                      00034001
              8        'FOR' l := 0 'STEP' 1 'UNTIL' 19 'DO'                      00035001
              8         'BEGIN'                                                   00036001
              8          SYSACT(1,14,3);                                          00037001
              9          'IF' l < 19 'THEN'                                       00038001
              9            SYSACT(1,2,58-3*l);                                    00039001
             10          a[l] := 1;                                               00040001
             11          'FOR' k := l-1 'STEP' -1 'UNTIL' 1 'DO'                  00041001
             11           a[k] := a[k-1] + a[k];                                  00042001
             12           'FOR' K :=0 'STEP' 1 'UNTIL' L 'DO'                     00043001
             12            'BEGIN'                                                00044001
             12             c := 'TRUE';                                          00045001
             13             m := a[k];                                            00046001
             14             'FOR' I := 5 'STEP' -1 'UNTIL' 0 'DO'                 00047001
             14              'BEGIN'                                              00048001
             14                Powerten := 10 ** I;                               00049001
             15                n := m '/' Powerten;                               00050001
             16                m := m-n * Powerten;                               00051001
             17                'IF' n 'EQUAL' 0 'THEN'                            00052001
             17                 'BEGIN'                                           00053001
             17                  'IF' c 'THEN' OUTSYMBOL (1,'(' ')',1)            00054001
             17                    'ELSE' OUTSYMBOL (1,'('0')',1);                00055001
             18                 'END'                                            00056001
             18                  'ELSE'                                          00057001
             18                   'BEGIN'                                        00058001
             18                    c := 'FALSE';                                 00059001
             19                    OUTSYMBOL(1,'('123456789')',N);               00060001
             20                   'END'                                          00061001
             20               'END'                                              00062001
             20              'END'                                               00063001
             20           'END'                                                  00064001
             20         'END'                                                    00065001
```

```
                                        IDENTIFIER TABLE                                                    PAGE   2
        PBN SC    PBN      NAME   TYPE  DM DSP       NAME   TYPE  DM DSP       NAME   TYPE  DM DSP
                  SURR                  PR LN                     PR LN                     PR LN

        001 00000 000      A      I A   01 030       C      B        048       I      I        024
                           K      I        01C       L      I        018       M      I        028
                           N      I        020       POWERT I        02C
```

```
                                     STORAGE REQUIREMENTS (DECIMAL)                                         PAGE   3


        OBJECT MODULE SIZE  1968 BYTES
        DATA STORAGE AREA SIZES
        PBN   BYTES       PBN   BYTES       PBN   BYTES       PBN   BYTES       PBN   BYTES
        001     132
```

```
F64-LEVEL LINKAGE EDITOR OPTIONS SPECIFIED XREF,LIST,LET
        DEFAULT OPTION(S) USED -  SIZE=(1015808,516096)

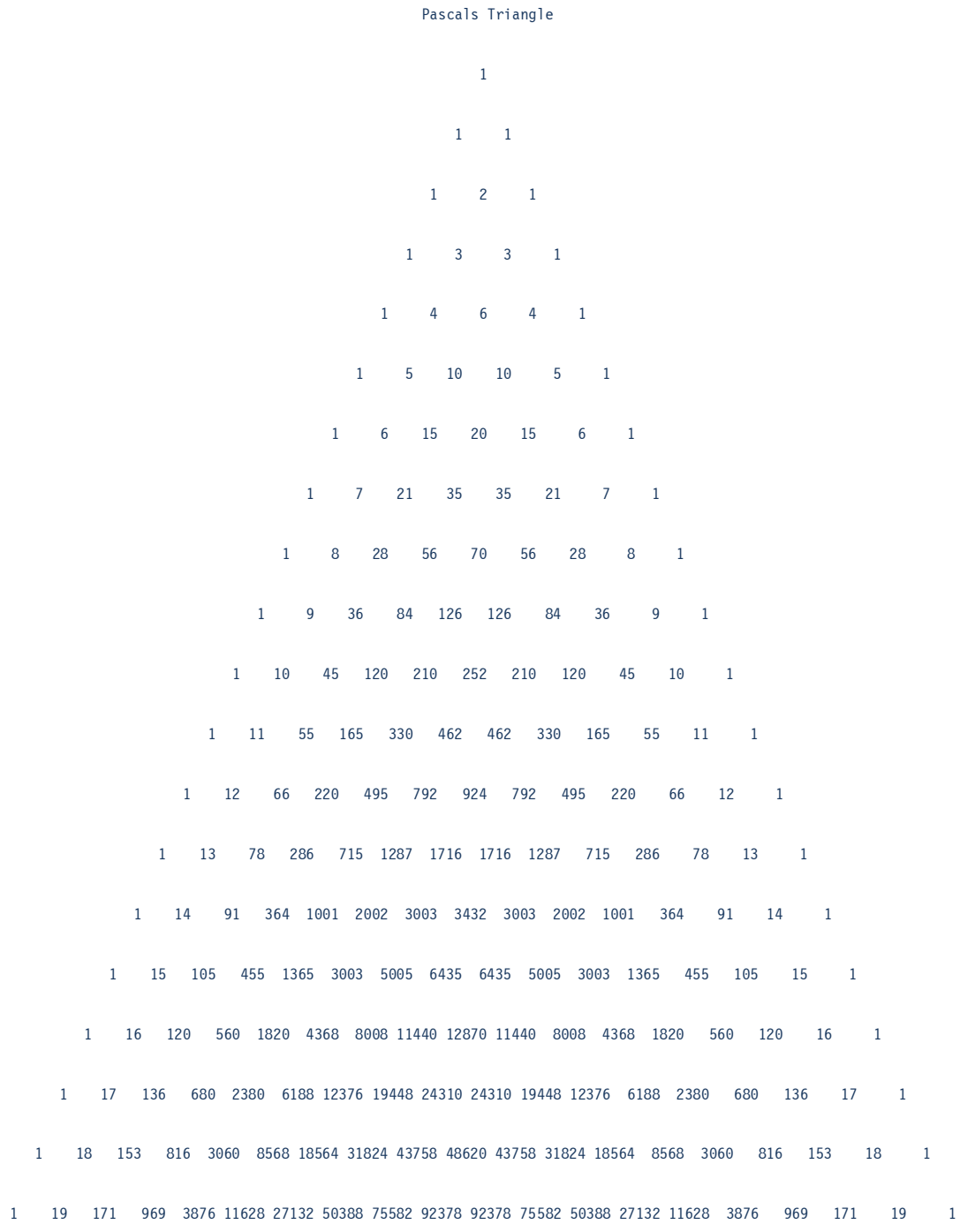

                                          CROSS REFERENCE TABLE


 CONTROL SECTION                      ENTRY

   NAME    ORIGIN  LENGTH               NAME   LOCATION     NAME   LOCATION     NAME   LOCATION     NAME   LOCATION
 PROGRAM       00     7B0
                                      IHIDSTAB     758    IHIENTIF     7A4
 IHIFRIXP*    7B0      A0
                                      IHIFRI       7B0
 IHIFSARA*    850     E70
                                      IHIFSAIN    164C
 IHIFSARB*   16C0     690
 IHIOSTRG*   1D50     148
 IHIOSYMB*   1E98     138
 IHISYSCT*   1FD0     780
 IHIIORTN*   2750     D70
                                      IHIIOROQ    2750    IHIIOROP    2836    IHIIORNX    2C04    IHIIORCL    2E4C
                                      IHIIORCP    2FF6    IHIIORGP    30F8    IHIIORCN    30FC    IHIIOREN    315C
                                      IHIIOREV    31DA    IHIIORED    3270    IHIIORCI    3348    IHIIORER    33CC
 IHIERROR*   34C0     6E8
 IHIERMSG*   3BA8     9B8
                                      IHIERM01    3C58


  LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION            LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION
      690           IHISYSCT        IHISYSCT                  6C8           IHIOSYMB        IHIOSYMB
      6E4           IHIOSTRG        IHIOSTRG                  6F4           IHIFRI          IHIFRIXP
     1694           IHIFSARB        IHIFSARB                  AE8           IHIERROR        IHIERROR
     1648           IHIIORER        IHIIORTN                 16A8           IHIIORCP        IHIIORTN
      AFC           IHIIORCP        IHIIORTN                 1644           IHIIORGP        IHIIORTN
     1640           IHIIOREN        IHIIORTN                 163C           IHIIOROQ        IHIIORTN
     1630           IHIIOREV        IHIIORTN                 1628           IHIIORCI        IHIIORTN
     16B0           IHIIORNX        IHIIORTN                 1634           IHIIORNX        IHIIORTN
      B01           IHIIORNX        IHIIORTN                 16B4           IHIIORCL        IHIIORTN
     162C           IHIIORCL        IHIIORTN                 16AC           IHIIOROP        IHIIORTN
     1638           IHIIOROP        IHIIORTN                  AF8           IHIIOROP        IHIIORTN
     16A4           IHIENTIF        PROGRAM                   8FC           IHIDSTAB        PROGRAM
     16C5           IHIFSARA        IHIFSARA                 3B90           IHIERM01        IHIERMSG
     3B8C           IHIERMSG        IHIERMSG
 ENTRY ADDRESS     164C

 TOTAL LENGTH      4560
****GO        DOES NOT EXIST BUT HAS BEEN ADDED TO DATA SET
AUTHORIZATION CODE IS         0.
```


Pascals Triangle
1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1
1 9 36 84 126 126 84 36 9 1
1 10 45 120 210 252 210 120 45 10 1
1 11 55 165 330 462 462 330 165 55 11 1
1 12 66 220 495 792 924 792 495 220 66 12 1
1 13 78 286 715 1287 1716 1716 1287 715 286 78 13 1
1 14 91 364 1001 2002 3003 3432 3003 2002 1001 364 91 14 1
1 15 105 455 1365 3003 5005 6435 6435 5005 3003 1365 455 105 15 1
1 16 120 560 1820 4368 8008 11440 12870 11440 8008 4368 1820 560 120 16 1
1 17 136 680 2380 6188 12376 19448 24310 24310 19448 12376 6188 2380 680 136 17 1
1 18 153 816 3060 8568 18564 31824 43758 48620 43758 31824 18564 8568 3060 816 153 18 1
1 19 171 969 3876 11628 27132 50388 75582 92378 92378 75582 50388 27132 11628 3876 969 171 19 1

```
  ALGOL PROGRAM TRACE

MODULE      SEMICOLON NUMBERS

  GO          1    2    3    4    5    6    7    8    9   10   11   12   13
             14   15   16   17   18   15   16   17   18   15   16   17   18
             15   16   17   18   15   16   17   18   15   16   17   19   20
              9   10   11   12   13   14   15   16   17   18   15   16   17
             18   15   16   17   18   15   16   17   18   15   16   17   18
             15   16   17   19   20   13   14   15   16   17   18   15   16
             17   18   15   16   17   18   15   16   17   18   15   16   17
             18   15   16   17   19   20    9   10   11   12   13   14   15
             16   17   18   15   16   17   18   15   16   17   18   15   16
             17   18   15   16   17   18   15   16   17   19   20   13   14
             15   16   17   18   15   16   17   18   15   16   17   18   15
             16   17   18   15   16   17   18   15   16   17   19   20   13
             14   15   16   17   18   15   16   17   18   15   16   17   18
             15   16   17   18   15   16   17   18   15   16   17   19   20
              9   10   11   12   13   14   15   16   17   18   15   16   17
             18   15   16   17   18   15   16   17   18   15   16   17   18
             15   16   17   19   20   13   14   15   16   17   18   15   16
             17   18   15   16   17   18   15   16   17   18   15   16   17
             18   15   16   17   19   20   13   14   15   16   17   18   15
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             17   18   15   16   17   19   20   13   14   15   16   17   18
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             14   15   16   17   18   15   16   17   18   15   16   17   18
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             19   20   13   14   15   16   17   18   15   16   17   18   15
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ALGOL PROGRAM TRACE

MODULE SEMICOLON NUMBERS

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ALGOL PROGRAM TRACE

MODULE SEMICOLON NUMBERS

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ALGOL PROGRAM TRACE

MODULE SEMICOLON NUMBERS

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```

ALGOL PROGRAM TRACE

MODULE SEMICOLON NUMBERS

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 15  16  17  18  15  16  17  19  20  15  16  17  19
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```

ALGOL PROGRAM TRACE

MODULE SEMICOLON NUMBERS

17 18 15 16 17 19 20 15 16 17 19 20 13
14 15 16 17 18 15 16 17 18 15 16 17 18
15 16 17 18 15 16 17 19 20 15 16 17 19
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17 18 15 16 17 18 15 16 17 18 15 16 17
19 20 9 10 11 12 13 14 15 16 17 18 15
16 17 18 15 16 17 18 15 16 17 18 15 16
17 18 15 16 17 19 20 13 14 15 16 17 18
15 16 17 18 15 16 17 18 15 16 17 18 15
16 17 19 20 15 16 17 19 20 13 14 15 16
17 18 15 16 17 18 15 16 17 18 15 16 17
18 15 16 17 19 20 15 16 17 19 20 13 14
15 16 17 18 15 16 17 18 15 16 17 18 15
16 17 19 20 15 16 17 19 20 15 16 17 19
20 13 14 15 16 17 18 15 16 17 18 15 16
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19 20 15 16 17 18 15 16 17 18 15 16 17
19 20 13 14 15 16 17 18 15 16 17 18 15
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20 15 16 17 19 20 13 14 15 16 17 18 15
16 17 18 15 16 17 18 15 16 17 19 20 15
16 17 18 15 16 17 19 20 13 14 15 16 17

ALGOL PROGRAM TRACE

MODULE SEMICOLON NUMBERS

```
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ALGOL PROGRAM TRACE

MODULE SEMICOLON NUMBERS

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```

ALGOL PROGRAM TRACE

MODULE SEMICOLON NUMBERS

```
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```

ALGOL PROGRAM TRACE

MODULE SEMICOLON NUMBERS

16 17 19 20 15 16 17 19 20 15 16 17 19
20 15 16 17 19 20 15 16 17 19 20 13 14
15 16 17 18 15 16 17 18 15 16 17 19 20
15 16 17 19 20 15 16 17 19 20 15 16 17
19 20 13 14 15 16 17 18 15 16 17 18 15
16 17 19 20 15 16 17 18 15 16 17 19 20
15 16 17 18 13 14 15 16 17 18 15 16 17
18 15 16 17 18 15 16 17 19 20 15 16 17
19 20 15 16 17 19 20 13 14 15 16 17 18
15 16 17 18 15 16 17 18 15 16 17 19 20
15 16 17 19 20 15 16 17 19 20 13 14 15
16 17 18 15 16 17 18 15 16 17 18 15 16
17 18 15 16 17 19 20 15 16 17 19 20 13
14 15 16 17 18 15 16 17 18 15 16 17 18
15 16 17 18 15 16 17 18 15 16 17 19 20
9 10 11 12 13 14 15 16 17 18 15 16 17
18 15 16 17 18 15 16 17 18 15 16 17 18
15 16 17 19 20 13 14 15 16 17 18 15 16
17 18 15 16 17 18 15 16 17 18 15 16 17
19 20 15 16 17 19 20 13 14 15 16 17 18
15 16 17 18 15 16 17 18 15 16 17 19 20
15 16 17 19 20 15 16 17 19 20 13 14 15
16 17 18 15 16 17 18 15 16 17 18 15 16
17 19 20 15 16 17 19 20 15 16 17 19 20
13 14 15 16 17 18 15 16 17 18 15 16 17
19 20 15 16 17 19 20 15 16 17 19 20 15
16 17 19 20 13 14 15 16 17 18 15 16 17
19 20 15 16 17 19 20 15 16 17 19 20 15
16 17 19 20 15 16 17 19 20 13 14 15 16
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16 17 19 20 15 16 17 19 20 15 16 17 19
20 13 14 15 16 17 18 15 16 17 19 20 15
16 17 18 15 16 17 19 20 15 16 17 19 20
15 16 17 19 20 13 14 15 16 17 18 15 16
17 19 20 15 16 17 19 20 15 16 17 19 20
15 16 17 19 20 15 16 17 19 20 13 14 15
16 17 18 15 16 17 19 20 15 16 17 19 20
15 16 17 19 20 15 16 17 19 20 15 16 17
19 20 13 14 15 16 17 18 15 16 17 19 20
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19 20 15 16 17 19 20 13 14 15 16 17 18
15 16 17 19 20 15 16 17 19 20 15 16 17
19 20 15 16 17 19 20 15 16 17 19 20 13
14 15 16 17 18 15 16 17 19 20 15 16 17
18 15 16 17 19 20 15 16 17 19 20 15 16

```
  ALGOL PROGRAM TRACE

MODULE     SEMICOLON NUMBERS

              17    19    20    13    14    15    16    17    18    15    16    17    19
              20    15    16    17    19    20    15    16    17    19    20    15    16
              17    19    20    15    16    17    19    20    13    14    15    16    17
              18    15    16    17    19    20    15    16    17    19    20    15    16
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              14    15    16    17    18    15    16    17    18    15    16    17    18
              15    16    17    18    15    16    17    18    15    16    17    19    20
END OF ALGOL PROGRAM EXECUTION
```

```
        LISTIDR  MEMBER=GO                                          00075001

                              *****  M O D U L E   S U M M A R Y  *****

         MEMBER NAME   GO                                 MAIN ENTRY POINT  00164C

                 ** ALIASES **                  SECONDARY ENTRY POINT ADDRESSES ASSOCIATED WITH ALIASES:
```

```
                      ****   LINKAGE EDITOR ATTRIBUTES OF MODULE   ****

                **   BIT  STATUS         BIT  STATUS         BIT  STATUS         BIT  STATUS   **

                      0  NOT-RENT         1  NOT-REUS         2  NOT-OVLY         3  NOT-TEST
                      4  NOT-OL           5  BLOCK           6  EXEC             7  MULTI-RCD
                      8  NOT-DC           9  ZERO-ORG        10 EP > ZERO        11 RLD
                      12 EDIT            13 NO-SYMS         14 F-LEVEL          15 NOT-REFR
```

```
                                  MODULE SSI:  NONE
                                  APFCODE      00000000

                    *****LOAD MODULE PROCESSED BY VS LINKAGE EDITOR
                                    LISTIDR FOR LOAD MODULE GO                          PAGE 0001


                          THIS LOAD MODULE CONTAINS NO INFORMATION SUPPLIED BY IMASPZAP
```

```
         THIS LOAD MODULE WAS PRODUCED BY LINKAGE EDITOR 5752SC104  AT LEVEL 03.08 ON DAY 230 OF YEAR 12  AT 13:34:17.
```

CSECT	TRANSLATOR	VR.MD	YR/DY
PROGRAM	360SAL531	02.01	12/230
IHIFRIXP	X390ASM	31.04	12/230
IHIFSARA	X390ASM	31.04	12/230
IHIFSARB	X390ASM	31.04	12/230
IHIOSTRG	X390ASM	31.04	12/230
IHIOSYMB	X390ASM	31.04	12/230
IHISYSCT	X390ASM	31.04	12/230
IHIIORTN	X390ASM	31.04	12/230
IHIERROR	X390ASM	31.04	12/230
IHIERMSG	X390ASM	31.04	12/230

CSECT	YR/DAY	USER DATA
IHIERMSG	12/230	360SLM532 V02 M01 ALGOL F LIBRARY
IHIERROR	12/230	360SLM532 V02 M01 ALGOL F LIBRARY
IHIFRIXP	12/230	360SLM532 V02 M01 ALGOL F LIBRARY
IHIFSARA	12/230	360SLM532 V02 M01 ALGOL F LIBRARY
IHIFSARB	12/230	360SLM532 V02 M01 ALGOL F LIBRARY
IHIIORTN	12/230	360SLM532 V02 M01 ALGOL F LIBRARY
IHIOSTRG	12/230	360SLM532 V02 M01 ALGOL F LIBRARY
IHIOSYMB	12/230	360SLM532 V02 M01 ALGOL F LIBRARY
IHISYSCT	12/230	360SLM532 V02 M01 ALGOL F LIBRARY

Appendix B. IVP IEXSAMP2 Listing

```
                                    J E S 2   J O B   L O G


13.35.56 JOB 9291  IEF677I WARNING MESSAGE(S) FOR JOB T1IV2    ISSUED
13.35.56 JOB 9291  $HASP373 T1IV2    STARTED - INIT  6 - CLASS S - SYS SYSA
13.35.56 JOB 9291  IEF403I T1IV2 - STARTED - TIME=13.35.56
13.35.57 JOB 9291  IEFACTRT - Stepname  Procstep  Program   Retcode
13.35.57 JOB 9291  T1IV2      IVP2      ALGOL     ALGOL     RC= 0000
13.35.57 JOB 9291  T1IV2      IVP2      LKED      IEWL      RC= 0000
13.35.57 JOB 9291  T1IV2      IVP2      GO        GO        RC= 0016
13.35.57 JOB 9291  IEF404I T1IV2 - ENDED - TIME=13.35.57
13.35.57 JOB 9291  $HASP395 T1IV2    ENDED

   1     //T1IV2   JOB  111,'ALGOL F LVL2.1',   <-- CUSTOMIZE FOR SITE STANDARDS JOB 9291
         //             CLASS=S,MSGCLASS=C,     <-- CUSTOMIZE FOR SITE STANDARDS 00002001
         //             REGION=1024K,COND=(0,NE),MSGLEVEL=(1,1)                  00003001
         ***                                                                    00004001
         ***       IBM ALGOL F LEVEL 2.1 IVP                                    00005001
         ***                                                                    00006001
         ***       360S-AL-531 ALGOL F COMPILER                                 00007001
         ***            AND                                                     00008001
         ***       360S-LM-532 ALGOL F LIBRARY                                  00009001
         ***                                                                    00010001
   2     //IVP2   EXEC  ALGOFCLG,PARM.GO='TRACE,DUMP'                           00011001
         ***                                                                    00001001
         ********************************************************************** 00002001
         ***                                                                    00003001
         ***       IBM ALGOL F LEVEL 2.1                                        00004001
         ***                                                                    00005001
         ***       360S-AL-531 ALGOL F COMPILER                                 00006001
         ***            AND                                                     00007001
         ***       360S-LM-532 ALGOL F LIBRARY                                  00008001
         ***                                                                    00009001
         ***       COMPILE, LINK-EDIT AND EXECUTE A PROGRAM                     00010001
         ***                                                                    00011001
         ********************************************************************** 00012001
         ***                                                                    00013001
   3     XXALGOL   EXEC PGM=ALGOL,REGION=1024K                                  00014001
   4     XXSYSPRINT DD  SYSOUT=*                                                00015001
   5     XXSYSPUNCH DD  DUMMY                                                   00016001
   6     XXSYSLIN   DD  DSN=&&OBJECT,UNIT=VIO,SPACE=(3200,(20,10)),             00017001
         XX             DISP=(,PASS)                                            00018001
   7     XXSYSUT1   DD  UNIT=VIO,SPACE=(2048,(50,10))                           00019001
   8     XXSYSUT2   DD  UNIT=VIO,SPACE=(2048,(50,10))                           00020001
   9     XXSYSUT3   DD  UNIT=VIO,SPACE=(2048,(40,10))                           00021001
  10     //ALGOL.SYSIN  DD  *                                                   00012001
  11     XXLKED    EXEC PGM=IEWL,PARM='XREF,LIST,LET',COND=(5,LT,ALGOL),        00022001
         XX             REGION=1024K                                            00023001
  12     XXSYSPRINT DD  SYSOUT=*                                                00024001
  13     XXSYSLIB   DD  DSN=SYS1.ALGLIB,DISP=SHR                                00025001
  14     XXSYSLMOD  DD  DSN=&&GOSET(GO),UNIT=VIO,DISP=(,PASS),                  00026001
         XX             SPACE=(2048,(100,20,1))                                 00027001
  15     XXSYSUT1   DD  UNIT=VIO,SPACE=(2048,(100,20))                          00028001
  16     XXSYSLIN   DD  DSN=&&OBJECT,DISP=(OLD,DELETE)                          00029001
  17     XX         DD  DDNAME=SYSIN                                            00030001
  18     XXGO      EXEC PGM=GO,COND=((5,LT,ALGOL),(5,LT,LKED)),                00031001
         XX             REGION=1024K                                            00032001
  19     XXSTEPLIB  DD  DSN=&&GOSET,DISP=(OLD,PASS)                             00033001
  20     XXALGLDD01 DD  SYSOUT=*                                                00034001
  21     XXSYSPRINT DD  SYSOUT=*                                                00035001
  22     XXSYSUT1   DD  UNIT=VIO,SPACE=(1024,(20,10))                           00036001
 STMT NO. MESSAGE
-
   18     IEF686I DDNAME REFERRED TO ON DDNAME KEYWORD IN PRIOR STEP WAS NOT RESOLVED
IEF236I ALLOC. FOR T1IV2 ALGOL IVP2
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I DMY  ALLOCATED TO SYSPUNCH
IEF237I VIO  ALLOCATED TO SYSLIN
IEF237I VIO  ALLOCATED TO SYSUT1
IEF237I VIO  ALLOCATED TO SYSUT2
IEF237I VIO  ALLOCATED TO SYSUT3
IEF237I JES2 ALLOCATED TO SYSIN
IEF142I T1IV2 ALGOL IVP2 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB09291.SO0102                        SYSOUT
IEF285I   SYS12230.T133556.RA000.T1IV2.OBJECT         PASSED       *--------2
IEF285I   SYS12230.T133556.RA000.T1IV2.R0000001       DELETED      *--------0
IEF285I   SYS12230.T133556.RA000.T1IV2.R0000002       DELETED      *--------0
IEF285I   SYS12230.T133556.RA000.T1IV2.R0000003       DELETED      *-------16
```

```
IEF285I   JES2.JOB09291.SI0101                        SYSIN
IEF373I STEP /ALGOL   / START 12230.1335
IEF374I STEP /ALGOL   / STOP  12230.1335 CPU    0MIN 00.05SEC SRB    0MIN 00.00SEC VIRT   192K SYS   304K
*************************************************************************************************************************************
*     1. Jobstep of job: T1IV2       Stepname: ALGOL       Program name: ALGOL      Executed on 17.08.12 from 13.35.56 to 13.35.57 *
*         elapsed time  24:00:00,10                    CPU-Identifier:  SYSA           Page-in:      0                          *
*             CPU time  00:00:00,05               Virtual Storage used:    192K         Page-out:     0                          *
*           corr. CPU:  00:00:00,05   CPU time has been corrected by  1 / 1,0  multiplier                                        *
*                                                                                                                                 *
*     I/O Operation                                                                                                               *
*     Number of records read via DD * or DD DATA:     36                                                                          *
*     DMY.......0 DMY.......0 FFF.......2 FFF.......0 FFF.......0 FFF......16 DMY.......0                                          *
*                                                                                                                                 *
*                                       Charge for step (w/o SYSOUT):          0,08                                           *
*************************************************************************************************************************************
IEF236I ALLOC. FOR T1IV2 LKED IVP2
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I 148  ALLOCATED TO SYSLIB
IEF237I VIO  ALLOCATED TO SYSLMOD
IEF237I VIO  ALLOCATED TO SYSUT1
IEF237I VIO  ALLOCATED TO SYSLIN
IEF237I DMY  ALLOCATED TO
IEF142I T1IV2 LKED IVP2 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB09291.SO0103                        SYSOUT
IEF285I   SYS1.ALGLIB                                 KEPT          *-------56
IEF285I   VOL SER NOS= MVSRES.
IEF285I   SYS12230.T133556.RA000.T1IV2.GOSET          PASSED        *-------17
IEF285I   SYS12230.T133556.RA000.T1IV2.R0000004       DELETED       *--------0
IEF285I   SYS12230.T133556.RA000.T1IV2.OBJECT         DELETED       *--------3
IEF373I STEP /LKED    / START 12230.1335
IEF374I STEP /LKED    / STOP  12230.1335 CPU    0MIN 00.05SEC SRB    0MIN 00.01SEC VIRT  1024K SYS   248K
*************************************************************************************************************************************
*     2. Jobstep of job: T1IV2       Stepname: LKED        Program name: IEWL       Executed on 17.08.12 from 13.35.57 to 13.35.57 *
*         elapsed time  24:00:00,07                    CPU-Identifier:  SYSA           Page-in:      0                          *
*             CPU time  00:00:00,06               Virtual Storage used:   1024K         Page-out:     0                          *
*           corr. CPU:  00:00:00,06   CPU time has been corrected by  1 / 1,0  multiplier                                        *
*                                                                                                                                 *
*     I/O Operation                                                                                                               *
*     Number of records read via DD * or DD DATA:      0                                                                          *
*     DMY.......0 148......56 FFF......17 FFF.......0 FFF.......3 DMY.......0                                                     *
*                                                                                                                                 *
*                                       Charge for step (w/o SYSOUT):          0,10                                           *
*************************************************************************************************************************************
IEF236I ALLOC. FOR T1IV2 GO IVP2
IEF237I VIO  ALLOCATED TO STEPLIB
IEF237I JES2 ALLOCATED TO ALGLDD01
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I VIO  ALLOCATED TO SYSUT1
IEF142I T1IV2 GO IVP2 - STEP WAS EXECUTED - COND CODE 0016
IEF285I   SYS12230.T133556.RA000.T1IV2.GOSET          PASSED        *--------0
IEF285I   JES2.JOB09291.SO0104                        SYSOUT
IEF285I   JES2.JOB09291.SO0105                        SYSOUT
IEF285I   SYS12230.T133556.RA000.T1IV2.R0000005       DELETED       *--------0
IEF373I STEP /GO      / START 12230.1335
IEF374I STEP /GO      / STOP  12230.1335 CPU    0MIN 00.02SEC SRB    0MIN 00.00SEC VIRT    28K SYS   280K
*************************************************************************************************************************************
*     3. Jobstep of job: T1IV2       Stepname: GO          Program name: GO         Executed on 17.08.12 from 13.35.57 to 13.35.57 *
*         elapsed time  24:00:00,04                    CPU-Identifier:  SYSA           Page-in:      0                          *
*             CPU time  00:00:00,02               Virtual Storage used:     28K         Page-out:     0                          *
*           corr. CPU:  00:00:00,02   CPU time has been corrected by  1 / 1,0  multiplier                                        *
*                                                                                                                                 *
*     I/O Operation                                                                                                               *
*     Number of records read via DD * or DD DATA:      0                                                                          *
*     FFF.......0 DMY.......0 DMY.......0 FFF.......0                                                                             *
*                                                                                                                                 *
*                                       Charge for step (w/o SYSOUT):          0,03                                           *
*************************************************************************************************************************************
IEF285I   SYS12230.T133556.RA000.T1IV2.GOSET          DELETED
IEF375I  JOB /T1IV2   / START 12230.1335
IEF376I  JOB /T1IV2   / STOP  12230.1335 CPU    0MIN 00.12SEC SRB    0MIN 00.01SEC
```

```
360S-AL-531 LEVEL 2.1          OS ALGOL SOURCE PROGRAM                          17 AUG 2012 13:35:56      PAGE   1
             SC     SOURCE STATEMENT

                          'BEGIN'                                                                    00013001
                          'COMMENT'                                                                  00014001
                           IBM ALGOL F LEVEL 2.1 IVP                                                 00015001
                           SAMPLE PROGRAM TO CREATE DELIBERATE DIVIDE BY ZERO ERROR                  00016001
                           TO DEMONSTRATE ALGOL RUN TIME DIAGNOSTIC INFORMATION;                     00017001
                                                                                                     00018001
                          'INTEGER' I;                                                               00019001
                      1   'REAL' A;                                                                  00020001
                      2   'BOOLEAN' B;                                                               00021001
                      3   'INTEGER' 'ARRAY' IA[1:5];                                                 00022001
                      4   'ARRAY' AR[0:3,2:8];                                                       00023001
                      5   'BOOLEAN' 'ARRAY' BA[0:1,1:3,3:7];                                         00024001
                      6   'INTEGER' 'PROCEDURE' IP;                                                  00025001
                      7   IP := I + 5;                                                               00026001
                      8   'REAL' 'PROCEDURE' RP(A);                                                  00027001
                      9   'VALUE' A;                                                                 00028001
                     10   'INTEGER' A;                                                               00029001
                     11   RP := A*A;                                                                 00030001
                     12   'PROCEDURE' P(A,B,C);                                                      00031001
                     13   'BOOLEAN' A;                                                               00032001
                     14   'REAL' B;                                                                  00033001
                     15   'INTEGER' C;                                                               00034001
                     16   A:= B < C ;                                                                00035001
                     17   I := 1;                                                                    00036001
                     18   A := 2.6;                                                                  00037001
                     19   AR[1,1] := IP;                                                             00038001
                     20   AR[1,2] := RP(AR[1,1]);                                                    00039001
                     21   P(BA[0,1,3],A,I);                                                          00040001
                     22   P(B,AR[1,2],IP);                                                           00041001
                     23   SYSACT(1,8,50);                                                            00042001
                     24   OUTREAL(1,AR[1,1]);                                                        00043001
                     25   OUTBOOLEAN(1,BA[0,1,3]);                                                   00044001
                     26   OUTBOOLEAN(1,B);                                                           00045001
                     27   'COMMENT' DELIBERATE DIVIDE BY ZERO ERROR;                                 00046001
                     27   A := A/0;                                                                  00047001
                     28   'END'                                                                      00048001
```

```
                                        IDENTIFIER TABLE                                                    PAGE   2
        PBN SC    PBN      NAME   TYPE  DM DSP       NAME   TYPE  DM DSP       NAME   TYPE  DM DSP
                  SURR                  PR LN                     PR LN                     PR LN

        001 00000 000      A      R        01C       AR     R A   02 03C       B      B        020
                           BA     B A   03 058       I      I        018       IA     I A   01 024
                           IP     I P   00 070       P        P   03 078       RP     R P   01 074

        002 00006 001      IP     I P   00 070

        003 00008 001      A      I  V     020       RP     R P   01 074

        004 00012 001      A      B  N     018       B      R  N     020       C      I  N     028
```

```
                                    STORAGE REQUIREMENTS (DECIMAL)                                          PAGE   3


        OBJECT MODULE SIZE  1840 BYTES
        DATA STORAGE AREA SIZES
        PBN   BYTES       PBN   BYTES       PBN   BYTES       PBN   BYTES       PBN   BYTES
        001     136       002     32        003     40        004     60
```

```
F64-LEVEL LINKAGE EDITOR OPTIONS SPECIFIED XREF,LIST,LET
        DEFAULT OPTION(S) USED -  SIZE=(1015808,516096)


                                        CROSS REFERENCE TABLE


 CONTROL SECTION                    ENTRY

   NAME    ORIGIN  LENGTH             NAME   LOCATION     NAME   LOCATION     NAME   LOCATION     NAME   LOCATION
 PROGRAM       00     730
                                    IHIDSTAB     6D8    IHIENTIF     724
 IHIFSARA*    730     E70
                                    IHIFSAIN    152C
 IHIFSARB*   15A0     690
 IHIOBOOL*   1C30     1C8
                                    IHIOBOAR    1C82
 IHISOREA*   1DF8     380
                                    IHISORAR    1DF8    IHISOREL    1E38
 IHISYSCT*   2178     780
 IHIIORTN*   28F8     D70
                                    IHIIOROQ    28F8    IHIIOROP    29DE    IHIIORNX    2DAC    IHIIORCL    2FF4
                                    IHIIORCP    319E    IHIIORGP    32A0    IHIIORCN    32A4    IHIIOREN    3304
                                    IHIIOREV    3382    IHIIORED    3418    IHIIORCI    34F0    IHIIORER    3574
 IHIERROR*   3668     6E8
 IHIERMSG*   3D50     9B8
                                    IHIERM01    3E00


  LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION            LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION
      61C           IHISYSCT       IHISYSCT                   658           IHISOREL       IHISOREA
      660           IHIOBOOL       IHIOBOOL                  1574           IHIFSARB       IHIFSARB
      9C8           IHIERROR       IHIERROR                  1528           IHIIORER       IHIIORTN
     1588           IHIIORCP       IHIIORTN                   9DC           IHIIORCP       IHIIORTN
     1524           IHIIORGP       IHIIORTN                  1520           IHIIOREN       IHIIORTN
     151C           IHIIOROQ       IHIIORTN                  1510           IHIIOREV       IHIIORTN
     1508           IHIIORCI       IHIIORTN                  1590           IHIIORNX       IHIIORTN
     1514           IHIIORNX       IHIIORTN                   9E1           IHIIORNX       IHIIORTN
     1594           IHIIORCL       IHIIORTN                  150C           IHIIORCL       IHIIORTN
     158C           IHIIOROP       IHIIORTN                  1518           IHIIOROP       IHIIORTN
      9D8           IHIIOROP       IHIIORTN                  1584           IHIENTIF       PROGRAM
      7DC           IHIDSTAB       PROGRAM                   15A5           IHIFSARA       IHIFSARA
     3D38           IHIERM01       IHIERMSG                  3D34           IHIERMSG       IHIERMSG

 ENTRY ADDRESS     152C

 TOTAL LENGTH      4708
****GO        DOES NOT EXIST BUT HAS BEEN ADDED TO DATA SET
AUTHORIZATION CODE IS         0.
```

```
+6.000000'+00  'FALSE'  'FALSE'


IHI031I  SC=    27 PSW= 078D000F 480A5F02 DIVISION BY ZERO, FLOATING POINT


MODULE = GO        PROGRAM BLOCK NUMBER =    1 (BLOCK)

         DECLARED IDENTIFIERS AND OBJECT TIME STACK
000018   00000001  4129999A  00000000  01000000   000A465C  000A4660  000A4674  00000014
000038   00000004  02000024  000A45E8  000A45F0   000A4660  00000070  0000001C  00000004
000058   0300003C  000A45C8  000A45D0  000A45EE   0000001E  0000000F  00000005  00000001
000078   000A460C  000A58FC  000A4698  400A593C

         SMF DISPLACEMENT IN DSA = 000058 DECLARED ARRAY
000000   00000000  00000000  00000000  00000000   00000000  00000000  00000000  00000000

         SMF DISPLACEMENT IN DSA = 00003C DECLARED ARRAY
000000   00000000  00000000  00000000  00000000   00000000  00000000  41600000  42240000
000020   00000000  00000000  00000000  00000000   00000000  00000000  00000000  00000000
000040   00000000  00000000  00000000  00000000   00000000  00000000  00000000  00000000
000060   00000000  00000000  00000000  00000000

         SMF DISPLACEMENT IN DSA = 000024 DECLARED ARRAY
000000   00000000  00000000  00000000  00000000   00000000

   ALGOL PROGRAM TRACE

MODULE     SEMICOLON NUMBERS

  GO           1     2     3     4     5     6     8    12    17    18    19     7    20
               9    10    11    21    13    14    15    16    22    13    14    15    16
               7    23    24    25    26    27
END OF ALGOL PROGRAM EXECUTION
```

Appendix C. IVP IEXSAMP3 Listing

```
                                    J E S 2   J O B   L O G


11.09.37 JOB 2687  IEF677I WARNING MESSAGE(S) FOR JOB T1IV3    ISSUED
11.09.37 JOB 2687  $HASP373 T1IV3    STARTED - INIT  6 - CLASS S - SYS SYSA
11.09.37 JOB 2687  IEF403I T1IV3 - STARTED - TIME=11.09.37
11.09.38 JOB 2687  IEFACTRT - Stepname  Procstep  Program   Retcode
11.09.38 JOB 2687  T1IV3      IVP3      ALGOL     ALGOL     RC= 0000
11.09.38 JOB 2687  T1IV3      IVP3      LKED      IEWL      RC= 0000
11.09.38 JOB 2687  T1IV3      IVP3      GO        GO        RC= 0000
11.09.38 JOB 2687  IEF404I T1IV3 - ENDED - TIME=11.09.38
11.09.38 JOB 2687  $HASP395 T1IV3    ENDED

   1     //T1IV3   JOB  111,'ALGOL F LVL2.1',   <-- CUSTOMIZE FOR SITE STANDARDS JOB 2687
         //             CLASS=S,MSGCLASS=C,     <-- CUSTOMIZE FOR SITE STANDARDS 00002001
         //             REGION=8500K,COND=(0,NE),MSGLEVEL=(1,1)                  00003001
         ***                                                                    00004001
         ***       IBM ALGOL F LEVEL 2.1 IVP                                    00005001
         ***                                                                    00006001
         ***       360S-AL-531 ALGOL F COMPILER                                 00007001
         ***            AND                                                     00008001
         ***       360S-LM-532 ALGOL F LIBRARY                                  00009001
         ***                                                                    00010001
   2     //IVP3   EXEC  ALGOFCLG                                                00011001
         ***                                                                    00001001
         ********************************************************************** 00002001
         ***                                                                    00003001
         ***       IBM ALGOL F LEVEL 2.1                                        00004001
         ***                                                                    00005001
         ***       360S-AL-531 ALGOL F COMPILER                                 00006001
         ***            AND                                                     00007001
         ***       360S-LM-532 ALGOL F LIBRARY                                  00008001
         ***                                                                    00009001
         ***       COMPILE, LINK-EDIT AND EXECUTE A PROGRAM                     00010001
         ***                                                                    00011001
         ********************************************************************** 00012001
         ***                                                                    00013001
   3     XXALGOL   EXEC PGM=ALGOL,REGION=1024K                                  00014001
   4     XXSYSPRINT DD  SYSOUT=*                                                00015001
   5     XXSYSPUNCH DD  DUMMY                                                   00016001
   6     XXSYSLIN   DD  DSN=&&OBJECT,UNIT=VIO,SPACE=(3200,(20,10)),             00017001
         XX             DISP=(,PASS)                                            00018001
   7     XXSYSUT1   DD  UNIT=VIO,SPACE=(2048,(50,10))                           00019001
   8     XXSYSUT2   DD  UNIT=VIO,SPACE=(2048,(50,10))                           00020001
   9     XXSYSUT3   DD  UNIT=VIO,SPACE=(2048,(40,10))                           00021001
  10     //ALGOL.SYSIN  DD  *                                                   00012001
  11     XXLKED    EXEC PGM=IEWL,PARM='XREF,LIST,LET',COND=(5,LT,ALGOL),        00022001
         XX             REGION=1024K                                            00023001
  12     XXSYSPRINT DD  SYSOUT=*                                                00024001
  13     XXSYSLIB   DD  DSN=SYS1.ALGLIB,DISP=SHR                                00025001
  14     XXSYSLMOD  DD  DSN=&&GOSET(GO),UNIT=VIO,DISP=(,PASS),                  00026001
         XX             SPACE=(2048,(100,20,1))                                 00027001
  15     XXSYSUT1   DD  UNIT=VIO,SPACE=(2048,(100,20))                          00028001
  16     XXSYSLIN   DD  DSN=&&OBJECT,DISP=(OLD,DELETE)                          00029001
  17     XX         DD  DDNAME=SYSIN                                            00030001
  18     XXGO      EXEC PGM=GO,COND=((5,LT,ALGOL),(5,LT,LKED)),                00031001
         XX             REGION=1024K                                            00032001
  19     XXSTEPLIB  DD  DSN=&&GOSET,DISP=(OLD,PASS)                             00033001
  20     XXALGLDD01 DD  SYSOUT=*                                                00034001
  21     XXSYSPRINT DD  SYSOUT=*                                                00035001
  22     XXSYSUT1   DD  UNIT=VIO,SPACE=(1024,(20,10))                           00036001
  23     //GO.SYSIN  DD *                                                       00091001
 STMT NO. MESSAGE
-
   18     IEF686I DDNAME REFERRED TO ON DDNAME KEYWORD IN PRIOR STEP WAS NOT RESOLVED
IEF236I ALLOC. FOR T1IV3 ALGOL IVP3
IEF237I JES2 ALLOCATED TO SYSPRINT
```

```
IEF237I DMY  ALLOCATED TO SYSPUNCH
IEF237I VIO  ALLOCATED TO SYSLIN
IEF237I VIO  ALLOCATED TO SYSUT1
IEF237I VIO  ALLOCATED TO SYSUT2
IEF237I VIO  ALLOCATED TO SYSUT3
IEF237I JES2 ALLOCATED TO SYSIN
IEF142I T1IV3 ALGOL IVP3 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB02687.SO0103                        SYSOUT
IEF285I   SYS14353.T110937.RA000.T1IV3.OBJECT         PASSED        *--------2
IEF285I   SYS14353.T110937.RA000.T1IV3.R0000001       DELETED       *--------0
IEF285I   SYS14353.T110937.RA000.T1IV3.R0000002       DELETED       *--------0
IEF285I   SYS14353.T110937.RA000.T1IV3.R0000003       DELETED       *-------13
IEF285I   JES2.JOB02687.SI0101                        SYSIN
IEF373I STEP /ALGOL   / START 14353.1109
IEF374I STEP /ALGOL   / STOP  14353.1109 CPU    0MIN 00.05SEC SRB    0MIN 00.00SEC VIRT   192K SYS   296K
*************************************************************************************************************************
**********
*     1. Jobstep of job: T1IV3       Stepname: ALGOL       Program name: ALGOL      Executed on 19.12.14 from 11.09.37 to
11.09.38 *
*         elapsed time  24:00:00,09                    CPU-Identifier:  SYSA           Page-in:      0
*
*             CPU time  00:00:00,05               Virtual Storage used:    192K         Page-out:      0
*
*           corr. CPU:  00:00:00,05   CPU time has been corrected by  1 / 1,0  multiplier
*
*
*
*     I/O Operation
*
*     Number of records read via DD * or DD DATA:     77
*
*     DMY.......0 DMY.......0 FFF.......2 FFF.......0 FFF.......0 FFF......13 DMY.......0
*
*
*
*                                       Charge for step (w/o SYSOUT):          0,08
*
*************************************************************************************************************************
**********
IEF236I ALLOC. FOR T1IV3 LKED IVP3
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I 148  ALLOCATED TO SYSLIB
IEF237I VIO  ALLOCATED TO SYSLMOD
IEF237I VIO  ALLOCATED TO SYSUT1
IEF237I VIO  ALLOCATED TO SYSLIN
IEF237I DMY  ALLOCATED TO
IEF142I T1IV3 LKED IVP3 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB02687.SO0104                        SYSOUT
IEF285I   SYS1.ALGLIB                                 KEPT          *-------72
IEF285I   VOL SER NOS= MVSRES.
IEF285I   SYS14353.T110937.RA000.T1IV3.GOSET          PASSED        *-------19
IEF285I   SYS14353.T110937.RA000.T1IV3.R0000004       DELETED       *--------0
IEF285I   SYS14353.T110937.RA000.T1IV3.OBJECT         DELETED       *--------3
IEF373I STEP /LKED    / START 14353.1109
IEF374I STEP /LKED    / STOP  14353.1109 CPU    0MIN 00.05SEC SRB    0MIN 00.01SEC VIRT  1028K SYS   264K
*************************************************************************************************************************
**********
*     2. Jobstep of job: T1IV3       Stepname: LKED        Program name: IEWL       Executed on 19.12.14 from 11.09.38 to
11.09.38 *
*         elapsed time  24:00:00,10                    CPU-Identifier:  SYSA           Page-in:      0
*
*             CPU time  00:00:00,06               Virtual Storage used:   1028K         Page-out:      0
*
*           corr. CPU:  00:00:00,06   CPU time has been corrected by  1 / 1,0  multiplier
*
*
*
*     I/O Operation
*
*     Number of records read via DD * or DD DATA:      0
*
```

```
*     DMY.......0 148......72 FFF......19 FFF.......0 FFF.......3 DMY.......0
*
*
*
*                                        Charge for step (w/o SYSOUT):          0,10
*
*********************************************************************************************************************************
**********
IEF236I ALLOC. FOR T1IV3 GO IVP3
IEF237I VIO  ALLOCATED TO STEPLIB
IEF237I JES2 ALLOCATED TO ALGLDD01
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I VIO  ALLOCATED TO SYSUT1
IEF237I JES2 ALLOCATED TO SYSIN
IEF142I T1IV3 GO IVP3 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS14353.T110937.RA000.T1IV3.GOSET           PASSED        *--------0
IEF285I   JES2.JOB02687.SO0105                         SYSOUT
IEF285I   JES2.JOB02687.SO0106                         SYSOUT
IEF285I   SYS14353.T110937.RA000.T1IV3.R0000005        DELETED       *--------0
IEF285I   JES2.JOB02687.SI0102                         SYSIN
IEF373I STEP /GO      / START 14353.1109
IEF374I STEP /GO      / STOP  14353.1109 CPU    0MIN 00.33SEC SRB    0MIN 00.00SEC VIRT  8228K SYS   280K
*********************************************************************************************************************************
**********
*     3. Jobstep of job: T1IV3       Stepname: GO          Program name: GO         Executed on 19.12.14 from 11.09.38 to
11.09.38 *
*         elapsed time  24:00:00,34                     CPU-Identifier:  SYSA           Page-in:      0
*
*             CPU time  00:00:00,33               Virtual Storage used:   8228K         Page-out:      0
*
*           corr. CPU:  00:00:00,33   CPU time has been corrected by  1 / 1,0  multiplier
*
*
*
*     I/O Operation
*
*     Number of records read via DD * or DD DATA:      1
*
*     FFF.......0 DMY.......0 DMY.......0 FFF.......0 DMY.......0
*
*
*
*                                        Charge for step (w/o SYSOUT):          0,55
*
*********************************************************************************************************************************
**********
IEF285I   SYS14353.T110937.RA000.T1IV3.GOSET           DELETED
IEF375I  JOB /T1IV3   / START 14353.1109
IEF376I  JOB /T1IV3   / STOP  14353.1109 CPU    0MIN 00.43SEC SRB    0MIN 00.01SEC
```

```
              SC     SOURCE STATEMENT

                     'BEGIN'                                                    00013001
                     'COMMENT'                                                  00014001
                     ////////////////////////////////////////////////////       00015001
                     // NAME: PETER M. MAURER                                   00016001
                     // PROGRAM: SIEVE OF ERATOSTHENES                          00017001
                     // DUE: NEVER                                              00018001
                     // LANGUAGE: ALGOL 60 ALA IBM 360                          00019001
                     //                                                         00020001
                     // Changes:                                                00021001
                     // - Juergen Winkelmann, 2014/07/12, Performance and Output 00022001
                     // Optimization                                            00023001
                     ////////////////////////////////////////////////////       00024001
                     ;                                                          00025001
                     'COMMENT' DEFINE THE SIEVE DATA STRUCTURE ;                00026001
                     'BOOLEAN' 'ARRAY' CANDIDATES[0:8400000];                   00027001
               1     'INTEGER' I,J,K,LIMIT;                                     00028001
               2     'COMMENT' SET LINE-LENGTH=120,SET LINES-PER-PAGE=62,OPEN;  00029001
               2     SYSACT(1,6,120);                                           00030001
               3     SYSACT(1,8,62);                                            00031001
               4     SYSACT(1,12,1);                                            00032001
               5     ININTEGER(0,LIMIT);                                        00033001
               6     'FOR' I := 0 'STEP' 1 'UNTIL' LIMIT 'DO'                   00034001
               6     'BEGIN'                                                    00035001
               6     'COMMENT' EVERYTHING IS POTENTIALLY PRIME                  00036001
               6     UNTIL PROVEN OTHERWISE ;                                   00037001
               6     CANDIDATES[I] := 'TRUE';                                   00038001
               7     'END';                                                     00039001
               8     'COMMENT' NEITHER 1 NOR 0 IS PRIME, SO FLAG THEM OFF ;     00040001
               8     CANDIDATES[0] := 'FALSE';                                  00041001
               9     CANDIDATES[1] := 'FALSE';                                  00042001
              10     'COMMENT' START THE SIEVE WITH THE INTEGER 0 ;             00043001
              10     I := 0;                                                    00044001
              11     K := 0;                                                    00045001
              12     'FOR' I := I 'WHILE' K 'LESS' LIMIT 'DO'                   00046001
              12     'BEGIN'                                                    00047001
              12     'COMMENT' ADVANCE TO THE NEXT UN-CROSSED OUT. ;            00048001
              12     'COMMENT' THIS NUMBER MUST BE A PRIME;                     00049001
              12     'FOR' I := I 'WHILE' K 'LESS' LIMIT                        00050001
              12     'AND' 'NOT' CANDIDATES[I] 'DO'                             00051001
              12     'BEGIN'                                                    00052001
              12     I := I+1;                                                  00053001
              13     K := I*I;                                                  00054001
              14     'END';                                                     00055001
              15     'COMMENT' INSURE AGAINST RUNNING OFF THE END;              00056001
              15     'IF' K 'LESS' LIMIT 'THEN'                                 00057001
              15     'BEGIN'                                                    00058001
              15     'COMMENT' CROSS OUT ALL MULTIPLES OF THE PRIME.;           00059001
              15     'FOR' K := K 'WHILE' K 'LESS' LIMIT 'DO'                   00060001
              15     'BEGIN'                                                    00061001
              15     CANDIDATES[K] := 'FALSE';                                  00062001
              16     K := K+I;                                                  00063001
              17     'END';                                                     00064001
              18     'COMMENT' ADVANCE TO THE NEXT CANDIDATE ;                  00065001
              18     I := I+1;                                                  00066001
```

```
              SC     SOURCE STATEMENT

              19     K := I*I;                                                  00067001
              20     'END'                                                      00068001
              20     'END';                                                     00069001
              21     'COMMENT' ALL UNCROSSED OUT NUMBERS ARE PRIME;             00070001
              21     'COMMENT' PRINT ALL PRIMES ;                               00071001
              21     J := 0;                                                    00072001
              22     K := 0;                                                    00073001
              23     'FOR' I := 0 'STEP' 1 'UNTIL' LIMIT-1 'DO'                 00074001
              23     'BEGIN'                                                    00075001
              23     'IF' CANDIDATES[I] 'THEN'                                  00076001
              23     'BEGIN'                                                    00077001
              23     J := J + 1;                                                00078001
              24     K := K + 1;                                                00079001
              25     OUTINTEGER(1,I);                                           00080001
              26     'IF' J 'EQUAL' 9 'THEN' J := 0;                            00081001
              27     'END';                                                     00082001
              28     'END';                                                    00083001
              29     'IF' J 'NOTEQUAL' 0 'THEN' SYSACT(1,14,1);                 00084001
              30     SYSACT(1,14,1);                                            00085001
              31     OUTINTEGER(1,K);                                           00086001
              32     OUTSTRING(1,'(' primes found')');                          00087001
              33     SYSACT(1,14,1);                                            00088001
              34     'END'                                                      00089001
```

```
                                        IDENTIFIER TABLE                                                    PAGE   3
        PBN SC    PBN      NAME   TYPE  DM DSP       NAME   TYPE  DM DSP       NAME   TYPE  DM DSP
                  SURR                  PR LN                     PR LN                     PR LN

        001 00000 000      CANDID B A   01 018       I      I        030       J      I        034
                           K      I        038       LIMIT  I        03C
```

```
                                    STORAGE REQUIREMENTS (DECIMAL)                                          PAGE   4


        OBJECT MODULE SIZE  1992 BYTES
        DATA STORAGE AREA SIZES
        PBN   BYTES       PBN   BYTES       PBN   BYTES       PBN   BYTES       PBN   BYTES
        001     104
```

```
F64-LEVEL LINKAGE EDITOR OPTIONS SPECIFIED XREF,LIST,LET
        DEFAULT OPTION(S) USED -  SIZE=(1017856,516096)

                                          CROSS REFERENCE TABLE

 CONTROL SECTION                      ENTRY

   NAME    ORIGIN  LENGTH               NAME   LOCATION     NAME   LOCATION     NAME   LOCATION     NAME   LOCATION
 PROGRAM       00     7C8
                                      IHIDSTAB     770    IHIENTIF     7BC
 IHIFSARA*    7C8     E68
                                      IHIFSAIN    15BC
 IHIFSARB*   1630     670
 IHIIDECM*   1CA0     6D0
                                      IHIIDEAI    1CA0    IHIIDEII    1CE4    IHIIDEIR    1D28
 IHIOINTE*   2370     1F8
                                      IHIOINAR    2370    IHIOINTG    23B0
 IHIOSTRG*   2568     148
 IHISYSCT*   26B0     788
 IHIIORTN*   2E38     D18
                                      IHIIOROQ    2E38    IHIIOROP    2F04    IHIIORNX    32B4    IHIIORCL    3518
                                      IHIIORCP    36CE    IHIIORGP    37BC    IHIIORCN    37C0    IHIIOREN    3824
                                      IHIIOREV    38A0    IHIIORED    3934    IHIIORCI    39E0    IHIIORER    3A64
 IHIERROR*   3B50     6E8
 IHIERMSG*   4238     9B8
                                      IHIERM01    42E8
 IHIPTTAB*   4BF0     108



  LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION            LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION
      6A0           IHISYSCT        IHISYSCT                  6C4           IHIIDEII        IHIIDECM
      6E0           IHIOINTG        IHIOINTE                  6F4           IHIOSTRG        IHIOSTRG
     1604           IHIFSARB        IHIFSARB                  A60           IHIERROR        IHIERROR
      874           IHIDSTAB        PROGRAM                  15B8           IHIIORER        IHIIORTN
     1618           IHIIORCP        IHIIORTN                  A74           IHIIORCP        IHIIORTN
     15B4           IHIIORGP        IHIIORTN                 15B0           IHIIOREN        IHIIORTN
     15AC           IHIIOROQ        IHIIORTN                 15A0           IHIIOREV        IHIIORTN
     1598           IHIIORCI        IHIIORTN                 1620           IHIIORNX        IHIIORTN
     15A4           IHIIORNX        IHIIORTN                  A79           IHIIORNX        IHIIORTN
     1624           IHIIORCL        IHIIORTN                 159C           IHIIORCL        IHIIORTN
     161C           IHIIOROP        IHIIORTN                 15A8           IHIIOROP        IHIIORTN
      A70           IHIIOROP        IHIIORTN                 1614           IHIENTIF        PROGRAM
     1635           IHIFSARA        IHIFSARA                 21B8           IHIPTTAB        IHIPTTAB
     4220           IHIERM01        IHIERMSG                 421C           IHIERMSG        IHIERMSG

 ENTRY ADDRESS     15BC

 TOTAL LENGTH      4CF8
****GO        DOES NOT EXIST BUT HAS BEEN ADDED TO DATA SET
AUTHORIZATION CODE IS         0.
```

```
  +2   +3   +5   +7  +11  +13  +17  +19  +23
 +29  +31  +37  +41  +43  +47  +53  +59  +61
 +67  +71  +73  +79  +83  +89  +97 +101 +103
+107 +109 +113 +127 +131 +137 +139 +149 +151
+157 +163 +167 +173 +179 +181 +191 +193 +197
+199 +211 +223 +227 +229 +233 +239 +241 +251
+257 +263 +269 +271 +277 +281 +283 +293 +307
+311 +313 +317 +331 +337 +347 +349 +353 +359
+367 +373 +379 +383 +389 +397 +401 +409 +419
+421 +431 +433 +439 +443 +449 +457 +461 +463
+467 +479 +487 +491 +499 +503 +509 +521 +523
+541 +547 +557 +563 +569 +571 +577 +587 +593
+599 +601 +607 +613 +617 +619 +631 +641 +643
+647 +653 +659 +661 +673 +677 +683 +691 +701
+709 +719 +727 +733 +739 +743 +751 +757 +761
+769 +773 +787 +797 +809 +811 +821 +823 +827
+829 +839 +853 +857 +859 +863 +877 +881 +883
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```

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```

```
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 +9157   +9161   +9173   +9181   +9187   +9199   +9203   +9209   +9221
 +9227   +9239   +9241   +9257   +9277   +9281   +9283   +9293   +9311
 +9319   +9323   +9337   +9341   +9343   +9349   +9371   +9377   +9391
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 +9461   +9463   +9467   +9473   +9479   +9491   +9497   +9511   +9521
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+10799  +10831  +10837  +10847  +10853  +10859  +10861  +10867  +10883
+10889  +10891  +10903  +10909  +10937  +10939  +10949  +10957  +10973
+10979  +10987  +10993  +11003  +11027  +11047  +11057  +11059  +11069
+11071  +11083  +11087  +11093  +11113  +11117  +11119  +11131  +11149
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+11321  +11329  +11351  +11353  +11369  +11383  +11393  +11399  +11411
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+11497  +11503  +11519  +11527  +11549  +11551  +11579  +11587  +11593
+11597  +11617  +11621  +11633  +11657  +11677  +11681  +11689  +11699
+11701  +11717  +11719  +11731  +11743  +11777  +11779  +11783  +11789
+11801  +11807  +11813  +11821  +11827  +11831  +11833  +11839  +11863
+11867  +11887  +11897  +11903  +11909  +11923  +11927  +11933  +11939
+11941  +11953  +11959  +11969  +11971  +11981  +11987  +12007  +12011
+12037  +12041  +12043  +12049  +12071  +12073  +12097  +12101  +12107
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+95143  +95153  +95177  +95189  +95191  +95203  +95213  +95219  +95231
+95233  +95239  +95257  +95261  +95267  +95273  +95279  +95287  +95311
+95317  +95327  +95339  +95369  +95383  +95393  +95401  +95413  +95419
+95429  +95441  +95443  +95461  +95467  +95471  +95479  +95483  +95507
+95527  +95531  +95539  +95549  +95561  +95569  +95581  +95597  +95603
+95617  +95621  +95629  +95633  +95651  +95701  +95707  +95713  +95717
+95723  +95731  +95737  +95747  +95773  +95783  +95789  +95791  +95801
+95803  +95813  +95819  +95857  +95869  +95873  +95881  +95891  +95911
+95917  +95923  +95929  +95947  +95957  +95959  +95971  +95987  +95989
+96001  +96013  +96017  +96043  +96053  +96059  +96079  +96097  +96137
+96149  +96157  +96167  +96179  +96181  +96199  +96211  +96221  +96223
+96233  +96259  +96263  +96269  +96281  +96289  +96293  +96323  +96329
+96331  +96337  +96353  +96377  +96401  +96419  +96431  +96443  +96451
+96457  +96461  +96469  +96479  +96487  +96493  +96497  +96517  +96527
+96553  +96557  +96581  +96587  +96589  +96601  +96643  +96661  +96667
+96671  +96697  +96703  +96731  +96737  +96739  +96749  +96757  +96763
+96769  +96779  +96787  +96797  +96799  +96821  +96823  +96827  +96847
+96851  +96857  +96893  +96907  +96911  +96931  +96953  +96959  +96973
+96979  +96989  +96997  +97001  +97003  +97007  +97021  +97039  +97073
+97081  +97103  +97117  +97127  +97151  +97157  +97159  +97169  +97171
+97177  +97187  +97213  +97231  +97241  +97259  +97283  +97301  +97303
+97327  +97367  +97369  +97373  +97379  +97381  +97387  +97397  +97423
+97429  +97441  +97453  +97459  +97463  +97499  +97501  +97511  +97523
+97547  +97549  +97553  +97561  +97571  +97577  +97579  +97583  +97607
+97609  +97613  +97649  +97651  +97673  +97687  +97711  +97729  +97771
+97777  +97787  +97789  +97813  +97829  +97841  +97843  +97847  +97849
+97859  +97861  +97871  +97879  +97883  +97919  +97927  +97931  +97943
+97961  +97967  +97973  +97987  +98009  +98011  +98017  +98041  +98047
+98057  +98081  +98101  +98123  +98129  +98143  +98179  +98207  +98213
+98221  +98227  +98251  +98257  +98269  +98297  +98299  +98317  +98321
+98323  +98327  +98347  +98369  +98377  +98387  +98389  +98407  +98411
+98419  +98429  +98443  +98453  +98459  +98467  +98473  +98479  +98491
+98507  +98519  +98533  +98543  +98561  +98563  +98573  +98597  +98621
+98627  +98639  +98641  +98663  +98669  +98689  +98711  +98713  +98717
+98729  +98731  +98737  +98773  +98779  +98801  +98807  +98809  +98837
```

```
     +98849       +98867       +98869       +98873       +98887       +98893       +98897       +98899       +98909
     +98911       +98927       +98929       +98939       +98947       +98953       +98963       +98981       +98993
     +98999       +99013       +99017       +99023       +99041       +99053       +99079       +99083       +99089
     +99103       +99109       +99119       +99131       +99133       +99137       +99139       +99149       +99173
     +99181       +99191       +99223       +99233       +99241       +99251       +99257       +99259       +99277
     +99289       +99317       +99347       +99349       +99367       +99371       +99377       +99391       +99397
     +99401       +99409       +99431       +99439       +99469       +99487       +99497       +99523       +99527
     +99529       +99551       +99559       +99563       +99571       +99577       +99581       +99607       +99611
     +99623       +99643       +99661       +99667       +99679       +99689       +99707       +99709       +99713
     +99719       +99721       +99733       +99761       +99767       +99787       +99793       +99809       +99817
     +99823       +99829       +99833       +99839       +99859       +99871       +99877       +99881       +99901
     +99907       +99923       +99929       +99961       +99971       +99989       +99991

     +9592   primes found
```

```
END OF ALGOL PROGRAM EXECUTION
```

Appendix D. IVP IEXSAMP4 Listing

```
                                    J E S 2   J O B   L O G


13.38.53 JOB 9293  IEF677I WARNING MESSAGE(S) FOR JOB T1IV4    ISSUED
13.38.53 JOB 9293  $HASP373 T1IV4    STARTED - INIT  6 - CLASS S - SYS SYSA
13.38.53 JOB 9293  IEF403I T1IV4 - STARTED - TIME=13.38.53
13.38.53 JOB 9293  IEFACTRT - Stepname  Procstep  Program   Retcode
13.38.53 JOB 9293  T1IV4      IVP4      ALGOL     ALGOL     RC= 0000
13.38.53 JOB 9293  T1IV4      IVP4      LKED      IEWL      RC= 0000
13.38.53 JOB 9293  T1IV4      ASMTIM    ASM       IFOX00    RC= 0000
13.38.54 JOB 9293  T1IV4      ASMTIM    LKED      IEWL      RC= 0000
13.42.09 JOB 9293  T1IV4      GOIVP4              GO        RC= 0000
13.42.09 JOB 9293  IEF404I T1IV4 - ENDED - TIME=13.42.09
13.42.09 JOB 9293  $HASP395 T1IV4    ENDED

   1     //T1IV4   JOB  111,'ALGOL F LVL2.1',   <-- CUSTOMIZE FOR SITE STANDARDS JOB 9293
         //             CLASS=S,MSGCLASS=C,     <-- CUSTOMIZE FOR SITE STANDARDS 00002001
         //             REGION=1024K,COND=(0,NE),MSGLEVEL=(1,1)                  00003001
         ***                                                                    00004001
         ***       IBM Algol F Level 2.1 IVP                                    00005001
         ***                                                                    00006001
         ***       360S-AL-531 Algol F Compiler                                 00007001
         ***            and                                                     00008001
         ***       360S-LM-532 Algol F Library                                  00009001
         ***                                                                    00010001
   2     //IVP4    EXEC ALGOFCL                                                 00011001
         ***                                                                    00001001
         ********************************************************************** 00002001
         ***                                                                    00003001
         ***       IBM ALGOL F LEVEL 2.1                                        00004001
         ***                                                                    00005001
         ***       360S-AL-531 ALGOL F COMPILER                                 00006001
         ***            AND                                                     00007001
         ***       360S-LM-532 ALGOL F LIBRARY                                  00008001
         ***                                                                    00009001
         ***       COMPILE AND LINK-EDIT A PROGRAM                              00010001
         ***                                                                    00011001
         ********************************************************************** 00012001
         ***                                                                    00013001
   3     XXALGOL   EXEC PGM=ALGOL,REGION=1024K                                  00014001
   4     XXSYSPRINT DD  SYSOUT=*                                                00015001
   5     XXSYSPUNCH DD  DUMMY                                                   00016001
   6     XXSYSLIN   DD  DSN=&&OBJECT,UNIT=VIO,SPACE=(3200,(20,10)),             00017001
         XX             DISP=(,PASS)                                            00018001
   7     XXSYSUT1   DD  UNIT=VIO,SPACE=(2048,(50,10))                           00019001
   8     XXSYSUT2   DD  UNIT=VIO,SPACE=(2048,(50,10))                           00020001
   9     XXSYSUT3   DD  UNIT=VIO,SPACE=(2048,(40,10))                           00021001
  10     //ALGOL.SYSIN  DD  *                                                   00012001
  11     XXLKED    EXEC PGM=IEWL,PARM='XREF,LIST,LET',COND=(5,LT,ALGOL),        00022001
         XX             REGION=1024K                                            00023001
  12     XXSYSPRINT DD  SYSOUT=*                                                00024001
  13     XXSYSLIB   DD  DSN=SYS1.ALGLIB,DISP=SHR                                00025001
  14     XXSYSLMOD  DD  DSN=&&GOSET(GO),UNIT=VIO,DISP=(,PASS),                  00026001
         XX             SPACE=(2048,(100,20,1))                                 00027001
  15     XXSYSUT1   DD  UNIT=VIO,SPACE=(2048,(100,20))                          00028001
  16     XXSYSLIN   DD  DSN=&&OBJECT,DISP=(OLD,DELETE)                          00029001
  17     XX         DD  DDNAME=SYSIN                                            00030001
  18     //ASMTIM   EXEC ASMFCL                                                 00789001
  19     XXASMFCL  PROC SOUT='*'                                                00000107
  20     XXASM     EXEC PGM=IFOX00,PARM=OBJ,REGION=512K                         00000204
  21     //ASM.SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR                               00790001
         X/SYSLIB   DD  DSN=SYS1.MACLIB,DISP=SHR                                00000307
  22     //           DD DSN=SYS1.AMODGEN,DISP=SHR                              00791001
         X/         DD  DSN=SYS1.AMODGEN,DISP=SHR                              00000407
  23     XXSYSUT1   DD  UNIT=VIO,SPACE=(TRK,(30,30))                            00000504
  24     XXSYSUT2   DD  UNIT=VIO,SPACE=(TRK,(30,30))                            00000604
  25     XXSYSUT3   DD  UNIT=VIO,SPACE=(TRK,(30,30))                            00000704
  26     XXSYSPRINT DD  SYSOUT=&SOUT                                            00000805
  27     XXSYSPUNCH DD  DUMMY                                                   00000904
  28     XXSYSGO    DD  DSN=&&OBJECT,UNIT=VIO,SPACE=(TRK,(3,30)),               00001004
         XX             DISP=(MOD,PASS)                                         00001104
  29     //ASM.SYSIN  DD *                                                      00792001
  30     XXLKED    EXEC PGM=IEWL,PARM='XREF,LET,LIST,NCAL',REGION=2048K,        00001204
         XX             COND=(8,LT,ASM)                                         00001304
  31     XXSYSPRINT DD  SYSOUT=&SOUT                                            00001406
  32     XXSYSUT1   DD  UNIT=VIO,SPACE=(2024,(50,20))                           00001506
  33     XXSYSLIN   DD  DSN=&&OBJECT,DISP=(OLD,DELETE)                          00001604
  34     XX         DD  DDNAME=SYSIN                                            00001704
```

```
  35     //LKED.SYSLMOD DD DSN=&&GOSET(CPUTIM),DISP=(OLD,PASS)                   00882001
         X/SYSLMOD  DD  DSN=&&GOSET(GO),UNIT=SYSDA,SPACE=(2048,(50,20,1)),      00001804
         XX             DISP=(MOD,PASS)                                        00001904
  36     //GOIVP4  EXEC PGM=GO                                                  00883001
  37     //STEPLIB  DD  DSN=&&GOSET,DISP=(OLD,PASS)                             00884001
  38     //ALGLDD01 DD  SYSOUT=*                                                00885001
  39     //SYSPRINT DD  SYSOUT=*                                                00886001
  40     //SYSUT1   DD  UNIT=VIO,SPACE=(1024,(20,10))                           00887001
 STMT NO. MESSAGE
-
   26     IEF653I SUBSTITUTION JCL - SYSOUT=*
   31     IEF653I SUBSTITUTION JCL - SYSOUT=*
   18     IEF686I DDNAME REFERRED TO ON DDNAME KEYWORD IN PRIOR STEP WAS NOT RESOLVED
   36     IEF686I DDNAME REFERRED TO ON DDNAME KEYWORD IN PRIOR STEP WAS NOT RESOLVED
IEF236I ALLOC. FOR T1IV4 ALGOL IVP4
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I DMY  ALLOCATED TO SYSPUNCH
IEF237I VIO  ALLOCATED TO SYSLIN
IEF237I VIO  ALLOCATED TO SYSUT1
IEF237I VIO  ALLOCATED TO SYSUT2
IEF237I VIO  ALLOCATED TO SYSUT3
IEF237I JES2 ALLOCATED TO SYSIN
IEF142I T1IV4 ALGOL IVP4 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB09293.SO0103                        SYSOUT
IEF285I   SYS12230.T133853.RA000.T1IV4.OBJECT         PASSED        *-------17
IEF285I   SYS12230.T133853.RA000.T1IV4.R0000001       DELETED       *-------11
IEF285I   SYS12230.T133853.RA000.T1IV4.R0000002       DELETED       *-------17
IEF285I   SYS12230.T133853.RA000.T1IV4.R0000003       DELETED       *-------77
IEF285I   JES2.JOB09293.SI0101                        SYSIN
IEF373I STEP /ALGOL   / START 12230.1338
IEF374I STEP /ALGOL   / STOP  12230.1338 CPU    0MIN 00.11SEC SRB    0MIN 00.01SEC VIRT   192K SYS   308K
*************************************************************************************************************************************
*     1. Jobstep of job: T1IV4       Stepname: ALGOL       Program name: ALGOL      Executed on 17.08.12 from 13.38.53 to 13.38.53 *
*         elapsed time  24:00:00,15                    CPU-Identifier:  SYSA           Page-in:      0                           *
*             CPU time  00:00:00,12               Virtual Storage used:    192K         Page-out:     0                           *
*           corr. CPU:  00:00:00,12   CPU time has been corrected by  1 / 1,0  multiplier                                        *
*                                                                                                                                 *
*     I/O Operation                                                                                                               *
*     Number of records read via DD * or DD DATA:    775                                                                          *
*     DMY.......0 DMY.......0 FFF......17 FFF......11 FFF......17 FFF......77 DMY.......0                                          *
*                                                                                                                                 *
*                                     Charge for step (w/o SYSOUT):          0,20                                               *
*************************************************************************************************************************************
IEF236I ALLOC. FOR T1IV4 LKED IVP4
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I 148  ALLOCATED TO SYSLIB
IEF237I VIO  ALLOCATED TO SYSLMOD
IEF237I VIO  ALLOCATED TO SYSUT1
IEF237I VIO  ALLOCATED TO SYSLIN
IEF237I DMY  ALLOCATED TO
IEF142I T1IV4 LKED IVP4 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB09293.SO0104                        SYSOUT
IEF285I   SYS1.ALGLIB                                 KEPT          *------107
IEF285I   VOL SER NOS= MVSRES.
IEF285I   SYS12230.T133853.RA000.T1IV4.GOSET          PASSED        *-------26
IEF285I   SYS12230.T133853.RA000.T1IV4.R0000004       DELETED       *--------0
IEF285I   SYS12230.T133853.RA000.T1IV4.OBJECT         DELETED       *-------18
IEF373I STEP /LKED    / START 12230.1338
IEF374I STEP /LKED    / STOP  12230.1338 CPU    0MIN 00.07SEC SRB    0MIN 00.01SEC VIRT  1024K SYS   280K
*************************************************************************************************************************************
*     2. Jobstep of job: T1IV4       Stepname: LKED        Program name: IEWL       Executed on 17.08.12 from 13.38.53 to 13.38.53 *
*         elapsed time  24:00:00,09                    CPU-Identifier:  SYSA           Page-in:      0                           *
*             CPU time  00:00:00,08               Virtual Storage used:   1024K         Page-out:     0                           *
*           corr. CPU:  00:00:00,08   CPU time has been corrected by  1 / 1,0  multiplier                                        *
*                                                                                                                                 *
*     I/O Operation                                                                                                               *
*     Number of records read via DD * or DD DATA:      0                                                                          *
*     DMY.......0 148.....107 FFF......26 FFF.......0 FFF......18 DMY.......0                                                     *
*                                                                                                                                 *
*                                     Charge for step (w/o SYSOUT):          0,13                                               *
*************************************************************************************************************************************
IEF236I ALLOC. FOR T1IV4 ASM ASMTIM
IEF237I 148  ALLOCATED TO SYSLIB
IEF237I 248  ALLOCATED TO
IEF237I VIO  ALLOCATED TO SYSUT1
IEF237I VIO  ALLOCATED TO SYSUT2
IEF237I VIO  ALLOCATED TO SYSUT3
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I DMY  ALLOCATED TO SYSPUNCH
IEF237I VIO  ALLOCATED TO SYSGO
IEF237I JES2 ALLOCATED TO SYSIN
IEF142I T1IV4 ASM ASMTIM - STEP WAS EXECUTED - COND CODE 0000
```

```
IEF285I   SYS1.MACLIB                                KEPT          *--------4
IEF285I   VOL SER NOS= MVSRES.
IEF285I   SYS1.AMODGEN                               KEPT          *--------7
IEF285I   VOL SER NOS= MVSDLB.
IEF285I   SYS12230.T133853.RA000.T1IV4.R0000005      DELETED       *-------31
IEF285I   SYS12230.T133853.RA000.T1IV4.R0000006      DELETED       *-------15
IEF285I   SYS12230.T133853.RA000.T1IV4.R0000007      DELETED       *--------8
IEF285I   JES2.JOB09293.SO0105                       SYSOUT
IEF285I   SYS12230.T133853.RA000.T1IV4.OBJECT        PASSED        *--------7
IEF285I   JES2.JOB09293.SI0102                       SYSIN
IEF373I STEP /ASM     / START 12230.1338
IEF374I STEP /ASM     / STOP  12230.1338 CPU    0MIN 00.17SEC SRB    0MIN 00.00SEC VIRT  1024K SYS   344K
*******************************************************************************************************************************
*     3. Jobstep of job: T1IV4       Stepname: ASM         Program name: IFOX00     Executed on 17.08.12 from 13.38.53 to 13.38.53 *
*         elapsed time  24:00:00,30                    CPU-Identifier:  SYSA           Page-in:      0                          *
*             CPU time  00:00:00,17              Virtual Storage used:   1024K         Page-out:     0                          *
*           corr. CPU:  00:00:00,17   CPU time has been corrected by  1 / 1,0  multiplier                                       *
*                                                                                                                               *
*     I/O Operation                                                                                                             *
*     Number of records read via DD * or DD DATA:     88                                                                        *
*     148.......4 248.......7 FFF......31 FFF......15 FFF.......8 DMY.......0 DMY.......0 FFF.......7 DMY.......0               *
*                                                                                                                               *
*                                      Charge for step (w/o SYSOUT):          0,28                                          *
*******************************************************************************************************************************
IEF236I ALLOC. FOR T1IV4 LKED ASMTIM
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I VIO  ALLOCATED TO SYSUT1
IEF237I VIO  ALLOCATED TO SYSLIN
IEF237I DMY  ALLOCATED TO
IEF237I VIO  ALLOCATED TO SYSLMOD
IEF142I T1IV4 LKED ASMTIM - STEP WAS EXECUTED - COND CODE 0000
IEF285I   JES2.JOB09293.SO0106                       SYSOUT
IEF285I   SYS12230.T133853.RA000.T1IV4.R0000008      DELETED       *--------0
IEF285I   SYS12230.T133853.RA000.T1IV4.OBJECT        DELETED       *--------8
IEF285I   SYS12230.T133853.RA000.T1IV4.GOSET         PASSED        *-------10
IEF373I STEP /LKED    / START 12230.1338
IEF374I STEP /LKED    / STOP  12230.1338 CPU    0MIN 00.03SEC SRB    0MIN 00.00SEC VIRT  1024K SYS   280K
*******************************************************************************************************************************
*     4. Jobstep of job: T1IV4       Stepname: LKED        Program name: IEWL       Executed on 17.08.12 from 13.38.53 to 13.38.54 *
*         elapsed time  24:00:00,04                    CPU-Identifier:  SYSA           Page-in:      0                          *
*             CPU time  00:00:00,03              Virtual Storage used:   1024K         Page-out:     0                          *
*           corr. CPU:  00:00:00,03   CPU time has been corrected by  1 / 1,0  multiplier                                       *
*                                                                                                                               *
*     I/O Operation                                                                                                             *
*     Number of records read via DD * or DD DATA:      0                                                                        *
*     DMY.......0 FFF.......0 FFF.......8 DMY.......0 FFF......10                                                               *
*                                                                                                                               *
*                                      Charge for step (w/o SYSOUT):          0,05                                          *
*******************************************************************************************************************************
IEF236I ALLOC. FOR T1IV4 GOIVP4
IEF237I VIO  ALLOCATED TO STEPLIB
IEF237I JES2 ALLOCATED TO ALGLDD01
IEF237I JES2 ALLOCATED TO SYSPRINT
IEF237I VIO  ALLOCATED TO SYSUT1
IEF142I T1IV4 GOIVP4 - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS12230.T133853.RA000.T1IV4.GOSET         PASSED        *--------0
IEF285I   JES2.JOB09293.SO0107                       SYSOUT
IEF285I   JES2.JOB09293.SO0108                       SYSOUT
IEF285I   SYS12230.T133853.RA000.T1IV4.R0000009      DELETED       *--------0
IEF373I STEP /GOIVP4  / START 12230.1338
IEF374I STEP /GOIVP4  / STOP  12230.1342 CPU    3MIN 15.31SEC SRB    0MIN 00.00SEC VIRT    56K SYS   280K
*******************************************************************************************************************************
*     5. Jobstep of job: T1IV4       Stepname: GOIVP4      Program name: GO         Executed on 17.08.12 from 13.38.54 to 13.42.09 *
*         elapsed time  24:03:15,49                    CPU-Identifier:  SYSA           Page-in:      0                          *
*             CPU time  00:03:15,31              Virtual Storage used:     56K         Page-out:     0                          *
*           corr. CPU:  00:03:15,31   CPU time has been corrected by  1 / 1,0  multiplier                                       *
*                                                                                                                               *
*     I/O Operation                                                                                                             *
*     Number of records read via DD * or DD DATA:      0                                                                        *
*     FFF.......0 DMY.......0 DMY.......0 FFF.......0                                                                           *
*                                                                                                                               *
*                                      Charge for step (w/o SYSOUT):        325,51                                          *
*******************************************************************************************************************************
IEF285I   SYS12230.T133853.RA000.T1IV4.GOSET         DELETED
IEF375I  JOB /T1IV4   / START 12230.1338
IEF376I  JOB /T1IV4   / STOP  12230.1342 CPU    3MIN 15.69SEC SRB    0MIN 00.02SEC
```

```
             SC     SOURCE STATEMENT

                       'BEGIN'                                                                  00013001
                       'COMMENT'  Basic Statement Times for Algol 60                            00014001
                                  B A Wichmann                                                  00015001
                                  National Physics laboratory                                   00016001
                                  Teddington, Middlesex                                         00017001
                                  November 1973;                                                00018001
                                                                                                00019001
                       'COMMENT'  Modified for IBM Algol F Level 2.1 IVP                        00020001
                                  This program will execute for aproximately 4 minutes          00021001
                                  on an MVS 3.8 system running on a Hercules 3.07               00022001
                                  system averaging 25 mips.                                     00023001
                                                                                                00024001
                                  Timings are guidelines only due to the PC, Windows            00025001
                                  and the Hercules timer implementations and will               00026001
                                  therefore vary for each execution;                            00027001
                                                                                                00028001
                       'REAL' x, y, z;                                                          00029001
                1      'INTEGER' i, j, n, k, l, m, case;                                        00030001
                2      'INTEGER' 'ARRAY' e1[1:1], e2[1:1,1:1], e3[1:1,1:1,1:1];                 00031001
                3                                                                               00032001
                3      'PROCEDURE' p0;                                                          00033001
                4         ;                                                                     00034001
                5                                                                               00035001
                5      'PROCEDURE' p1(x);                                                       00036001
                6         'VALUE' x;                                                            00037001
                7         'REAL' x;                                                             00038001
                8         ;                                                                     00039001
                9                                                                               00040001
                9      'PROCEDURE' p2(x,y);                                                     00041001
               10         'VALUE' x, y;                                                         00042001
               11         'REAL' x, y;                                                          00043001
               12         ;                                                                     00044001
               13                                                                               00045001
               13      'PROCEDURE' p3(x,y,z);                                                   00046001
               14         'VALUE' x, y, z;                                                      00047001
               15         'REAL' x, y, z;                                                       00048001
               16         ;                                                                     00049001
               17                                                                               00050001
               17      'INTEGER' 'ARRAY' #TT[1:43];                                             00051001
               18                                                                               00052001
               18      'PROCEDURE' printt;                                                      00053001
               19           'BEGIN'                                                             00054001
               19                'INTEGER' i;                                                   00055001
               20                'REAL' x, mix, loop;                                           00056001
               21                'COMMENT' calculate time differences;                          00057001
               21                'FOR' i := 43 'STEP' -1 'UNTIL' 2 'DO'                         00058001
               21                     'BEGIN'                                                   00059001
               21                          #TT[i] := #TT[i] - #TT[i-1];                         00060001
               22                          'COMMENT' subtract previous accum cpu time           00061001
               22                                    to derive case timing;                     00062001
               22                     'END';                                                    00063001
               23                'FOR' i := 2 'STEP'  1 'UNTIL' 42 'DO'                         00064001
               23                     'BEGIN'                                                   00065001
               23                          #TT[i] := (#TT[i] - #TT[43])/ ((n * 10)/1000);       00066001
```

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SC     SOURCE STATEMENT

24                          'COMMENT' subtract loop overhead and          00067001
24                                    convert to picroseconds;            00068001
24                     'END';                                             00069001
25                 'COMMENT' Print results;                               00070001
25                 SYSACT(1,14,1);                                        00071001
26                 OUTINTEGER(1,#TT[2]);                                  00072001
27                 OUTSTRING(1,'('x := 1.0 ')');                          00073001
28                 SYSACT(1,14,1);                                        00074001
29                 OUTINTEGER(1,#TT[3]);                                  00075001
30                 OUTSTRING(1,'('x := 1 ')');                            00076001
31                 SYSACT(1,14,1);                                        00077001
32                 OUTINTEGER(1,#TT[4]);                                  00078001
33                 OUTSTRING(1,'('x := y ')');                            00079001
34                 SYSACT(1,14,1);                                        00080001
35                 OUTINTEGER(1,#TT[5]);                                  00081001
36                 OUTSTRING(1,'('x := y + z')');                         00082001
37                 SYSACT(1,14,1);                                        00083001
38                 OUTINTEGER(1,#TT[6]);                                  00084001
39                 OUTSTRING(1,'('x := y * z')');                         00085001
40                 SYSACT(1,14,1);                                        00086001
41                 OUTINTEGER(1,#TT[7]);                                  00087001
42                 OUTSTRING(1,'('x := y / z')');                         00088001
43                 SYSACT(1,14,1);                                        00089001
44                 OUTINTEGER(1,#TT[8]);                                  00090001
45                 OUTSTRING(1,'('k := 1')');                             00091001
46                 SYSACT(1,14,1);                                        00092001
47                 OUTINTEGER(1,#TT[9]);                                  00093001
48                 OUTSTRING(1,'('k := 1.0')');                           00094001
49                 SYSACT(1,14,1);                                        00095001
50                 OUTINTEGER(1,#TT[10]);                                 00096001
51                 OUTSTRING(1,'('k := l + m')');                         00097001
52                 SYSACT(1,14,1);                                        00098001
53                 OUTINTEGER(1,#TT[11]);                                 00099001
54                 OUTSTRING(1,'('k := l * m')');                         00100001
55                 SYSACT(1,14,1);                                        00101001
56                 OUTINTEGER(1,#TT[12]);                                 00102001
57                 OUTSTRING(1,'('k := l / m')');                         00103001
58                 SYSACT(1,14,1);                                        00104001
59                 OUTINTEGER(1,#TT[13]);                                 00105001
60                 OUTSTRING(1,'('k := l')');                             00106001
61                 SYSACT(1,14,1);                                        00107001
62                 OUTINTEGER(1,#TT[14]);                                 00108001
63                 OUTSTRING(1,'('x := l')');                             00109001
64                 SYSACT(1,14,1);                                        00110001
65                 OUTINTEGER(1,#TT[15]);                                 00111001
66                 OUTSTRING(1,'('l := y')');                             00112001
67                 SYSACT(1,14,1);                                        00113001
68                 OUTINTEGER(1,#TT[16]);                                 00114001
69                 OUTSTRING(1,'('x := y ** 2')');                        00115001
70                 SYSACT(1,14,1);                                        00116001
71                 OUTINTEGER(1,#TT[17]);                                 00117001
72                 OUTSTRING(1,'('x := y ** 3')');                        00118001
73                 SYSACT(1,14,1);                                        00119001
74                 OUTINTEGER(1,#TT[18]);                                 00120001
```

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SC     SOURCE STATEMENT

 75                OUTSTRING(1,'('x := y ** z')');                          00121001
 76                SYSACT(1,14,1);                                          00122001
 77                OUTINTEGER(1,#TT[19]);                                   00123001
 78                OUTSTRING(1,'('e1[1] := 1')');                           00124001
 79                SYSACT(1,14,1);                                          00125001
 80                OUTINTEGER(1,#TT[20]);                                   00126001
 81                OUTSTRING(1,'('e2[1,1] := 1')');                         00127001
 82                SYSACT(1,14,1);                                          00128001
 83                OUTINTEGER(1,#TT[21]);                                   00129001
 84                OUTSTRING(1,'('e3[1,1,1] := 1')');                       00130001
 85                SYSACT(1,14,1);                                          00131001
 86                OUTINTEGER(1,#TT[22]);                                   00132001
 87                OUTSTRING(1,'('l := e1[1]')');                           00133001
 88                SYSACT(1,14,1);                                          00134001
 89                OUTINTEGER(1,#TT[23]);                                   00135001
 90                OUTSTRING(1,'('begin real a; end')');                    00136001
 91                SYSACT(1,14,1);                                          00137001
 92                OUTINTEGER(1,#TT[24]);                                   00138001
 93                OUTSTRING(1,'('begin real a[1:1]; end')');               00139001
 94                SYSACT(1,14,1);                                          00140001
 95                OUTINTEGER(1,#TT[25]);                                   00141001
 96                OUTSTRING(1,'('begin real a[1:500]; end')');             00142001
 97                SYSACT(1,14,1);                                          00143001
 98                OUTINTEGER(1,#TT[26]);                                   00144001
 99                OUTSTRING(1,'('begin real a[1:1,1:1]; end')');           00145001
100                SYSACT(1,14,1);                                          00146001
101                OUTINTEGER(1,#TT[27]);                                   00147001
102                OUTSTRING(1,'('begin real a[1:1,1:1,1:1]; end')');       00148001
103                SYSACT(1,14,1);                                          00149001
104                OUTINTEGER(1,#TT[28]);                                   00150001
105                OUTSTRING(1,'('begin goto lab; lab: end')');             00151001
106                SYSACT(1,14,1);                                          00152001
107                OUTINTEGER(1,#TT[29]);                                   00153001
108                OUTSTRING(1,'('begin switch s := q; goto s[1]; q: end')');00154001
109                SYSACT(1,14,1);                                          00155001
110                OUTINTEGER(1,#TT[30]);                                   00156001
111                OUTSTRING(1,'('x := sin(y)')');                          00157001
112                SYSACT(1,14,1);                                          00158001
113                OUTINTEGER(1,#TT[31]);                                   00159001
114                OUTSTRING(1,'('x := cos(y)')');                          00160001
115                SYSACT(1,14,1);                                          00161001
116                OUTINTEGER(1,#TT[32]);                                   00162001
117                OUTSTRING(1,'('x := abs(y)')');                          00163001
118                SYSACT(1,14,1);                                          00164001
119                OUTINTEGER(1,#TT[33]);                                   00165001
120                OUTSTRING(1,'('x := exp(y)')');                          00166001
121                SYSACT(1,14,1);                                          00167001
122                OUTINTEGER(1,#TT[34]);                                   00168001
123                OUTSTRING(1,'('x := ln(y)')');                           00169001
124                SYSACT(1,14,1);                                          00170001
125                OUTINTEGER(1,#TT[35]);                                   00171001
126                OUTSTRING(1,'('x := sqrt(y)')');                         00172001
127                SYSACT(1,14,1);                                          00173001
128                OUTINTEGER(1,#TT[36]);                                   00174001
```

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 SC     SOURCE STATEMENT

129                 OUTSTRING(1,'('x := arctan(y)')');                      00175001
130                 SYSACT(1,14,1);                                         00176001
131                 OUTINTEGER(1,#TT[37]);                                  00177001
132                 OUTSTRING(1,'('x := sign(y)')');                        00178001
133                 SYSACT(1,14,1);                                         00179001
134                 OUTINTEGER(1,#TT[38]);                                  00180001
135                 OUTSTRING(1,'('x := entier(y)')');                      00181001
136                 SYSACT(1,14,1);                                         00182001
137                 OUTINTEGER(1,#TT[39]);                                  00183001
138                 OUTSTRING(1,'('p0')');                                  00184001
139                 SYSACT(1,14,1);                                         00185001
140                 OUTINTEGER(1,#TT[40]);                                  00186001
141                 OUTSTRING(1,'('p1(x)')');                               00187001
142                 SYSACT(1,14,1);                                         00188001
143                 OUTINTEGER(1,#TT[41]);                                  00189001
144                 OUTSTRING(1,'('p2(x,y)')');                             00190001
145                 SYSACT(1,14,1);                                         00191001
146                 OUTINTEGER(1,#TT[42]);                                  00192001
147                 OUTSTRING(1,'('p3(x,y,z)')');                           00193001
148                 'COMMENT' print DO loop overhead;                       00194001
148                 SYSACT(1,14,1);                                         00195001
149                 OUTINTEGER(1,#TT[43]);                                  00196001
150                 OUTSTRING(1,'('DO Loop overhead')');                    00197001
151             'END';                                                      00198001
152                                                                         00199001
152         'INTEGER' 'PROCEDURE' CPUTIM; 'CODE';                           00200001
154               'COMMENT' Procedure that returns the current accumulated  00201001
154                         job step processor time in microseconds in the  00202001
154                         MVS 3.8J environment;                           00203001
154                                                                         00204001
154         'COMMENT' Set line-length = 120, Set lines-per-page = 62, OPEN; 00205001
154         SYSACT(1,6,120);                                                00206001
155         SYSACT(1,8,62);                                                 00207001
156         SYSACT(1,12,1);                                                 00208001
157         SYSACT(1,2,10);                                                 00209001
158         OUTSTRING (1,'('Algol F Statement Timings')');                  00210001
159         SYSACT(1,14,1);                                                 00211001
160         OUTSTRING(1,'('Picoseconds  Statement')');                      00212001
161                                                                         00213001
161         x := y := z := 1.0;                                             00214001
162         l := k := m := 1;                                               00215001
163         e1[1] := 1;                                                     00216001
164         case := 1;                                                      00217001
165                                                                         00218001
165              'COMMENT' Case 01;                                         00219001
165         n := 100000;                                                    00220001
166              'COMMENT' n should be given a large enough value           00221001
166                        for the resolution of the clock not to           00222001
166                        be a limiting factor to the accuracy.            00223001
166                        If n is made too large then processor time       00224001
166                        is wasted;                                       00225001
166         #TT[1] := CPUTIM;                                               00226001
167              'COMMENT' #TT[1] equals program initialization overhead;   00227001
167                                                                         00228001
```

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 SC     SOURCE STATEMENT

167             'COMMENT' Case 02;                                              00229001
167        case := case + 1;                                                    00230001
168        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                                 00231001
168             'BEGIN'                                                         00232001
168                  x := 1.0; x := 1.0; x := 1.0; x := 1.0; x := 1.0;          00233001
173                  x := 1.0; x := 1.0; x := 1.0; x := 1.0; x := 1.0;          00234001
178             'END';                                                          00235001
179        #TT[case] := CPUTIM;                                                 00236001
180                                                                             00237001
180        case := case + 1;                                                    00238001
181             'COMMENT' Case 03;                                              00239001
181        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                                 00240001
181             'BEGIN'                                                         00241001
181                  x := 1; x := 1; x := 1; x := 1; x := 1;                    00242001
186                  x := 1; x := 1; x := 1; x := 1; x := 1;                    00243001
191             'END';                                                          00244001
192        #TT[case] := CPUTIM;                                                 00245001
193                                                                             00246001
193        case := case + 1;                                                    00247001
194             'COMMENT' Case 04;                                              00248001
194        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                                 00249001
194             'BEGIN'                                                         00250001
194                  x := y; x := y; x := y; x := y;                            00251001
198                  x := y; x := y; x := y; x := y;                            00252001
202                  x := y; x := y; x := y; x := y;                            00253001
206                  x := y;                                                    00254001
207             'END';                                                          00255001
208        #TT[case] := CPUTIM;                                                 00256001
209                                                                             00257001
209        case := case + 1;                                                    00258001
210             'COMMENT' Case 05;                                              00259001
210        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                                 00260001
210             'BEGIN'                                                         00261001
210                  x := y + z; x := y + z; x := y + z; x := y + z;            00262001
214                  x := y + z; x := y + z; x := y + z; x := y + z;            00263001
218                  x := y + z; x := y + z;                                    00264001
220             'END';                                                          00265001
221        #TT[case] := CPUTIM;                                                 00266001
222                                                                             00267001
222        case := case + 1;                                                    00268001
223             'COMMENT' Case 06;                                              00269001
223        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                                 00270001
223             'BEGIN'                                                         00271001
223                  x := y * z; x := y * z; x := y * z; x := y * z;            00272001
227                  x := y * z; x := y * z; x := y * z; x := y * z;            00273001
231                  x := y * z; x := y * z;                                    00274001
233             'END';                                                          00275001
234        #TT[case] := CPUTIM;                                                 00276001
235                                                                             00277001
235        case := case + 1;                                                    00278001
236             'COMMENT' Case 07;                                              00279001
236        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                                 00280001
236             'BEGIN'                                                         00281001
236                  x := y/z; x := y/z; x := y/z; x := y/z;                    00282001
```

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 SC     SOURCE STATEMENT

240                 x := y/z; x := y/z; x := y/z; x := y/z;                  00283001
244                 x := y/z; x := y/z;                                      00284001
246            'END';                                                        00285001
247       #TT[case] := CPUTIM;                                               00286001
248                                                                          00287001
248       case := case + 1;                                                  00288001
249            'COMMENT' Case 08;                                            00289001
249       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00290001
249            'BEGIN'                                                       00291001
249                 k := 1; k := 1; k := 1; k := 1;                          00292001
253                 k := 1; k := 1; k := 1; k := 1;                          00293001
257                 k := 1; k := 1;                                          00294001
259            'END';                                                        00295001
260       #TT[case] := CPUTIM;                                               00296001
261                                                                          00297001
261       case := case + 1;                                                  00298001
262            'COMMENT' Case 09;                                            00299001
262       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00300001
262            'BEGIN'                                                       00301001
262                 k := 1.0; k := 1.0; k := 1.0; k := 1.0;                  00302001
266                 k := 1.0; k := 1.0; k := 1.0; k := 1.0;                  00303001
270                 k := 1.0; k := 1.0;                                      00304001
272            'END';                                                        00305001
273       #TT[case] := CPUTIM;                                               00306001
274                                                                          00307001
274       case := case + 1;                                                  00308001
275            'COMMENT' Case 10;                                            00309001
275       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00310001
275            'BEGIN'                                                       00311001
275                 k := l + m; k := l + m;                                  00312001
277                 k := l + m; k := l + m;                                  00313001
279                 k := l + m; k := l + m;                                  00314001
281                 k := l + m; k := l + m;                                  00315001
283                 k := l + m; k := l + m;                                  00316001
285            'END';                                                        00317001
286       #TT[case] := CPUTIM;                                               00318001
287                                                                          00319001
287       case := case + 1;                                                  00320001
288            'COMMENT' Case 11;                                            00321001
288       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00322001
288            'BEGIN'                                                       00323001
288                 k := l * m; k := l * m; k := l * m;                      00324001
291                 k := l * m; k := l * m; k := l * m;                      00325001
294                 k := l * m; k := l * m; k := l * m;                      00326001
297                 k := l * m;                                              00327001
298            'END';                                                        00328001
299       #TT[case] := CPUTIM;                                               00329001
300                                                                          00330001
300       case := case + 1;                                                  00331001
301            'COMMENT' Case 12;                                            00332001
301       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00333001
301            'BEGIN'                                                       00334001
301                 k := l / m; k := l / m; k := l / m;                      00335001
304                 k := l / m; k := l / m; k := l / m;                      00336001
```

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 SC     SOURCE STATEMENT

307                 k := l / m; k := l / m; k := l / m;                    00337001
310                 k := l / m;                                            00338001
311            'END';                                                      00339001
312       #TT[case] := CPUTIM;                                             00340001
313                                                                        00341001
313       case := case + 1;                                                00342001
314            'COMMENT' Case 13;                                          00343001
314       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                             00344001
314            'BEGIN'                                                     00345001
314                 k := l; k := l; k := l;                                00346001
317                 k := l; k := l; k := l;                                00347001
320                 k := l; k := l; k := l;                                00348001
323                 k := l; k := l; k := l;                                00349001
326                 k := l;                                                00350001
327            'END';                                                      00351001
328       #TT[case] := CPUTIM;                                             00352001
329                                                                        00353001
329       case := case + 1;                                                00354001
330            'COMMENT' Case 14;                                          00355001
330       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                             00356001
330            'BEGIN'                                                     00357001
330                 x := l; x := l; x := l; x := l;                        00358001
334                 x := l; x := l; x := l; x := l;                        00359001
338                 x := l; x := l;                                        00360001
340            'END';                                                      00361001
341       #TT[case] := CPUTIM;                                             00362001
342                                                                        00363001
342       case := case + 1;                                                00364001
343            'COMMENT' Case 15;                                          00365001
343       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                             00366001
343            'BEGIN'                                                     00367001
343                 l := y; l := y; l := y;                                00368001
346                 l := y; l := y; l := y;                                00369001
349                 l := y; l := y; l := y;                                00370001
352                 l := y;                                                00371001
353            'END';                                                      00372001
354       #TT[case] := CPUTIM;                                             00373001
355                                                                        00374001
355       case := case + 1;                                                00375001
356            'COMMENT' Case 16;                                          00376001
356       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                             00377001
356            'BEGIN'                                                     00378001
356                 x := y ** 2; x := y ** 2;                              00379001
358                 x := y ** 2; x := y ** 2;                              00380001
360                 x := y ** 2; x := y ** 2;                              00381001
362                 x := y ** 2; x := y ** 2;                              00382001
364                 x := y ** 2; x := y ** 2;                              00383001
366            'END';                                                      00384001
367       #TT[case] := CPUTIM;                                             00385001
368                                                                        00386001
368       case := case + 1;                                                00387001
369            'COMMENT' Case 17;                                          00388001
369       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                             00389001
369            'BEGIN'                                                     00390001
```

```
 SC     SOURCE STATEMENT

369                 x := y ** 3; x := y ** 3;                                00391001
371                 x := y ** 3; x := y ** 3;                                00392001
373                 x := y ** 3; x := y ** 3;                                00393001
375                 x := y ** 3; x := y ** 3;                                00394001
377                 x := y ** 3; x := y ** 3;                                00395001
379            'END';                                                        00396001
380       #TT[case] := CPUTIM;                                               00397001
381                                                                          00398001
381       case := case + 1;                                                  00399001
382            'COMMENT' Case 18;                                            00400001
382       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00401001
382            'BEGIN'                                                       00402001
382                 x := y ** z;       x := y ** z;                          00403001
384                 x := y ** z;       x := y ** z;                          00404001
386                 x := y ** z;       x := y ** z;                          00405001
388                 x := y ** z;       x := y ** z;                          00406001
390                 x := y ** z;       x := y ** z;                          00407001
392            'END';                                                        00408001
393       #TT[case] := CPUTIM;                                               00409001
394                                                                          00410001
394       case := case + 1;                                                  00411001
395            'COMMENT' Case 19;                                            00412001
395       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00413001
395            'BEGIN'                                                       00414001
395                 e1[1] := 1; e1[1] := 1; e1[1] := 1;                      00415001
398                 e1[1] := 1; e1[1] := 1; e1[1] := 1;                      00416001
401                 e1[1] := 1; e1[1] := 1; e1[1] := 1;                      00417001
404                 e1[1] := 1;                                              00418001
405            'END';                                                        00419001
406       #TT[case] := CPUTIM;                                               00420001
407                                                                          00421001
407       case := case + 1;                                                  00422001
408            'COMMENT' Case 20;                                            00423001
408       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00424001
408            'BEGIN'                                                       00425001
408                 e2[1,1]:= 1; e2[1,1]:= 1; e2[1,1]:= 1;                   00426001
411                 e2[1,1]:= 1; e2[1,1]:= 1; e2[1,1]:= 1;                   00427001
414                 e2[1,1]:= 1; e2[1,1]:= 1; e2[1,1]:= 1;                   00428001
417                 e2[1,1]:= 1; e2[1,1]:= 1;                                00429001
419            'END';                                                        00430001
420       #TT[case] := CPUTIM;                                               00431001
421                                                                          00432001
421       case := case + 1;                                                  00433001
422            'COMMENT' Case 21;                                            00434001
422       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00435001
422            'BEGIN'                                                       00436001
422                 e3[1,1,1]:= 1; e3[1,1,1] := 1;                           00437001
424                 e3[1,1,1]:= 1; e3[1,1,1] := 1;                           00438001
426                 e3[1,1,1]:= 1; e3[1,1,1] := 1;                           00439001
428                 e3[1,1,1]:= 1; e3[1,1,1] := 1;                           00440001
430                 e3[1,1,1]:= 1; e3[1,1,1] := 1;                           00441001
432            'END';                                                        00442001
433       #TT[case] := CPUTIM;                                               00443001
434                                                                          00444001
```

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              SC     SOURCE STATEMENT

             434        case := case + 1;                                          00445001
             435             'COMMENT' Case 22;                                    00446001
             435        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                       00447001
             435             'BEGIN'                                               00448001
             435                  l := e1[1]; l := e1[1]; l := e1[1];              00449001
             438                  l := e1[1]; l := e1[1]; l := e1[1];              00450001
             441                  l := e1[1]; l := e1[1]; l := e1[1];              00451001
             444                  l := e1[1];                                      00452001
             445             'END';                                                00453001
             446        #TT[case] := CPUTIM;                                       00454001
             447                                                                   00455001
             447        case := case + 1;                                          00456001
             448             'COMMENT' Case 23;                                    00457001
             448        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                       00458001
             448             'BEGIN'                                               00459001
             448                  'BEGIN'                                          00460001
             448                       'REAL' a;                                   00461001
             449                  'END';                                           00462001
             450                  'BEGIN'                                          00463001
             450                       'REAL' a;                                   00464001
             451                  'END';                                           00465001
             452                  'BEGIN'                                          00466001
             452                       'REAL' a;                                   00467001
             453                  'END';                                           00468001
             454                  'BEGIN'                                          00469001
             454                       'REAL' a;                                   00470001
             455                  'END';                                           00471001
             456                  'BEGIN'                                          00472001
             456                       'REAL' a;                                   00473001
             457                  'END';                                           00474001
             458             'END';                                                00475001
             459        #TT[case] := CPUTIM;                                       00476001
             460                                                                   00477001
             460        case := case + 1;                                          00478001
             461             'COMMENT' Case 24;                                    00479001
             461        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                       00480001
             461             'BEGIN'                                               00481001
             461                  'BEGIN'                                          00482001
             461                       'ARRAY' a[1:1];                             00483001
             462                  'END';                                           00484001
             463             'END';                                                00485001
             464        #TT[case] := CPUTIM;                                       00486001
             465                                                                   00487001
             465        case := case + 1;                                          00488001
             466             'COMMENT' Case 25;                                    00489001
             466        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                       00490001
             466             'BEGIN'                                               00491001
             466                  'BEGIN'                                          00492001
             466                       'ARRAY' a[1:500];                           00493001
             467                  'END';                                           00494001
             468             'END';                                                00495001
             469        #TT[case] := CPUTIM;                                       00496001
             470                                                                   00497001
             470        case := case + 1;                                          00498001
```

```
              SC     SOURCE STATEMENT

              471            'COMMENT' Case 26;                                    00499001
              471       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                       00500001
              471            'BEGIN'                                               00501001
              471                 'BEGIN'                                          00502001
              471                      'ARRAY' a[1:1,1:1];                         00503001
              472                 'END';                                           00504001
              473            'END';                                                00505001
              474       #TT[case] := CPUTIM;                                       00506001
              475                                                                  00507001
              475       case := case + 1;                                          00508001
              476            'COMMENT' Case 27;                                    00509001
              476       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                       00510001
              476            'BEGIN'                                               00511001
              476                 'BEGIN'                                          00512001
              476                      'ARRAY' a[1:1,1:1,1:1];                     00513001
              477                 'END';                                           00514001
              478            'END';                                                00515001
              479       #TT[case] := CPUTIM;                                       00516001
              480                                                                  00517001
              480       case := case + 1;                                          00518001
              481            'COMMENT' Case 28;                                    00519001
              481       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                       00520001
              481            'BEGIN'                                               00521001
              481                 'GOTO' l0;                                       00522001
              482                 l0: ;                                            00523001
              483                 'GOTO' l1;                                       00524001
              484                 l1: ;                                            00525001
              485                 'GOTO' l2;                                       00526001
              486                 l2: ;                                            00527001
              487                 'GOTO' l3;                                       00528001
              488                 l3: ;                                            00529001
              489                 'GOTO' l4;                                       00530001
              490                 l4: ;                                            00531001
              491                 'GOTO' l5;                                       00532001
              492                 l5: ;                                            00533001
              493                 'GOTO' l6;                                       00534001
              494                 l6: ;                                            00535001
              495                 'GOTO' l7;                                       00536001
              496                 l7: ;                                            00537001
              497                 'GOTO' l8;                                       00538001
              498                 l8: ;                                            00539001
              499                 'GOTO' l9;                                       00540001
              500                 l9: ;                                            00541001
              501                 p0;                                              00542001
              502            'END';                                                00543001
              503       #TT[case] := CPUTIM;                                       00544001
              504                                                                  00545001
              504       case := case + 1;                                          00546001
              505            'COMMENT' Case 29;                                    00547001
              505       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                       00548001
              505            'BEGIN'                                               00549001
              505                 'BEGIN'                                          00550001
              505                      'SWITCH' s := q; 'GOTO' s[1];               00551001
              507                      q:  ;                                       00552001
```

```
 SC     SOURCE STATEMENT

508                 'END';                                                  00553001
509            'END';                                                       00554001
510        #TT[case] := CPUTIM;                                             00555001
511                                                                         00556001
511        case := case + 1;                                                00557001
512             'COMMENT' Case 30;                                          00558001
512        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                             00559001
512             'BEGIN'                                                     00560001
512                 x := sin(y);                                            00561001
513                 x := sin(y);                                            00562001
514                 x := sin(y);                                            00563001
515                 x := sin(y);                                            00564001
516                 x := sin(y);                                            00565001
517                 x := sin(y);                                            00566001
518                 x := sin(y);                                            00567001
519                 x := sin(y);                                            00568001
520                 x := sin(y);                                            00569001
521                 x := sin(y);                                            00570001
522             'END';                                                      00571001
523        #TT[case] := CPUTIM;                                             00572001
524                                                                         00573001
524        case := case + 1;                                                00574001
525             'COMMENT' Case 31;                                          00575001
525        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                             00576001
525             'BEGIN'                                                     00577001
525                 x := cos(y);                                            00578001
526                 x := cos(y);                                            00579001
527                 x := cos(y);                                            00580001
528                 x := cos(y);                                            00581001
529                 x := cos(y);                                            00582001
530                 x := cos(y);                                            00583001
531                 x := cos(y);                                            00584001
532                 x := cos(y);                                            00585001
533                 x := cos(y);                                            00586001
534                 x := cos(y);                                            00587001
535             'END';                                                      00588001
536        #TT[case] := CPUTIM;                                             00589001
537                                                                         00590001
537        case := case + 1;                                                00591001
538             'COMMENT' Case 32;                                          00592001
538        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                             00593001
538             'BEGIN'                                                     00594001
538                 x := abs(y); x := abs(y); x := abs(y);                  00595001
541                 x := abs(y); x := abs(y); x := abs(y);                  00596001
544                 x := abs(y); x := abs(y); x := abs(y);                  00597001
547                 x := abs(y);                                            00598001
548             'END';                                                      00599001
549        #TT[case] := CPUTIM;                                             00600001
550                                                                         00601001
550        case := case + 1;                                                00602001
551             'COMMENT' Case 33;                                          00603001
551        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                             00604001
551             'BEGIN'                                                     00605001
551                 x := exp(y);                                            00606001
```

```
 SC     SOURCE STATEMENT

552                 x := exp(y);                                    00607001
553                 x := exp(y);                                    00608001
554                 x := exp(y);                                    00609001
555                 x := exp(y);                                    00610001
556                 x := exp(y);                                    00611001
557                 x := exp(y);                                    00612001
558                 x := exp(y);                                    00613001
559                 x := exp(y);                                    00614001
560                 x := exp(y);                                    00615001
561            'END';                                               00616001
562       #TT[case] := CPUTIM;                                      00617001
563                                                                 00618001
563       case := case + 1;                                         00619001
564            'COMMENT' Case 34;                                   00620001
564       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                      00621001
564            'BEGIN'                                              00622001
564                 x := ln(y);                                     00623001
565                 x := ln(y);                                     00624001
566                 x := ln(y);                                     00625001
567                 x := ln(y);                                     00626001
568                 x := ln(y);                                     00627001
569                 x := ln(y);                                     00628001
570                 x := ln(y);                                     00629001
571                 x := ln(y);                                     00630001
572                 x := ln(y);                                     00631001
573                 x := ln(y);                                     00632001
574            'END';                                               00633001
575       #TT[case] := CPUTIM;                                      00634001
576                                                                 00635001
576       case := case + 1;                                         00636001
577            'COMMENT' Case 35;                                   00637001
577       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                      00638001
577            'BEGIN'                                              00639001
577                 x := sqrt(y);                                   00640001
578                 x := sqrt(y);                                   00641001
579                 x := sqrt(y);                                   00642001
580                 x := sqrt(y);                                   00643001
581                 x := sqrt(y);                                   00644001
582                 x := sqrt(y);                                   00645001
583                 x := sqrt(y);                                   00646001
584                 x := sqrt(y);                                   00647001
585                 x := sqrt(y);                                   00648001
586                 x := sqrt(y);                                   00649001
587            'END';                                               00650001
588       #TT[case] := CPUTIM;                                      00651001
589                                                                 00652001
589       case := case + 1;                                         00653001
590            'COMMENT' Case 36;                                   00654001
590       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                      00655001
590            'BEGIN'                                              00656001
590                 x := arctan(y);                                 00657001
591                 x := arctan(y);                                 00658001
592                 x := arctan(y);                                 00659001
593                 x := arctan(y);                                 00660001
```

```
 SC     SOURCE STATEMENT

 594                 x := arctan(y);                                          00661001
 595                 x := arctan(y);                                          00662001
 596                 x := arctan(y);                                          00663001
 597                 x := arctan(y);                                          00664001
 598                 x := arctan(y);                                          00665001
 599                 x := arctan(y);                                          00666001
 600            'END';                                                        00667001
 601       #TT[case] := CPUTIM;                                               00668001
 602                                                                          00669001
 602       case := case + 1;                                                  00670001
 603            'COMMENT' Case 37;                                            00671001
 603       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00672001
 603            'BEGIN'                                                       00673001
 603                 x := sign(y); x := sign(y); x := sign(y);                00674001
 606                 x := sign(y); x := sign(y); x := sign(y);                00675001
 609                 x := sign(y); x := sign(y); x := sign(y);                00676001
 612                 x := sign(y);                                            00677001
 613            'END';                                                        00678001
 614       #TT[case] := CPUTIM;                                               00679001
 615                                                                          00680001
 615       case := case + 1;                                                  00681001
 616            'COMMENT' Case 38;                                            00682001
 616       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00683001
 616            'BEGIN'                                                       00684001
 616                 x := entier(y); x := entier(y);                          00685001
 618                 x := entier(y); x := entier(y);                          00686001
 620                 x := entier(y); x := entier(y);                          00687001
 622                 x := entier(y); x := entier(y);                          00688001
 624                 x := entier(y); x := entier(y);                          00689001
 626            'END';                                                        00690001
 627       #TT[case] := CPUTIM;                                               00691001
 628                                                                          00692001
 628       case := case + 1;                                                  00693001
 629            'COMMENT' Case 39;                                            00694001
 629       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00695001
 629            'BEGIN'                                                       00696001
 629                 p0;                                                      00697001
 630                 p0;                                                      00698001
 631                 p0;                                                      00699001
 632                 p0;                                                      00700001
 633                 p0;                                                      00701001
 634                 p0;                                                      00702001
 635                 p0;                                                      00703001
 636                 p0;                                                      00704001
 637                 p0;                                                      00705001
 638                 p0;                                                      00706001
 639            'END';                                                        00707001
 640       #TT[case] := CPUTIM;                                               00708001
 641                                                                          00709001
 641       case := case + 1;                                                  00710001
 642            'COMMENT' Case 40;                                            00711001
 642       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                               00712001
 642            'BEGIN'                                                       00713001
 642                 p1(x);                                                   00714001
```

```
SC     SOURCE STATEMENT

643                 p1(x);                                          00715001
644                 p1(x);                                          00716001
645                 p1(x);                                          00717001
646                 p1(x);                                          00718001
647                 p1(x);                                          00719001
648                 p1(x);                                          00720001
649                 p1(x);                                          00721001
650                 p1(x);                                          00722001
651                 p1(x);                                          00723001
652            'END';                                               00724001
653       #TT[case] := CPUTIM;                                      00725001
654                                                                 00726001
654       case := case + 1;                                         00727001
655            'COMMENT' Case 41;                                   00728001
655       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                      00729001
655            'BEGIN'                                              00730001
655                 p2(x,y);                                        00731001
656                 p2(x,y);                                        00732001
657                 p2(x,y);                                        00733001
658                 p2(x,y);                                        00734001
659                 p2(x,y);                                        00735001
660                 p2(x,y);                                        00736001
661                 p2(x,y);                                        00737001
662                 p2(x,y);                                        00738001
663                 p2(x,y);                                        00739001
664                 p2(x,y);                                        00740001
665            'END';                                               00741001
666       #TT[case] := CPUTIM;                                      00742001
667                                                                 00743001
667       case := case + 1;                                         00744001
668            'COMMENT' Case 42;                                   00745001
668       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                      00746001
668            'BEGIN'                                              00747001
668                p3(x,y,z);                                       00748001
669                p3(x,y,z);                                       00749001
670                p3(x,y,z);                                       00750001
671                p3(x,y,z);                                       00751001
672                p3(x,y,z);                                       00752001
673                p3(x,y,z);                                       00753001
674                p3(x,y,z);                                       00754001
675                p3(x,y,z);                                       00755001
676                p3(x,y,z);                                       00756001
677                p3(x,y,z);                                       00757001
678            'END';                                               00758001
679       #TT[case] := CPUTIM;                                      00759001
680                                                                 00760001
680       case := case + 1;                                         00761001
681            'COMMENT' Case 43;                                   00762001
681       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                      00763001
681            ;                                                    00764001
682       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                      00765001
682            ;                                                    00766001
683       'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                      00767001
683            ;                                                    00768001
```

```
 SC     SOURCE STATEMENT

684        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                    00769001
684             ;                                                  00770001
685        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                    00771001
685             ;                                                  00772001
686        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                    00773001
686             ;                                                  00774001
687        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                    00775001
687             ;                                                  00776001
688        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                    00777001
688             ;                                                  00778001
689        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                    00779001
689             ;                                                  00780001
690        'FOR' i := 1 'STEP' 1 'UNTIL' n 'DO'                    00781001
690             ;                                                  00782001
691        #TT[case] := CPUTIM;                                    00783001
692                                                                00784001
692        printt;                                                 00785001
693                                                                00786001
693        'END';                                                  00787001
```

```
                                        IDENTIFIER TABLE                                                    PAGE  16
        PBN SC    PBN      NAME   TYPE  DM DSP       NAME   TYPE  DM DSP       NAME   TYPE  DM DSP
                  SURR                  PR LN                     PR LN                     PR LN

        001 00000 000      CASE   I        03C       CPUTIM I P C 00 084       E1     I A   01 040
                           E2     I A   02 058       E3     I A   03 074       I      I        024
                           J      I        028       K      I        030       L      I        034
                           L0      L       088       L1      L       08C       L2      L       090
                           L3      L       094       L4      L       098       L5      L       09C
                           L6      L       0A0       L7      L       0A4       L8      L       0A8
                           L9      L       0AC       M      I        038       N      I        02C
                           P0       P   00 070       P1       P   01 074       P2       P   02 078
                           P3       P   03 07C       PRINTT   P   00 080       X      R        018
                           Y      R        01C       Z      R        020       #TT    I A   01 094

        002 00003 001

        003 00005 001      X      R  V     018

        004 00009 001      X      R  V     018       Y      R  V     020

        005 00013 001      X      R  V     018       Y      R  V     020       Z      R  V     028

        006 00018 001      I      I        018       LOOP   R        024       MIX    R        020
                           X      R        01C

        007 00152 001      CPUTIM I P C 00 084

        008 00448 001      A      R        018

        009 00450 001      A      R        018

        010 00452 001      A      R        018

        011 00454 001      A      R        018

        012 00456 001      A      R        018

        013 00461 001      A      R A   01 018

        014 00466 001      A      R A   01 018

        015 00471 001      A      R A   02 018

        016 00476 001      A      R A   03 018

        017 00505 001      Q       L       0B4       S       S    01 0B0
```

```
                                    STORAGE REQUIREMENTS (DECIMAL)                                          PAGE  17


        OBJECT MODULE SIZE 29752 BYTES
        DATA STORAGE AREA SIZES
        PBN   BYTES       PBN   BYTES       PBN   BYTES       PBN   BYTES       PBN   BYTES
        001     348       002     24        003     32        004     40        005     48
        006      92       007     32        008     28        009     28        010     28
        011      28       012     28        013     56        014     56        015     64
        016      72       017     24
```

```
F64-LEVEL LINKAGE EDITOR OPTIONS SPECIFIED XREF,LIST,LET
        DEFAULT OPTION(S) USED -  SIZE=(1015808,516096)

                                        CROSS REFERENCE TABLE

 CONTROL SECTION                    ENTRY

   NAME    ORIGIN  LENGTH             NAME   LOCATION     NAME   LOCATION     NAME   LOCATION     NAME   LOCATION
 PROGRAM       00    7438
                                    IHIDSTAB    71E8    IHIENTIF    742C
 IHIFRIXP*   7438      A0
                                    IHIFRI      7438
 IHIOINTE*   74D8     1F8
                                    IHIOINAR    74D8    IHIOINTG    7518
 IHIOSTRG*   76D0     148
 IHISATAN*   7818      E0
                                    IHISAT      7818
 IHISEXPT*   78F8     138
                                    IHISEX      78F8
```

```
  IHISLOGM*   7A30      E8
                                  IHISLO      7A30
  IHISSCSN*   7B18     140
                                  IHISSCC     7B18    IHISSCS     7B52
  IHISSQRT*   7C58      C8
                                  IHISSQ      7C58
  IHISYSCT*   7D20     780
  IHIFRRXP*   84A0      F8
                                  IHIFRR      84A0
  IHIFSARA*   8598     E70
                                  IHIFSAIN    9394
  IHIFSARB*   9408     690
  IHIIORTN*   9A98     D70
                                  IHIIOROQ    9A98    IHIIOROP    9B7E    IHIIORNX    9F4C    IHIIORCL    A194
                                  IHIIORCP    A33E    IHIIORGP    A440    IHIIORCN    A444    IHIIOREN    A4A4
                                  IHIIOREV    A522    IHIIORED    A5B8    IHIIORCI    A690    IHIIORER    A714
  IHIERROR*   A808     6E8
  IHIERMSG*   AEF0     9B8
                                  IHIERM01    AFA0


  LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION            LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION
     6D88           IHISYSCT        IHISYSCT                  6D8C           IHISSQ          IHISSQRT
     6D90           IHISSCS         IHISSCSN                  6D94           IHISSCC         IHISSCSN
     6D98           IHISAT          IHISATAN                  6D9C           IHISLO          IHISLOGM
     6DA0           IHISEX          IHISEXPT                  6DC8           IHIOINTG        IHIOINTE
     6DDC           IHIOSTRG        IHIOSTRG                  6DEC           IHIFRI          IHIFRIXP
     6DF0           IHIFRR          IHIFRRXP                  8590           IHISEX          IHISEXPT
     858C           IHISLO          IHISLOGM                  93DC           IHIFSARB        IHIFSARB
     8830           IHIERROR        IHIERROR                  9390           IHIIORER        IHIIORTN
     93F0           IHIIORCP        IHIIORTN                  8844           IHIIORCP        IHIIORTN
     938C           IHIIORGP        IHIIORTN                  9388           IHIIOREN        IHIIORTN
     9384           IHIIOROQ        IHIIORTN                  9378           IHIIOREV        IHIIORTN
     9370           IHIIORCI        IHIIORTN                  93F8           IHIIORNX        IHIIORTN
     937C           IHIIORNX        IHIIORTN                  8849           IHIIORNX        IHIIORTN
     93FC           IHIIORCL        IHIIORTN                  9374           IHIIORCL        IHIIORTN
     93F4           IHIIOROP        IHIIORTN                  9380           IHIIOROP        IHIIORTN
     8840           IHIIOROP        IHIIORTN                  93EC           IHIENTIF        PROGRAM
     8644           IHIDSTAB        PROGRAM                   940D           IHIFSARA        IHIFSARA
     AED8           IHIERM01        IHIERMSG                  AED4           IHIERMSG        IHIERMSG

 ENTRY ADDRESS     9394

 TOTAL LENGTH      B8A8
****GO        DOES NOT EXIST BUT HAS BEEN ADDED TO DATA SET
AUTHORIZATION CODE IS         0.
```

```
CPU                                     EXTERNAL SYMBOL DICTIONARY                                      PAGE    1

SYMBOL   TYPE  ID   ADDR  LENGTH LDID                                                          ASM 0201 13.38 08/17/12

CPUTIM    SD  0001 000000 0000AC
```

```
CPU      CPUTIM - ALGOL F FUNCTION TO RETURN ACCUMULATED STEP CPU TIME                                  PAGE    2

  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                          ASM 0201 13.38 08/17/12

                                    2 *                                                                    00795001
                                    3 *        FUNCTION -                                                  00796001
                                    4 *        RETURN THE ACCUMULATED STEP CPU TIME IN MICROSECONDS WHEN    00797001
                                    5 *        CALLED AS AN ALGOL F FUNCTION DECLARED AS -                 00798001
                                    6 *        'INTEGER' 'PROCEDURE' CPUTIM; 'CODE';                       00799001
                                    7 *        THIS ALGOL F FUNCTION IS DESIGNED TO OPERATE IN THE         00800001
                                    8 *        MVS 3.8 ENVIRONMENT                                         00801001
                                    9 *                                                                    00802001
                                   10 *        ENVIRONMENT -                                               00803001
                                   11 *        SEE OS/360 ALGOL F PROGRAMMERS GUIDE GC33-4000 FOR A        00804001
                                   12 *        DESCRIPTION OF THE INVOKING ENVIRONMENT                     00805001
                                   13 *                                                                    00806001
                                   14 *        STATUS -                                                    00807001
                                   15 *        THIS FUNCTION IS SERIALLY REUSEABLE BUT NOT                 00808001
                                   16 *        RECURSIVE OR REENTRANT                                      00809001
                                   17 *                                                                    00810001
000000                             18 CPUTIM   CSECT                                                      00811001
                                   19 *                                                                    00812001
                                   20 *        FSA OFFSETS                                                 00813001
                                   21 *                                                                    00814001
                          000D4    22 CAP1     EQU   X'0D4'                                               00815001
                          000D8    23 CAP2     EQU   X'0D8'                                               00816001
                          000DC    24 PROLOGFP EQU   X'0DC'                                               00817001
                          000E4    25 RETPROG  EQU   X'0E4'                                               00818001
                          000E8    26 EPILOGP  EQU   X'0E8'                                               00819001
                          000F4    27 CSWE1    EQU   X'0F4'                                               00820001
                          00118    28 VALUCALL EQU   X'118'                                               00821001
                                   29 *                                                                    00822001
                          00000    30          USING PBTAB,R11                                            00823001
                                   31 *                                                                    00824001
                                   32 *        PROGRAM BLOCK TABLE                                         00825001
                                   33 *                                                                    00826001
000000 00000000                    34 PBTAB    DC    A(0)                                                 00827001
000004 C3D7E4E3                    35          DC    CL4'CPUT'           NAME                             00828001
000008 00000000                    36          DC    A(0)                                                 00829001
00000C 0020                        37          DC    H'32'               L'DSA FOR TYPED PROCEDURE (FUNCTION) 00830001
00000E 08                          38          DC    X'08'               TYPE PROCEDURE INTEGER           00831001
00000F 00                          39          DC    AL1(0)              NUMBER OF FORMAL PARAMETERS      00832001
                                   40 *                                                                    00833001
                                   41 *        ENTRY BLOCK                                                 00834001
                                   42 *                                                                    00835001
000010 00000000                    43 CPUENT   DC    A(PBTAB)                                             00836001
000014 00000000                    44          DC    A(0)                                                 00837001
000018 0000001C                    45          DC    A(CPUCODE)                                           00838001
                                   46 *                                                                    00839001
                                   47 *        ESTABLISH ADDRESSABILITY TO THE PSA, ASCB                   00840001
                                   48 *                                                                    00841001
                          00000    49          USING PSA,R0                                               00842001
                          00000    50          USING ASCB,R4                                              00843001
                                   51 *                                                                    00844001
00001C 47F0 B036      00036        52 CPUCODE  B     CPUCODEA                                             00845001
                                   53 *                                                                    00846001
000020 15                          54          DC    AL1(L'ID)                                            00847001
                                   55 ID       DC    C'CPUTIM &SYSDATE &SYSTIME'                          00848001
000021 C3D7E4E3C9D440F0            56+ID       DC    C'CPUTIM 08/17/12 13.38'                             00848001
```

```
  LOC  OBJECT CODE    ADDR1 ADDR2  STMT   SOURCE STATEMENT                                      ASM 0201 13.38 08/17/12

                                     57 *                                                                    00849001
000036 90EA B070      00070          58 CPUCODEA STM   R14,R10,SAVEAREA+12                                     00850001
00003A 5840 0224      00224          59          L     R4,PSAAOLD          R4 -> CURRENT ASCB               00851001
00003E 9823 4040      00040          60          LM    R2,R3,ASCBEJST      ACCUM STEP TCB CPU TIME          00852001
000042 5E30 40CC      000CC          61          AL    R3,ASCBSRBT+4       ADD ACCUM SRB CPU TIME           00853001
000046 47C0 B04E      0004E          62          BC    12,CPUCODEB         OVERFLOW ? NO, BRANCH            00854001
00004A 4120 2001      00001          63          LA    R2,1(,R2)           YES, ADD CARRY                   00855001
00004E 5A20 40C8      000C8          64 CPUCODEB A     R2,ASCBSRBT         TOTAL CPU TIME (TCB + SRB)       00856001
000052 8C20 000C      0000C          65          SRDL  R2,(63-51)          SHIFT TO CONVERT TO MICROSECONDS 00857001
000056 5030 A018      00018          66          ST    R3,24(,R10)         STORE RESULT IN DSA+24           00858001
00005A 98EA B070      00070          67          LM    R14,R10,SAVEAREA+12                              00859001
00005E 47F0 D0E8      000E8          68          B     EPILOGP(,R13)       RETURN VIA EPILOG CODE IN FSA    00860001
                                     69 *                                                                    00861001
000062 0000
000064 0000000000000000              70 SAVEAREA DC    18F'0'                                                00862001
                                     71 *                                                                    00863001
                                     72          PRINT NOGEN                                               00864001
                                     73 *                                                                    00865001
                                     74 *        PREFIXED SAVE AREA                                        00866001
                                     75 *                                                                    00867001
                                     76          IHAPSA                                                    00868001
                                    544 *                                                                    00869001
                                    545 *        ADDRESS SPACE CONTROL BLOCK                               00870001
                                    546 *                                                                    00871001
                                    547          IHAASCB                                                   00872001
                                    780 *                                                                    00873001
                                    781          PRINT GEN                                                 00874001
                                    782 *                                                                    00875001
                                    783 *        REGISTER EQUATES                                          00876001
                                    784 *                                                                    00877001
                                    785          IEZREGS                                                   00878001
                          00000     786+R0       EQU   0                                                   00000600
                          00001     787+R1       EQU   1                                                   00000700
                          00002     788+R2       EQU   2                                                   00000800
                          00003     789+R3       EQU   3                                                   00000900
                          00004     790+R4       EQU   4                                                   00001000
                          00005     791+R5       EQU   5                                                   00001100
                          00006     792+R6       EQU   6                                                   00001200
                          00007     793+R7       EQU   7                                                   00001300
                          00008     794+R8       EQU   8                                                   00001400
                          00009     795+R9       EQU   9                                                   00001500
                          0000A     796+R10      EQU   10                                                  00001600
                          0000B     797+R11      EQU   11                                                  00001700
                          0000C     798+R12      EQU   12                                                  00001800
                          0000D     799+R13      EQU   13                                                  00001900
                          0000E     800+R14      EQU   14                                                  00002000
                          0000F     801+R15      EQU   15                                                  00002100
                                    802 *                                                                    00879001
000010                              803          END CPUENT                                                00880001
```

```
CPU                                          RELOCATION DICTIONARY                                          PAGE    4

POS.ID   REL.ID   FLAGS   ADDRESS                                                                 ASM 0201 13.38 08/17/12

 0001     0001      0C     000010
 0001     0001      0C     000018
```

```
CPU                                          CROSS-REFERENCE                                                PAGE    5

SYMBOL    LEN   VALUE   DEFN    REFERENCES                                                        ASM 0201 13.38 08/17/12

ASCB     00001 00000000 00564  00050
ASCBEJST 00008 00000040 00619  00060
ASCBSRBT 00008 000000C8 00778  00061 00064
CPUCODE  00004 0000001C 00052  00045
CPUCODEA 00004 00000036 00058  00052
CPUCODEB 00004 0000004E 00064  00062
CPUENT   00004 00000010 00043  00803
EPILOGP  00001 000000E8 00026  00068
FLCEICOD 00002 00000086 00150  00151
FLCENPSW 00004 00000058 00129  00131
FLCEOPSW 00008 00000018 00112  00113
FLCINPSW 00004 00000078 00142  00144
FLCIOPSW 00008 00000038 00120  00121
FLCIPPSW 00008 00000000 00103  00106
FLCMNPSW 00004 00000070 00138  00141
FLCMOPSW 00008 00000030 00118  00119
FLCPICOD 00002 0000008E 00170  00171
FLCPIILC 00001 0000008D 00164  00169
FLCPNPSW 00004 00000068 00135  00137
FLCPOPSW 00008 00000028 00116  00117
FLCSNPSW 00004 00000060 00132  00134
FLCSOPSW 00008 00000020 00114  00115
FLCSVCN  00002 0000008A 00160  00161
FLCSVILC 00001 00000089 00155  00159
FLCTIMER 00004 00000050 00126  00127
ID       00021 00000021 00056  00054
PBTAB    00004 00000000 00034  00030 00043
PSA      00001 00000000 00101  00049 00313 00318
PSAAOLD  00004 00000224 00250  00059
PSAIPCDM 00001 0000026C 00319  00318
PSAIPCRM 00001 00000264 00314  00313
PSATNEW  00004 00000218 00246  00247
R0       00001 00000000 00786  00049
R10      00001 0000000A 00796  00058 00066 00067
R11      00001 0000000B 00797  00030
R13      00001 0000000D 00799  00068
R14      00001 0000000E 00800  00058 00067
R2       00001 00000002 00788  00060 00063 00063 00064 00065
R3       00001 00000003 00789  00060 00061 00066
R4       00001 00000004 00790  00050 00059
SAVEAREA 00004 00000064 00070  00058 00067
```

```
CPU                                          ASSEMBLER DIAGNOSTICS AND STATISTICS                           PAGE    6

                                                                                                ASM 0201 13.38 08/17/12

NO STATEMENTS FLAGGED IN THIS ASSEMBLY
HIGHEST SEVERITY WAS    0
OPTIONS FOR THIS ASSEMBLY
  ALIGN, ALOGIC, BUFSIZE(STD), DECK, ESD, FLAG(0), LINECOUNT(55), LIST, NOMCALL, YFLAG, WORKSIZE(2097152)
  NOMLOGIC, NONUMBER, OBJECT, NORENT, RLD, NOSTMT, NOLIBMAC, NOTERMINAL, NOTEST, XREF(SHORT)
  SYSPARM()
WORK FILE BUFFER SIZE/NUMBER =19066/ 1
TOTAL RECORDS READ FROM SYSTEM INPUT         88
TOTAL RECORDS READ FROM SYSTEM LIBRARY      762
TOTAL RECORDS PUNCHED                         7
TOTAL RECORDS PRINTED                       172
```

```
 F64-LEVEL LINKAGE EDITOR OPTIONS SPECIFIED XREF,LET,LIST,NCAL
          DEFAULT OPTION(S) USED -  SIZE=(1015808,516096)

                                              CROSS REFERENCE TABLE


  CONTROL SECTION                       ENTRY

    NAME    ORIGIN  LENGTH                NAME   LOCATION     NAME   LOCATION     NAME   LOCATION     NAME   LOCATION
  CPUTIM        00      AC


  LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION            LOCATION  REFERS TO SYMBOL  IN CONTROL SECTION

 ENTRY ADDRESS       10

 TOTAL LENGTH        B0
****CPUTIM    DOES NOT EXIST BUT HAS BEEN ADDED TO DATA SET
AUTHORIZATION CODE IS         0.
```

```
        Algol F Statement Timings
Picoseconds  Statement
        +14  x := 1.0
       +492  x := 1
       +327  x := y
       +164  x := y + z
       +164  x := y * z
       +163  x := y / z
       +164  k := 1
       +655  k := 1.0
       +164  k := l + m
       +327  k := l * m
      +1638  k := l / m
       +164  k := l
       +492  x := l
       +659  l := y
       +818  x := y ** 2
       +820  x := y ** 3
      +2625  x := y ** z
       +164  e1[1] := 1
       +328  e2[1,1] := 1
       +163  e3[1,1,1] := 1
       +328  l := e1[1]
     +13454  begin real a; end
      +5732  begin real a[1:1]; end
      +8846  begin real a[1:500]; end
      +5896  begin real a[1:1,1:1]; end
      +5898  begin real a[1:1,1:1,1:1]; end
      +3112  begin goto lab; lab: end
      +2783  begin switch s := q; goto s[1]; q: end
      +1638  x := sin(y)
      +1473  x := cos(y)
       +164  x := abs(y)
      +1309  x := exp(y)
      +1310  x := ln(y)
       +982  x := sqrt(y)
      +1475  x := arctan(y)
       +491  x := sign(y)
       +983  x := entier(y)
     +27542  p0
     +31601  p1(x)
     +33736  p2(x,y)
     +35911  p3(x,y,z)
          0  DO Loop overhead

END OF ALGOL PROGRAM EXECUTION
```