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D. J. RICHARDSON

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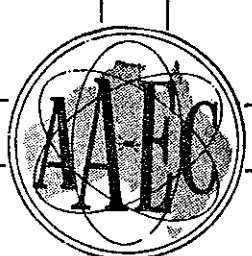

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A RELOCATABLE ASSEMBLY SYSTEM FOR THE I.B.M. 1620 COMPUTER

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ABSTRACT

The indirect addressing feature of the I.B.M. 1620 computer has been used to overcome the difficulty of cross-referencing separately assembled subroutines within a computer programme.

A relocatable assembler has been devised which permits the separate assembly and testing of such subroutines.

The concept of a "next subroutine" has been introduced, and its applications to interpretive systems such as Fortran shown.

CONTENTS

1. INTRODUCTION

One of the difficulties associated with computer programmes assembled in a fixed part of core storage is that major modifications to a programme usually necessitate a complete re–assembly with re–testing of the programme.

With relocatable assemblies, this is not so. Internal references within any one section or sub–routine are adjusted on loading, depending on the current location of the subroutine in storage. External references present a problem, since the locations of other subroutines may not be known until all loading has been completed. The indirect addressing feature available on the I.B.M. 1620 computer can be used to overcome this problem. No restriction is placed on the degree of cross–referencing allowable.

The minimum requirement is a 40K I.B.M. 1620 card computer, with indirect addressing.

2. ASSEMBLY SYSTEMS

A computer programme assembly system provides a means for translating a programmer's instruc–tions into a language directly acceptable to the computer. One such assembly system is the Symbolic Programming System (SPS) developed by I.B.M. for their 1620 computer*.

Machine language instructions are allotted mnemonics, and reference points within a programme are given labels. On assembly, the mnemonics used are replaced by the corresponding machine language instructions, and references to labels by appropriate numerical values normally determined by the assem–bler.

In addition to machine language instructions, certain special instructions called pseudo–instructions are available in mnemonic form for use with the assembler. These pseudo–instructions provide for such matters as telling the assembler where the start of a particular assembly should be located in storage, and when the end of an assembly has been reached. Pseudo–instructions are also used to reserve working areas and to specify constant data required in a programme.

Another important use for pseudo–instructions is the spectification of a group of machine language instructions by a single pseudo–instruction. Such pseudo–instructions are called macro instructions. Macro instructions simplify the linking together of subroutines within a programme.

3. DISADVANTAGES OF AN ABSOLUTE ASSEMBLER

When preparing programmes for a computer, it is usually desirable to be able to assemble and to test separately the various component sections (subroutines) of each programme. This is especially so with large programmes, and with subroutines that may be used in more than one programme. The standard SPS compiler for the 1620* does not readily permit this, for two reasons.

First, programmes are assembled into locations that are fixed once and for all at the time of assembly. It is difficult to know in advance just how much room to reserve for any given programme, especially when allowance must be made for possible corrections and modifications at a later date.

Second, apart from the ability to refer to a few "built in" subroutines such as floating addition and subtraction, no provision is made for cross–referencing subroutines not assembled together.

These difficulties may be overcome by a relocatable assembler.

4. THE RELOCATABLE ASSEMBLER

The basic property of a relocatable assembler, implied in its name, is that subroutines assembled by it may be located in varying positions of storage to fit in with other subroutines which may already be present in storage.

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* I.B.M. publication J28–4201–1 May 1960

The relocatable assembler described in this report achieves this by marking those quantities within a subroutine whose values depend on the actual position in storage of the subroutine. A separate loading programme recognizes these marks, and makes the necessary adjustments as the subroutines are read into the computer.

The cross-referencing problem is more difficult. Since the location in storage of any one of a group of subroutines is not known until that subroutine is actually loaded into storage, any reference to this subroutine cannot be satisfied until after this subroutine has started loading. This problem has been overcome as follows, using the indirect addressing feature available on the 1620.

A list of all the external references from a subroutine is made during the assembly of that particular subroutine repeated references being counted once only. Title cards are produced by the assembler, containing the name by which the subroutine will be referred to, and also the list of external references for that subroutine. Five digit locations are reserved by the assembler at the start of the subroutine for each external reference from the subroutine. Indirect addressing is used with these reference locations to link various subroutines together. As each subroutine is loaded into the computer, these title cards provide the loader with the information needed to enable it to remember these reserved locations and to fill them in with the actual positions of the various subroutines referred to as these become available.

The assembly process is fundamentally a two pass process. During the first pass, an ordered list is prepared of the reference points within a subroutine, a search is made for any external references used, and the storage requirements of the subroutine are determined. Allowance is made for the external reference requirements in front of the subroutine. Title cards, containing the first subroutine label, the subroutine size, and the external references used, are punched at the end of the first pass.

During the second pass, all symbolic addresses are "looked up" in the ordered tables produced from the first pass, and the assembled subroutine is punched onto cards. Addresses whose values relate to the position of the subroutine in storage are marked with a flagged record mark on the output cards and an asterisk on the printed listing which may be produced if desired. If there is more than one possible subroutine entry point, each additional entry point produces a special card, called a Syn card, in the output deck of cards. An overall compression of about four to one is achieved during assembly.

External references, both to and from a subroutine, are marked by adding a special character -- the dollar character -- to the end of each such reference label or symbol.

5. THE CONCEPT OF A NEXT SUBROUTINE

The concept of a "next subroutine" has been introduced. Subroutines, when loaded together into a computer, are necessarily loaded in some sequence. The "next subroutine" in any programme is then that subroutine immediately following in the loading sequence. In the same way that references within any one subroutine may be either absolute or relocatable, so external references from a subroutine may be either fixed (labelled), or relative (next subroutine).

A dollar sign by itself in an address field is used to refer to the next subroutine; reference is made to the first dollar reference point within that next subroutine, whichever subroutine that might be. A dollar sign may also be used by itself to label the first dollar reference point within any subroutine.

One application of this concept is to the development of interpretive systems such as I.B.M. Fortran. These systems use statements which are ordered, but not necessarily separately labelled. Each statement would then correspond to a subroutine, and the next such statement would correspond to the next subroutine.

6. CONCLUSIONS

A system has been developed, applicable to an I.B.M. 1620 computer, which will enable each section of a computer programme to be assembled and tested separately, the separate assemblies finally being loaded together and run as a single programme.

The concept of a "next subroutine" has been introduced, and its applications to interpretive schemes such as Fortran have been shown.

7. ACKNOWLEDGMENT

The author wishes to express his appreciation to Mr. J.P.Pollard and Mr. E.E.Jansen for many helpful discussions and for the preparation of the standard subroutines needed for use with the relocatable assembler.

APPENDIX A

SYMBOLS, LABELS, AND EXPRESSIONS

A symbol is a group of characters, used for reference purposes, conforming to one of the following.

(i) Any group of from one to six digits or letters, containing at least one letter.

(ii) An asterisk by itself.

(iii) Any group satisfying (i), with a dollar character added at the end.

(iv) Any group of from one to six digits, with a dollar character added at the end.

(v) A dollar character by itself.

A symbol satisfying one of (iii), (iv), or (v) is called a dollar symbol, dollar symbols of class (v) sometimes being called blank dollar symbols.

An asterisk symbol is used for local references within a programme.

A label is a symbol, used to mark a reference point in a programme. Any symbol of six characters or less, other than an asterisk symbol, may be used as a label.

Two attributes are associated with each symbol; a type and a value. Symbols may be either absolute or relocatable in type and may possess up to five digit integers as values. All values are taken modulo core storage size. For definiteness, the value of a relocatable symbol is taken to be the value that would be allotted to it if the subroutine containing it were to be loaded into the computer starting at location zero.

Absolute symbols are restricted to be symbols of class (i).

An expression is either

(a) a collection of integers of six digits or less and non-dollar symbols, each separated by a single character +, -, or * and possibly commencing with a + or - character, or

(b) a dollar symbol by itself.

Expressions may be absolute, relocatable, or illegal. Class (b) expressions are always relocatable. The nature of a class (a) expression may be determined by the following rule:

Consider those groups of symbols and integers within the expression joined solely by asterisks. If more than one relocatable symbol occurs in any one such group, the whole expression is illegal. If not, ignore absolute symbols and integers when neither is in a group, and also ignore those groups containing only absolute symbols and integers. Elsewhere, replace all absolute symbols by their known values, and all relocatable symbols by the value unity. Combine the resulting numbers remaining in the expression by the rules of arithmetic, a connecting asterisk denoting multiplication. If the resulting number is zero, the expression is absolute. If it is unity, the expression is relocatable. If it is any other value, the expression is illegal.

The value of an expression is not defined if it is an illegal expression, but is otherwise obtained by replacing all symbols by their known values, and combining the resultant expression by the rules of arithmetic. The result is taken modulo core storage size. A connecting asterisk denotes multiplication. The rules of formation of an expression avoid any confusion between symbol asterisks and multiplication asterisks.

APPENDIX B

PROGRAMME CARD PREPARATION

Instructions and pseudo operations are punched, one per card, in the following form.

cols. 1 – 5 Card identification, or blank

cols. 6 – 11 A reference label, or blank

cols.12 – 15 Instruction or pseudo–operation

cols. 16 – 75 Address on operand fields, separated by commas.

Cards containing an asterisk in column six may be used as comments cards. Such cards are not processed, but are included in any typed listing produced.

Each machine instruction listed in Appendix C may have associated with it up to four operands and a label. Each of the first two operands may be either absolute or relocatable. A symbol asterisk used with either of these two operands refers to the first digit position of the instruction. The third operand specifies any flag requirements. The twelve instruction digit positions are numbered from 0 to 11, these numbers then being used to specify the flag requirements. For example the combination 6711 would specify flags over positions 6, 7, and 11. The fourth operand is purely for comments, being simply reproduced on any typed listing. Operands may be omitted; but the appropriate number of commas must be inserted if later operands, such as comments, are used. Labels refer to instruction position 0.

If no flags are specified, "immediate" instructions, apart from TDM, have a flag automatically inserted over position seven of the instruction.

Pseudo–operation operands are discussed individually in Appendix D.

APPENDIX C

INSTRUCTION MNEMONICS

The following is a list of the instruction mnemonics available, together with their equivalent machine codes and interpretations.

A	21	Add
AM	11	Add Immediate
B	49	Branch
BA	46	Branch Any Latch On ‡
BB	42	Branch Back
BC1	46	Branch Console Switch One On ‡
BC2	46	Branch Console Switch Two On ‡
BC3	46	Branch Console Switch Three On ‡
BC4	46	Branch Console Switch Four On ‡
BD	43	Branch on Digit
BE	46	Branch Equal ‡
BH	46	Branch High ‡
BI	46	Branch Indicator *
BL	47	Branch Low ‡
BLC	46	Branch Last Card ‡
BN	47	Branch Negative ‡
BNA	47	Branch Any Latch Off ‡
BNC1	47	Branch Console Switch One Off ‡
BNC2	47	Branch Console Switch Two Off ‡
BNC3	47	Branch Console Switch Three Off ‡
BNC4	47	Branch Console Switch Four Off ‡
BNE	47	Branch Not Equal ‡
BNF	44	Branch No Flag
BNH	47	Branch Not High ‡
BNI	47	Branch No Indicator *
BNL	46	Branch Not Low ‡
BNLC	47	Branch Not Last Card ‡
BNN	46	Branch Not Negative ‡
BNP	47	Branch Not Positive ‡
BNR	45	Branch No Record Mark
BNV	47	Branch No Overflow ‡
BNZ	47	Branch Not Zero ‡
BP	46	Branch Positive ‡
BT	27	Branch and Transmit
BTM	17	Branch and Transmit Immediate
BV	46	Branch on Overflow ‡
BZ	46	Branch Zero ‡
C	24	Compare
CF	33	Clear Flag
CM	14	Compare Immediate
D	29	Divide
DM	19	Divide Immediate
DN	35	Dump Numerically *
DNCD	35	Dump Numerically Cards ‡
DNPT	35	Dump Numerically Paper Tape ‡
DNTY	35	Dump Numerically Typewriter ‡
H	48	Halt
K	34	Controle **
LD	28	Load Dividend
LDM	18	Load Dividend Immediate

APPENDIX C (continued)

M	23	Multiply
MF	71	Move Flag
MM	13	Multiply Immediate
NOP	41	No Operation
RA	37	Read Alphamerically *
RACD	37	Read Alphamerically Card ‡
RAPT	37	Read Alphamerically Paper Tape ‡
RATY	37	Read Alphamerically Typewriter ‡
RCTY	34	Return Carriage Typewriter **
RN	36	Read Numerically *
RNCD	36	Read Numerically Card ‡
RNPT	36	Read Numerically Paper Tape ‡
RNTY	36	Read Numerically Typewriter ‡
S	22	Subtract
SF	32	Set Flag
SM	12	Subtract Immediate
SPTY	34	Space Typewriter ‡
TBTY	34	Tabulate Typewriter ‡
TD	25	Transmit Digit
TDM	15	Transmit Digit Immediate
TF	26	Transmit Field
TFM	16	Transmit Field Immediate
TNF	73	Transfer Numerical Fill
TNS	72	Transfer Numerical Strip
TR	31	Transmit Record
WA	39	Write Alphamerically *
WACD	39	Write Alphamerically Card ‡
WAPT	39	Write Alphamerically Paper Tape ‡
WATY	39	Write Alphamerically Typewriter ‡
WN	38	Write Numerically *
WNCD	38	Write Numerically Card ‡
WNPT	38	Write Numerically Paper Tape
WNTY	38	Write Numerically Typewriter

‡ The required instruction modifiers are inserted by the assembler. If a second operand is specified, positions 8, 9, and 11 of this specification will be overwritten by the processor and the resultant operand will be taken to be an absolute expression.

* Modifiers in instruction positions 8 and 9 are required.

** Modifiers in instruction positions 8, 9, and 11 are required.

APPENDIX D

PSEUDO-OPERATIONS

The various pseudo-operations available, together with their uses, are listed below.

Those pseudo-operations used to define items of data or to reserve space for data may either specify where these data are to be located, or may leave the allocation of space for these data to the processor itself. In this latter case the data items or the space for them will follow immediately after the last field (instruction or data) allocated by the processor. A symbol asterisk used within any pseudo-operation operand always refers to the end of the last preceding field allocated by the processor. Successive operands within a pseudo-operation are separated by commas.

Labels defined by means of a pseudo-operation may in general be either absolute or relocatable; but dollar labels so defined must correspond to relocatable expressions.

Symbols occurring within any pseudo-operation operand expression must in general have been defined previously within the assembly. This restriction does not apply to DNA and DSA operands.

AST — Add Symbol Table

Absolute symbols and their values are read in from cards until a blank card is read. The symbols and their values are added to the current assembly symbol table. The symbol table cards and one blank card must either follow immediately after the AST card with the two pass assembler, or immediately after the DEND card with the one pass assembler. Symbol table card formats are given in Appendix G.

DAC — Define Alphameric Constant

Alphameric data containing up to 34 characters may be defined, each character being represented in storage as two digits. DAC cards may contain up to four operands and a label. The first operand specifies the number of characters. This operand must be an absolute expression. The characters themselves are given in the second operand. The third operand may be used to specify the location of these data, if desired, and refers to the right hand digit of the first defined character. This operand, if specified, may be either a relocatable or an absolute non-dollar expression. If this operand is left blank the processor will ensure that the alphameric data start in an even location. The fourth operand may be used for comments. If the final data character specified is @ , this will be replaced in storage by the alphameric record mark combination 0 ‡ . A flag is always placed over the left hand high order digit position in storage.

If a label is present it will be allotted the value and the type of the third operand if this is specified, otherwise it will be allotted the (relocatable) value of the right hand digit of the first data character.

DAS — Define Alphameric Storage

This pseudo-operation reserves alphameric data storage locations. DAS cards may contain up to three operands and a label. The first operand, which must be an absolute expression, specifies the number of two digit storage locations to be reserved. The second operand, if present, specifies the location of the right hand member of the first pair of storage digits. This operand may be either an absolute or a relocatable non-dollar expression. The third operand is for any comments. If the second operand is not specified, the processor will reserve sufficient storage to allow the data storage to commence in an even location. If a label is present, but no second operand is specified, the relocatable (odd) value of the right hand member of the first pair of storage digits will be allotted to the label. If a label is present and the location of the DAS is specified, the label will be allotted the value and the type of the second operand expression.

DC — Define Constant

Up to 68 digits of constant data may be defined by this pseudo-operation. A DC card may contain up to three operands and a label. The first operand specifies the number of digits to be occupied by the data field. It must be an absolute expression. The second operand contains the data. These data may consist of integers, possibly preceded by a minus sign, and possibly terminated by the character @ . An @ character by itself is also permissible.

APPENDIX D (continued)

If an @ is present, the right hand data field digit will be a record mark. If the value of the first operand exceeds the number of digits specified (including any @ character), zeros will be supplied to the left of the specified digits. A flag will be placed over the left hand zero or digit position of the data field if two or more digit positions are specified. If a minus sign is present in the second operand, a flag will be placed over the right-most numerical digit of the data field.

The third operand may be used to specify the location of the right hand digit of the data field defined by the DC card. If specified, this operand may be either an absolute or a relocatable non-dollar expression; and any label present will assume the value and type of this expression. If the third operand is blank, the data will be located by the processor, any label present then being relocatable and referring to the right hand digit of the data field.

DEND — Define End

The last card of any assembly must be a DEND card. The DEND card may also be used to indicate the starting point of a programme.

A DEND card may contain two operands, the second operand being for comments. If the first operand is blank, no starting point is indicated and no transfer set card is produced (see Appendix G). If the first operand is not blank, it must be a relocatable expression. If it is a non-dollar expression, it may refer to any reference point within the assembly containing the DEND card as a programme starting point. If it is a dollar expression, an external reference point is indicated as a programme starting point. An appropriate transfer set card is produced in either case.

DIN — Define Instruction

This pseudo-operation is used to define additional instruction mnemonics. The desired instruction mnemonic is punched in card columns 6 to 9, and a five digit integer code in card columns 16 to 20. The first two digits of this code give the required two digit machine operation code. If no instruction modifiers are required, the fourth code digit is a zero. In this case, the fifth code digit is arbitrary, the third code digit being used to specify whether or not a flag should be assembled over the seventh instruction position in the absence of a flag operand when using the defined instruction mnemonic. A flag is set if this third code digit is non-zero, the fourth code digit being zero.

If instruction modifiers are required, the fourth code digit is non-zero. The third, fourth, and fifth code digits then specify the eighth, ninth, and eleventh instruction position modifiers respectively.

DIN cards must precede cards using mnemonics defined by them. Once defined, a mnemonic may not be re-defined without re-loading the processor. Care should therefore be taken not to duplicate DIN cards when preparing multiple assemblies.

DMAC — Define Macro Instruction

This pseudo-operation is used to specify macro instructions. The desired macro instruction is punched in card columns 6 to 9. No other specification is needed.

When using a defined macro instruction in a programme up to ten operands may be specified. Each operand may be any absolute or relocatable expression. No comments are permitted, and no comma should appear after the last operand.

The linkage generated by the macro instruction

```
        LABEL  SUBR  A, B, ..... , Z      for example,

is      LABEL  BTM   SUBR $, * + 12
               DSA   * + α, A, B, ..... , Z
               DC    1, @
```

where α has the value $5(N + 1) + 2$ if N is even,
or $5(N + 1) + 3$ if N is odd, N being the number of operands present.

APPENDIX D (continued)

Appendix J illustrates the use of macro instructions.

A DMAC card must precede the use of any macro instruction. Once defined, a macro instruction remains defined while the processor is loaded. Care should therefore be taken not to duplicate DMAC cards when preparing multiple assemblies.

Up to twenty five additional instructions and macro instructions may be defined in any group of assemblies.

DNA — Define Negative Addresses

This pseudo-operation is identical to DSA, except that all addresses will have a flag inserted over the units position.

The chief uses of this pseudo-operation are to define negative constants and to specify indirect addresses.

DNB — Define Numerical Blank

Three operands and a label may be specified. The first operand gives the number of numerical blanks required and must be an absolute expression. The second operand may be used to specify the location of the right-most numerical blank. This operand if not left blank, may be either an absolute or a relocatable non-dollar expression. The third operand is for comments.

Any label will refer to the right-most numerical blank. There is no limit (apart from storage considerations) to the number of numerical blanks that may be defined by a DNB card.

DORG — Define Origin

Although a relocatable assembly does not have an absolute origin specified, it is often convenient to adjust assembly locations relative to the assembly itself. DORG cards permit this. They may have up to two operands and a label. The first operand specifies where the first digit of the next field assigned by the processor is to be located (apart from possible adjustment by the processor if this should need to be an even digit). This operand must be a relocatable, non-dollar expression, and any symbol within this expression must have been defined previously within the assembly. Any label present will take the value of this expression. The second operand may be used for comments, if desired.

DS — Define Storage

This pseudo-operation reserves storage locations for data. DS cards may contain up to three operands and a label. The first operand, which must be an absolute expression, specifies the number of storage locations to be reserved. The second operand, if present, specifies the position of the last (right-most) reserved digit location in storage. This operand, if not blank, may be either an absolute or a relocatable non-dollar expression. The third operand may be used for comments. Any label present relates to the right-most reserved digit location.

DSA — Define Symbolic Address

A DSA card may be used to define up to eleven consecutive five digit fields. Each DSA card may contain up to eleven operands and a label. Each operand is assembled as a five digit field with a flag over the left-most digit. Each operand may be any relocatable or absolute expression. Asterisk symbols used within any operand refer to the digit location immediately preceding the first five digit field. Any label present refers to the units digit of the first five digit field specified on the card.

No comma should appear after the last operand, and no comments may appear on a DSA card.

DSB — Define Symbolic Block

This pseudo-operation permits the reservation of space for blocks of data.

Each DSB card may contain up to four operands and a label. The first operand specified the number of digits in each item of data. The second operand specifies the number of such data items.

APPENDIX D (continued)

Each of the first two operands must be an absolute expression. The space reserved is equal to the product of the values of the first two operands. Any label present refers to the right hand end of the first (left-most) item of data. The third operand, if present, specifies the position to be occupied by the right hand end of the first item of data. This operand may be any non-dollar expression. The fourth operand may be used for comments, if desired.

DZE — Define Zeros

This pseudo-operation permits any number of consecutive zero digits to be defined. Three operands and a label may be specified. The first operand gives the number of consecutive zero digits required and must be an absolute expression. The second operand, if not blank, specifies the location of the right-most zero digit. Any non-dollar expression may be used. The third operand is for comments.

Any label will refer to the right-most zero digit.

No flag is assembled with this operation.

SKP — Skip

One operand only is specified. This operand gives the number of lines to be skipped by the typewriter, and must be an absolute expression. The value of this operand is taken modulo 100. SKP cards are not reproduced in a listing.

SUP — Suppress Typing

All listing is suppressed until a TYP card is reached. The SUP card is not listed.

TYP — Type

Listing is resumed after the TYP card.

WST — Write Symbol Table

All absolute symbols defined prior to the WST card are punched, together with their values, four per card. A final blank card is also punched. If no absolute symbols are present, no cards are punched, and the WST card is effectively ignored. Symbol table card formats are given in Appendix G.

APPENDIX E

USING THE RELOCATABLE ASSEMBLER

Load the relocatable assembler card deck. If a printed listing is desired, set the typewriter margins to the extreme left and extreme right positions, and set the tabulate stops to positions 51 and 66.

A succession of programme card decks may be assembled, the last card of each deck being a DEND card.

Two versions of the relocatable assembler are available; a one pass version for subroutines of up to about 500 cards, and a two pass version for longer assemblies. The one pass version stores compressed card images for use during the two assembly passes. Each version is readily adaptable to either a 40 K or a 60 K machine.

APPENDIX F

ERROR MESSAGES

Error messages are printed out, together with the contents of the card in error, whether or not a printed listing has been requested.

The following error messages may occur

TOO MANY DIGITS

INVALID FIELD LENGTH

PROGRAMME CARD ERROR

COMMA MISSING

ILLEGAL CHARACTER

ILLEGAL LABEL

OPERAND ERROR

ILLEGAL OPERATION

LABEL PREVIOUSLY DEFINED

SYMBOL TABLE FULL

PHASE ERROR

UNDEFINED SYMBOL

RELOCATION ERROR

These error messages are, for the most part, self explanatory. A phase error will arise if any label has changed its value or type between the two assembly passes.

APPENDIX G

OUTPUT CARD FORMATS

Output cards of the following formats may be produced by the relocatable assembler or are acceptable to the loader.

TITLE CARDS

Col 1	zero
Cols 2–6	relocatable label value. Col 2 flagged
Cols 7–18	right justified alphameric label representation, or zeros. Col 7 flagged
Col 19	record mark
Cols 20–24	total number of digits in subroutine. Col 20 flagged
Cols 25–26	number of external references. Col 25 flagged
Cols 27–28	zeros. Col 27 flagged
Cols 29–76	up to four twelve digit right justified external references, the left hand end digits being flagged
Cols 77–80	serial number, col 77 flagged

TITLE CONTINUATION CARDS

Col 1	zero
Col 19	flagged record mark
Cols 27–28	two digit serial number, col 27 flagged
Cols 29–76	up to four twelve digit external references, the left hand end digits being flagged
Cols 77–80	serial number, col 77 flagged

PROGRAMME CARDS

Col 1	flagged record mark
Cols 2–6	relocatable or absolute value of first digit, col 2 flagged Absolute values denoted by a flag on col 6
Cols 7–8	number of card digits after col 8. Col 7 flagged
Cols 9–76	up to 68 digits, including relocatable marker (flagged record mark) following each relocatable 5 digit field
Cols 77–80	serial number, col 77 flagged

DIGIT DEFINITION CARDS

Col 1	record mark
Cols 2–6	relocatable or absolute value of first digit. Col 2 flagged Absolute values denoted by a flag on col 6
Col 7	flagged or un–flagged record mark
Col 8	a digit
Cols 9–13	a count, N. Col 9 flagged
Cols 77–80	serial number, col 77 flagged

The digit from col 8 is taken, with or without a flag depending on whether the record mark in column 7 is flagged or unflagged, and repeated N times, starting in the location indicated by cols 2–6.

SYN CARDS

Col 1	a non–zero integer
Cols 2–6	relocatable label value. Col 2 flagged
Cols 7–18	alphameric label representation. Col 7 flagged
Col 19	record mark
Cols 77–80	serial number, col 77 flagged

APPENDIX G (continued)

TRANSFER SET CARDS

Col 1	record mark
Cols 2–6	used only if label zero, then giving desired relocatable starting location. Col 2 flagged
Cols 7–18	zeros, or extemal reference label at which programme is to be entered. Col 7 flagged
Col 19	record mark
Cols 77–80	serial number, col 77 flagged

TRANSFER CARD

Col 1	no record mark
Col 3	no record
Col 19	no record mark

A blank card will suffice.

SYMBOL TABLE CARDS

Col 1	no record mark
Col 3	record mark
Col 4	unflagged zero if any symbols present on card record mark if no symbol on card
Cols 5–9	absolute value of first symbol on card. Col 5 flagged
Cols 10–21	first symbol, right justified. Col 10 flagged
Col 22	unflagged zero if more than one symbol on card record mark if only one symbol on card
Cols 23–27	absolute value of second symbol on card. Col 23 flagged etc.
Col 76	record mark if four symbols on card
Cols 77–80	serial number, col 77 flagged

APPENDIX H

USING THE PROGRAMME LOADER

The programme loader is first loaded into core storage, followed in any order by the programmes and subroutines to be loaded. Finally, a single blank card is loaded.

If all necessary subroutines have been included in the loading, the message LOAD DATA will be typed. The programme is then ready to run.

If any necessary subroutines have been omitted, a list of these will be typed out. The missing subroutines may then be loaded, followed by a further blank card.

Should any subroutine or reference label be duplicated, the duplicated label will be listed. The subroutine will be loaded; but only the first occurring label will be used for reference.

Symbol table cards, and one following card, are ignored by the loader.

APPENDIX J

A SAMPLE LISTING

The following listing of a subroutine for evaluating the functions SINH and COSH illustrates subroutine linkages and external reference labelling.

```
*FSNH AND FCSH SUBROUTINE. DATA IN B, RESULT IN A. FLOATING POINT
*REQUIRES FEX,FA,FD,FM
*CALLING SEQUENCE    BTM FSNH$,*+12        OR    BTM FCSH$,*+12
*                    DSA *+17,A,B                DSA *+17,A,B
*                    DC  1,@                     DC  1,@
     FEX     DMAC
     FA      DMAC
     FD      DMAC
     FM      DMAC
             DS    5                             00024 00005
     FSNH$   TR    FSC2+2,*-1,11, FSNH ENTRY POINT
                                                 00026 31 00236*00025*
             TDM   FSC1+1,2                      00038 15 00155*00002
             B     FCSH+24                       00050 49 00086*00000
     FCSH$   TR    FSC2+2,*-1,11, FCSH ENTRY POINT
                                                 00062 31 00236*00061*
             TDM   FSC1+1,3                      00074 15 00155*00003
             TF    FSC1A,FSC2+16,11              00086 26 00261*00250*
             FEX   FSC1A,FSC1A
                                                 00098 17 00019*00110*
                                                 00114 00015    00126*00261*00261*
                                                 00125 00001    ‡
             FD    FSC1C,FSC1A
                                                 00126 17 00009*00138*
                                                 00142 00015    00154*00271*00261*
                                                 00153 00001    ‡
     FSC1    SF    99,,,           CF FOR FCSH
                                                 00154 32 00099 00000
             FA    FSC1A,99
                                                 00166 17 00004*00178*
                                                 00182 00015    00194*00261*00099
                                                 00193 00001    ‡
             FM    FSC1A,FSC2C
                                                 00194 17 00014*00206*
                                                 00210 00015    00222*00261*00281*
                                                 00221 00001    ‡
             TF    FSC2+11,99,6                  00222 26 00245*00099
     FSC2    B                                   00234 49 00000 00000
             DS    6                             00251 00006
     FSC1A   DS    10                            00261 00010
     FSC1C   DC    10,5110000000                 00271 00010    5110000000
     FSC2C   DC    10,3050000000                 00281 00010    3050000000
             DEND
END OF PASS 2
```

APPENDIX K

THE RELOCATABLE ASSEMBLER

A listing of the one-pass version of the relocatable assembler is given. To convert to a two pass assembler, omit cards 2118 to 2182. To adapt to other machine sizes, change card 1301 appropriately.

The standard SPS processor was modified to assemble DC 1, 0 as an unflagged zero digit.

THE RELOCATABLE ASSEMBLER

```
0001          DORG 402.                          00402
0002 SET      TFM RTA1C,RTA1T,.                  SET SYMBOL TABLE
                                                 00402 16 18215 K2882
0003          TDM RTB1F,0,,                      00414 15 23059 00000
0004          TFM DTA1C,DTA1T,.                  SET DOLLAR TABLE
                                                 00426 16 09666 J0866
0005          TDM DTB1F,0,,                      00438 15 11057 00000
0006          TFM DTB1N,0,10.                    SET DOLLAR COUNTER
                                                 00450 16 11056 000+0
0007          TR  PTC4R,SET1A,,                  SET TITLE LABEL

                                                 00462 31 17874 00709
0008          TFM LPA1V,0,8,                     CLEAR LPA INDICATORS
                                                 00474 16 16286 0+000
0009          TFM ILC,99999,,                    SET ILC
                                                 00486 16 16282 R9999
0010          TD  RCT,SET2A,,                    SET RM IN RCT
                                                 00498 25 16297 00727
0011          TDM CPR1E,0,,                      CLEAR CPR ENTRY INDICATOR
                                                 00510 15 02398 00000
0012          TFM CPR3T,1,8,                     SET CARD COUNTER
                                                 00522 16 02404 0+001
0013          TDM LPA1S,0,,                      CARD PRINTING INDICATOR
                                                 00534 15 15315 00000
0014          RCTY                               00546 34 00000 00102
0015          BTM  LPA ,*+12,.                   DO ASSEMBLY
                                                 00558 17 15100 +0570
0016          BD  SET2 ,LPA1X                    00570 43 00678 16284
0017 SET1     RCTY,,,                            00582 34 00000 00102
0018          WATY  SET1F,,.                     00594 39 00651 00100
0019          RCTY                               00606 34 00000 00102
0020          RCTY                               00618 34 00000 00102
0021          H                                  00630 48 00000 00000
0022          B   SET                            00642 49 00402 00000
0023          DORG *-3                           00650
0024 SET1F    DAC 14,END OF PASS 2@.,            00651    00014
0025 SET2     RCTY                               00678 34 00000 00102
0026          WATYSET3A                          00690 39 00729 00100
0027          B   SET1                           00702 49 00582 00000
0028          DORG *-4                           00709
0029 SET1A    DC  1,0,,                          00709    00001
0030          DC  5,0,,                          00714    00005
0031          DC  12,0,,                         00726    00012
0032 SET2A    DC  1,@,.                          00727    00001
0033 SET3A    DAC 15,ASSEMBLY ERROR@,,           00729    00015
0034 RCD      DAS 80,,                           00759    00080
0035          DORG RCD-1                         00758
0036          H   ,,0410,                        00758 M8 00+00 000+0
0037          H   ,,0246810,                     00770 M8 +0+0+ 0+0+0
0038          H   ,,6810,                        00782 48 0000+ 0+0+0
0039          H   ,,0246810,                     00794 M8 +0+0+ 0+0+0
0040          H   ,,0246810,                     00806 M8 +0+0+ 0+0+0
0041          H   ,,0246810,                     00818 M8 +0+0+ 0+0+0
0042          H   ,,0246810,                     00830 M8 +0+0+ 0+0+0
0043          H   ,,0246810,                     00842 M8 +0+0+ 0+0+0
0044          H   ,,0246810,                     00854 M8 +0+0+ 0+0+0
0045          H   ,,0246810,                     00866 M8 +0+0+ 0+0+0
```

```
0046          H     ,,0246810,
0047          H     ,,0246810,
0048          H     ,,0246810,
0049          H     ,,0246810,
0050          H     ,,0246810,
0051          DAC   1,@
0052          DS    5,
0053 ARS      TF    ARS1S,EVACS,,
0054          SF    ARS1S,,,
0055          TFM   ARS1E,RTA1T-13,,
0056 ARS1     C     RTA1C,ARS1E,,
0057          BH    ARS-1,,6,
0058          BNF   ARS2  ,,,
0059 ARS1E    DS    ,*,
0060          S     ARS1E,99,6,
0061          C     ARS1S,ARS1E,11,
0062          BL    ARS2  ,,,
0063          TF    ARS1V,ARS1E,11,
0064          CF    ARS1V-4,,,
0065          TDM   ARS1V-5,0,11,
0066          S     ARS1V,ARS1S,,
0067          SF    ARS1V-4,,,
0068          TF    ARS1E,ARS1V,6,
0069 ARS2     SM    ARS1E,18,10,
0070          B     ARS1  ,,,
0071 ARS1S    DS    6,,
0072 ARS1V    DS    6,,
0073 AST      BD    AST8,LPA2T
0074 AST9     TDM   LPA1P,1,,
0075 AST11    TDM   SMB1T,,,
0076          DC    1,@,*,
0077 AST1     RNCDCPR4R,,,
0078          BNR   LPA  ,CPR4R+2,,
0079          BD    AST1  ,LPA2T,,
0080          BNR   AST2  ,CPR4R+3,,
0081          B     AST1,,,
0082 AST1L    DS    ,*,
0083 AST2     TFM   AST1E,CPR4R+3,,
0084 AST3     TF    AST1L,AST1E,,
0085          AM    AST1E,18,10,
0086          TD    AST1T,,,
0087 AST1E    DS    ,*,
0088          TDM   AST1E,,6,
0089 AST1T    DS    ,*-2
0090          DC    1,@,*,
0091          TDM   AST1L,0,6,
0092          TDM   SMB2S,0,,
0093          TR    SMB1R,AST1L,11,
0094          BNR   AST4  ,SMB2S,,
0095          TDM   SMB2S,0,,
0097          SF    SMB1R+1,,,
0098          CF    SMB1V,,,
0099          TDM   SMB1R,0,,
0100          BTM   RTA  ,*+12,,
0101          BD    AST6  ,RTA1S,,
0102          BTM   RTB  ,*+12,,
0103          BD    AST7  ,RTB1F,,

00878 M8  +0+0+ 0+0+0
00890 M8  +0+0+ 0+0+0
00902 M8  +0+0+ 0+0+0
00914 M8  +0+0+ 0+0+0
00926 M8  +0+0+ 0+0+0
00939     00001
00944     00005
00946 26  01155 13556
00958 32  01155 00000
00970 16  01017 K2869
00982 24  18215 01017
00994 46  0094N 01100
01006 44  01126 00000
01017     00000
01018 22  0101P 00099
01030 24  01155 0101P
01042 47  01126 01300
01054 26  01161 0101P
01066 33  01157 00000
01078 15  01156 0000+
01090 22  01161 01155
01102 32  01157 00000
01114 26  0101P 01161
01126 12  01017 000J8
01138 49  00982 00000
01155     00006
01161     00006
01162 43  01518 16283
01174 15  16285 00001
01186 15  24853 00000
01197     00001
01198 36  02519 00500
01210 45  15100 02521
01222 43  01198 16283
01234 45  01258 02522
01246 49  01198 00000
01257     00000
01258 16  01305 +2522
01270 26  01257 01305
01282 11  01305 000J8
01294 25  01315 00000
01305     00000
01306 15  0130N 00000
01315     00000
01317     00001
01318 15  0125P 00000
01330 15  24852 00000
01342 31  24834 0125P
01354 45  01542 24852
01366 15  24852 00000
01390 32  24835 00000
01402 33  24839 00000
01414 15  24834 00000
01426 17  17960 +1438
01438 43  01566 18273
01450 17  22888 +1462
01462 43  01590 23059
```

```
0104 AST5   CM   AST1L,CPR4R+57,,
0105        BNL  AST1 ,,,
0106        BNR  AST3 ,AST1T,,
0107        B    AST1 ,,,
0108        DORG *-3 ,
0109 AST8   BD   AST9,LPA1S,,
0110        BTM  CDP,AST11,,
0111 AST4   WATYSMB1S+1,,,
0112        BTM  SCP ,AST5,,
0113 AST6   WATYSMB1S+1,,,
0114        BTM  LLP ,AST5,,
0115 AST7   WATYSMB1S+1,,,
0116        BTM  LLE ,AST1,,
0117        DS   5,,
0118 CDP    BD   CDP-1,LPA1P,6,

0119        WATYCDP3S,,,
0120        SPTY
0121        WATYRCD+10,,,
0122        SPTY
0123        WATYCTA4S,,,
0124        SPTY
0125        WATYRCD+30,,,
0126        TDM  LPA1P,1,,
0127        BD   CDP-1;CDP1P,6,
0128        RCTY,,,
0129        B    CDP-1,,6,
0130 CDP1P  DS   ,*,
0131 CDP3S  DAS  3
0132        DC   2,@,,
0133        DS   5,,
0134 CPR    TFM  CPR3E,CPR4R,,

0135        BD   CPR1 ,CPR1E,,

0136        TDM  CPR1P,1,,
0137        TD   CPR2R,CPR3R,,

0138        SF   CPR2R,,,

0139        TDM  CPR1E,1,,

0140        B    CPR14,,,
0141        DORG *-3
0142 CPR1   CM   CPR3D,68,10,

0143        BNH  CPR2,,,
0144        TFM  CPR3D,0,10,

0145        BTM  TMP,CPR9,,

0146 CPR2   BD   CPR9 ,CPR1P,,

0147        TF   CPR3W,CPR3D,,
0148        SF   CPR3D-1,,,

0149        A    CPR3W,CPR2D,,
0150        CM   CPR3W,68,10,
0151        BH   CPR11,,,
```

```
                    01474 14 01257 +2576
                    01486 46 01198 01300
                    01498 45 01270 01315
                    01510 49 01198 00000
                    01518
                    01518 43 01174 15315
                    01530 17 01620 +1186
                    01542 39 24841 00100
                    01554 17 11576 +1474
                    01566 39 24841 00100
                    01578 17 11824 +1474
                    01590 39 24841 00100
                    01602 17 11904 +1198
                    01618    00005
EXIT IF ALREADY PRINTED
                    01620 43 0161R 16285
                    01632 39 01765 00100
                    01644 34 00000 00101
                    01656 39 00769 00100
                    01668 34 00000 00101
                    01680 39 02873 00100
                    01692 34 00000 00101
                    01704 39 00789 00100
                    01716 15 16285 00001
                    01728 43 0161R 01763
                    01740 34 00000 00102
                    01752 49 0161R 00000
                    01763    00000
                    01765    00003
                    01771    00002
                    01776    00005
RESET DIGIT EXTRACT COUNTER
                    01778 16 02421 +2519
BRANCH IF NOT FIRST ENTRY
                    01790 43 01858 02398
                    01802 15 02399 00001
SET STARTING RM
                    01814 25 02437 02406
AND FLAG IT
                    01826 32 02437 00000
SET ENTRY INDICATOR
                    01838 15 02398 00001
                    01850 49 02350 00000
                    01858
CHECK LENGTH
                    01858 14 02416 00008
                    01870 47 01906 01100
CLEAR DIGITS CURRENT COUNTER
                    01882 16 02416 000+0
ERROR PRINT (TOO MANY DIGITS)
                    01894 17 11312 +2206
BRANCH FOR POSSIBLE PUNCH OUT
                    01906 43 02206 02399
                    01918 26 02436 02416
TWO DIGIT FIELD
                    01930 32 02415 00000
                    01942 21 02436 02444
                    01954 14 02436 00008
                    01966 46 02218 01100
```

```
0152         CM   CPR3D,0,10,          01978 14 02416 000+0
0153         BE   CPR-1,,6,          EXIT
                                         01990 46 0177P 01200
0154         BH   CPR3 ,,,               02002 46 02038 01100
0155         TFM  CPR3D,0,10,            02014 16 02416 000+0
0156         BTM  FLP,CPR9,,,        ERROR PRINT (INVALID FIELD LENGTH)
                                         02026 17 11374 +2206
0157 CPR3    TF   CPR3C,CPR3S,,      DIGIT SET TO PREVIOUS SET
                                         02038 26 02431 02426
0158 CPR4    BD   CPR7 ,CPR1R,,      BRANCH FOR RELOCATION TEST
                                         02050 43 02130 02400
0159 CPR5    TD   CPR3S,CPR3E,611,   TRANSMIT DIGIT
                                         02062 25 02420 0242J
0160         AM   CPR3S,1,10,        ADD 1 TO SET COUNTER
                                         02074 11 02426 000+1
0161 CPR6    AM   CPR3E,1,10,        ADD 1 TO EXTRACT COUNTER
                                         02086 11 02421 000+1
0162         SM   CPR3D,1,10,        SUBTRACT 1 FROM DIGITS CURRENT COUNTER
                                         02098 12 02416 000+1
0163         BH   CPR4,,,            REPEAT FOR NEXT DIGIT
                                         02110 46 02050 01100
0164         B    CPR8                    02122 49 02162 00000
0165         DORG *-3                     02130
0166 CPR7    BNR  CPR5,CPR3E,11,     BRANCH NO RM
                                         02130 45 02062 0242J
0167         BNF  CPR6,CPR3E,11,         02142 44 02086 0242J
0168         B    CPR5,,,            BRANCH TO TRANSMIT FLAGGED RM
                                         02154 49 02062 00000
0169         DORG *-3                    02162
0170 CPR8    S    CPR3C,CPR3S,,          02162 22 02431 02426
0171         SF   CPR3C-1,,,             02174 32 02430 00000
0172         S    CPR2D,CPR3C,,      INCREASE CARD DIGITS COUNTER
                                         02186 22 02444 02431
0173         B    CPR-1,,6,          BY NO OF DIGITS ADDED AND EXIT
                                         02198 49 0177P 00000
0174         DORG *-3                    02206
0175 CPR9    TDM  CPR1P,0,,              02206 15 02399 00000
0176 CPR11   CM   CPR2D,0,10,            02218 14 02444 000+0
0177         BH   CPR13,,,               02230 46 02290 01100
0178         BE   CPR15,,,               02242 46 02362 01200
0179         BTM  CEP  ,CPR14            02254 17 11446 +2350
0180 CPR12   TD   CPR3S,CPR3B,6,     SET TRAILING BLANKS ON CARD
                                         02266 25 02420 02405
0181         AM   CPR3S,1,10,            02278 11 02426 000+1
0182 CPR13   CM   CPR3S,CPR2T-3,,        02290 14 02426 +2513
0183         BL   CPR12,,,               02302 47 02266 01300
0184         TF   CPR2T,CPR3T,,      SET CARD NUMBER
                                         02314 26 02516 02404
0185         WNCDCPR2R,,,            OUT@PUT CARD
                                         02326 38 02437 00400
0186         AM   CPR3T,1,10,            02338 11 02404 000+1
0187 CPR14   TFM  CPR2D,0,10,        RESET CARD DIGITS COUNTER
                                         02350 16 02444 000+0
0188 CPR15   TF   CPR2A,CPR3A,,      RESET CARD ADDRESS COUNTER
                                         02362 26 02442 02411
0189         TFM  CPR3S,CPR2D+ ,,    RESET DIGIT SET COUNTER
                                         02374 16 02426 +2445
```

```
0190         B    CPR1,,,                    02386 49 01858 00000
0191 CPR1E   DC   1,0,,                   PROG ENTRY INDICATOR
                                             02398     00001
0192 CPR1P   DC   1,0,,                   PUNCH OUT INDICATOR
                                             02399     00001
0193 CPR1R   DC   1,0,,                   REL INDICATOR
                                             02400     00001
0194 CPR3T   DC   4,1,,                   CARD TOTAL COUNTER
                                             02404     00004
0195 CPR3B   DNB  1,,                     NUMERICAL BLANK
                                             02405     00001
0196 CPR3R   DC   1,@,,                   RM  02406     00001
0197 CPR3A   DC   5,0,,                   CURRENT ADDRESS COUNTER
                                             02411     00005
0198 CPR3D   DC   5,0,,                   DIGITS CURRENT COUNTER
                                             02416     00005
0199 CPR3E   DS   5,,                     DIGITS EXTRACT COUNTER
                                             02421     00005
0200 CPR3S   DS   5,,                     DIGITS SET COUNTER
                                             02426     00005
0201 CPR3C   DS   5,,                     PREVIOUS SET COUNTER
                                             02431     00005
0202 CPR3W   DS   5,,                     WORKING COUNTER
                                             02436     00005
0203 CPR2R   DS   1,,                     FOR FLAGGED RM AT START CARD IMAGE
                                             02437     00001
0204 CPR2A   DS   5,,                     FOR CARD ADDRESS COUNTER
                                             02442     00005
0205 CPR2D   DS   2,,                     FOR CARD DIGITS COUNTER
                                             02444     00002
0206         DS   68,,                    FOR PROGRAMME DIGITS
                                             02512     00068
0207 CPR2T   DS   4,,                     FOR CARD NUMBER
                                             02516     00004
0208 CPR4R   DAS  59,,                    FOR ACCUMULATED DIGITS
                                             02519     00059
0209         DS   5,,                        02640     00005
0210 CTA     TR   CTA2A,CTA1A,               02642 31 02935 02882
0211         TDM  CTA2S,0,,                  02654 15 02880 00000
0212 CTA1    AM   CTA1D,5,10,                02666 11 02946 000+5
0213         C    CTA1E,CTA1C,,              02678 24 02951 02888
0214         BNH  CTA2  ,,,                  02690 47 02750 01100
0215         C    CTA2S,CTA1E,11,            02702 24 02880 0295J
0216         BH   CTA2  ,,,                  02714 46 02750 01100
0217         TF   CTA1P,CTA1E,,              02726 26 02941 02951
0218         BE   CTA5  ,,,                  02738 46 02822 01200
0219 CTA2    BNR  CTA3  ,CTA1D,11,           02750 45 02770 02940
0220         B    CTA-1,,6,                  02762 49 0264J 00000
0221         DORG *-3                        02770
0222 CTA3    BH   CTA4  ,,,                  02770 46 02802 01100
0223         A    CTA1E,CTA1D,11,            02782 21 02951 02940
0224         B    CTA1  ,,,                  02794 49 02666 00000
0225         DORG *-3                        02802
0226 CTA4    S    CTA1E,CTA1D,11,            02802 22 02951 02940
0227         B    CTA1  ,,,                  02814 49 02666 00000
```

```
0228          DORG *-4
0229 CTA5     TDM CTA1S,1,,
0230          SM  CTA1E,9,10,
0231          TF  CTA1V,CTA1E,11,
0232          B   CTA-1,,6,
0233          DORG *-3
0234 CTA1R    DC  1,0,,
0235 CTA1V    DS  5,,

0236 CTA4S    DAC 5,    @,,
0237 CTA2S    DS  ,CTA4S+7,
0238          DC  2,0,,
0239 CTA1A    DS  ,*-1,
0240 CTA1C    DSA CTA1T-102*14
0241          DSA CTA2D-5,CTA1T-63*14

0242          DC  1,@,,
0243 CTA2D    DSA 32*14,16*14,8*14,4*14,2*14,1*14

0244          DC  5,@,,
0245 CTA2A    DS  1,,
0246 CTA1S    DS  1,,

0247 CTA1P    DS  5,,

0248 CTA1D    DS  5,,

0249 CTA1E    DS  5,,

0250          DS  1,,
0251          DAS 1,,
0252          DORG *-1,
0253 CTA1T    DS  127*14+1,,
0254          DORGCTA1T-102*14
0255          DC  1,0,,
0256          DSA WST
0257          DAC 4,WST  ,,
0258          DC  1,0,,
0259          DC  5,-38010,,
0260          DAC 4,WNTY,,
0261          DC  1,0,,
0262          DC  5,-38020,,
0263          DAC 4,WNPT,,
0264          DC  1,0,,
0265          DC  5,-38040,,
0266          DAC 4,WNCD,,
0267          DC  1,0,,
0268          DC  5,-38000,,
0269          DAC 4,WN   ,,
0270          DC  1,0,,
0271          DC  5,-39010,,
```

```
02821
02822 15 02936 00001
02834 12 02951 000+9
02846 26 02871 0295J
02858 49 0264J 00000
02866
02866     00001
SYMBOL VALUE
02871     00005
02873     00005
02880     00000
02883     00002
02882     00000
02888     00005 +3304
02893     00005 +2899
02898     00005 +3850
02899     00001
02904     00005 +0448
02909     00005 +0224
02914     00005 +0112
02919     00005 +0056
02924     00005 +0028
02929     00005 +0014
02934     00005
02935     00001
SYMBOL PRESENT IF DIGIT
02936     00001
SYMBOL R.H. POSITION
02941     00005
POWER TWO DIRECTOR
02946     00005
SYMBOL R.H. EXAMINER
02951     00005
02952     00001
02955     00001
02954
04732     01779
03304
03304     00001
03309     00005 K4896
03311     00004
03318     00001
03323     00005
03325     00004
03332     00001
03337     00005
03339     00004
03346     00001
03351     00005
03353     00004
03360     00001
03365     00005
03367     00004
03374     00001
03379     00005
```

```
0272        DAC  4,WATY,,
0273        DC   1,0,,
0274        DC   5,-39020,,
0275        DAC  4,WAPT,,
0276        DC   1,0,,
0277        DC   5,-39040,,
0278        DAC  4,WACD,,
0279        DC   1,0,,
0280        DC   5,-39000,,
0281        DAC  4,WA   ,,
0282        DC   1,0,,
0283        DSA  TYP
0284        DAC  4,TYP  ,,
0285        DC   1,0,,
0286        DC   5,-31000,,
0287        DAC  4,TR   ,,
0288        DC   1,0,,
0289        DC   5,-72000,,
0290        DAC  4,TNS  ,,
0291        DC   1,0,,
0292        DC   5,-73000,,
0293        DAC  4,TNF  ,,
0294        DC   1,0,,
0295        DC   5,-16100,,
0296        DAC  4,TFM  ,,
0297        DC   1,0,,
0298        DC   5,-26000,,
0299        DAC  4,TF   ,,
0300        DC   1,0,,
0301        DC   5,-15000,,
0302        DAC  4,TDM  ,,
0303        DC   1,0,,
0304        DC   5,-25000,,
0305        DAC  4,TD   ,,
0306        DC   1,0,,
0307        DC   5,-34018,,
0308        DAC  4,TBTY,,
0309        DC   1,0,,
0310        DSA  SUP
0311        DAC  4,SUP  ,,
0312        DC   1,0,,
0313        DC   5,-34011,,
0314        DAC  4,SPTY,,
0315        DC   1,0,,
0316        DC   5,-12100,,
0317        DAC  4,SM   ,,
0318        DC   1,0,,
0319        DSA  SKP
0320        DAC  4,SKP  ,,
0321        DC   1,0,,
0322        DC   5,-32000,,
0323        DAC  4,SF   ,,
0324        DC   1,0,,
0325        DC   5,-22000,,
0326        DAC  4,S    ,,
0327        DC   1,0,,
```

```
03381   00004
03388   00001
03393   00005
03395   00004
03402   00001
03407   00005
03409   00004
03416   00001
03421   00005
03423   00004
03430   00001
03435   00005  K4856
03437   00004
03444   00001
03449   00005
03451   00004
03458   00001
03463   00005
03465   00004
03472   00001
03477   00005
03479   00004
03486   00001
03491   00005
03493   00004
03500   00001
03505   00005
03507   00004
03514   00001
03519   00005
03521   00004
03528   00001
03533   00005
03535   00004
03542   00001
03547   00005
03549   00004
03556   00001
03561   00005  K4876
03563   00004
03570   00001
03575   00005
03577   00004
03584   00001
03589   00005
03591   00004
03598   00001
03603   00005  K4072
03605   00004
03612   00001
03617   00005
03619   00004
03626   00001
03631   00005
03633   00004
03640   00001
```

```
0328        DC  5,-36010,,                  03645   00005
0329        DAC 4,RNTY,,                    03647   00004
0330        DC  1,0,,                       03654   00001
0331        DC  5,-36030,,                  03659   00005
0332        DAC 4,RNPT,,                    03661   00004
0333        DC  1,0,,                       03668   00001
0334        DC  5,-36050,,                  03673   00005
0335        DAC 4,RNCD,,                    03675   00004
0336        DC  1,0,,                       03682   00001
0337        DC  5,-36000,,                  03687   00005
0338        DAC 4,RN   ,,                   03689   00004
0339        DC  1,0,,                       03696   00001
0340        DC  5,-34012,,                  03701   00005
0341        DAC 4,RCTY,,                    03703   00004
0342        DC  1,0,,                       03710   00001
0343        DC  5,-37010,,                  03715   00005
0344        DAC 4,RATY,,                    03717   00004
0345        DC  1,0,,                       03724   00001
0346        DC  5,-37030,,                  03729   00005
0347        DAC 4,RAPT,,                    03731   00004
0348        DC  1,0,,                       03738   00001
0349        DC  5,-37050,,                  03743   00005
0350        DAC 4,RACD,,                    03745   00004
0351        DC  1,0,,                       03752   00001
0352        DC  5,-37000,,                  03757   00005
0353        DAC 4,RA   ,,                   03759   00004
0354        DC  1,0,,                       03766   00001
0355        DC  5,-41000,,                  03771   00005
0356        DAC 4,NOP  ,,                   03773   00004
0357        DC  1,0,,                       03780   00001
0358        DC  5,-13100,,                  03785   00005
0359        DAC 4,MM   ,,                   03787   00004
0360        DC  1,0,,                       03794   00001
0361        DC  5,-71000,,                  03799   00005
0362        DAC 4,MF   ,,                   03801   00004
0363        DC  1,0,,                       03808   00001
0364        DC  5,-23000,,                  03813   00005
0365        DAC 4,M    ,,                   03815   00004
0366        DC  1,0,,                       03822   00001
0367        DC  5,-18100,,                  03827   00005
0368        DAC 4,LDM  ,,                   03829   00004
0369        DC  1,0,,                       03836   00001
0370        DC  5,-28000,,                  03841   00005
0371        DAC 4,LD   ,,                   03843   00004
0372        DC  1,0,,                       03850   00001
0373        DC  5,-34000,,                  03855   00005
0374        DAC 4,K    ,,                   03857   00004
0375        DC  1,0,,                       03864   00001
0376        DC  5,-48000,,                  03869   00005
0377        DAC 4,H    ,,                   03871   00004
0378        DC  1,0,,                       03878   00001
0379        DSA DZE                         03883   00005  +4922
0380        DAC 4,DZE  ,,                   03885   00004
0381        DC  1,0,,                       03892   00001
0382        DSA DSB                         03897   00005  +7560
0383        DAC 4,DSB  ,,                   03899   00004
0384        DC  1,0,,                       03906   00001
0385        DSA DSA                         03911   00005  +6896
```

```
0386        DAC 4,DSA  ,.
0387        DC  1,0,,
0388        DSA DS
0389        DAC 4,DS   ,,
0390        DC  1,0,,
0391        DSA DRG
0392        DAC 4,DORG,,
0393        DC  1,0,,
0394        DSA DOP
0395        DAC 4,DOP  ,,
0396        DC  1,0,,
0397        DC  5,-35010,,
0398        DAC 4,DNTY,,
0399        DC  1,0,,
0400        DC  5,-35020,,
0401        DAC 4,DNPT,,
0402        DC  1,0,,
0403        DC  5,-35040,,
0404        DAC 4,DNCD,,
0405        DC  1,0,,
0406        DSA DNB
0407        DAC 4,DNB  ,,
0408        DC  1,0,,
0409        DSA DNA
0410        DAC 4,DNA  ,,
0411        DC  1,0,,
0412        DC  5,-35000,,
0413        DAC 4,DN   ,,
0414        DC  1,0,,
0415        DSA DMC
0416        DAC 4,DMAC,,
0417        DC  1,0,,
0418        DC  5,-19100,,
0419        DAC 4,DM   ,,
0420        DC  1,0,,
0421        DSA DIN
0422        DAC 4,DIN  ,,
0423        DC  1,0,,
0424        DSA DND
0425        DAC 4,DEND,,
0426        DC  1,0,,
0427        DSA DC
0428        DAC 4,DC   ,,
0429        DC  1,0,,
0430        DSA DAS
0431        DAC 4,DAS  ,,
0432        DC  1,0,,
0433        DSA DAC
0434        DAC 4,DAC  ,,
0435        DC  1,0,,
0436        DC  5,-29000,,
0437        DAC 4,D    ,,
0438        DC  1,0,,
0439        DC  5,-14100,,
0440        DAC 4,CM   ,,
0441        DC  1,0,,
```

```
03913   00004
03920   00001
03925   00005  +8130
03927   00004
03934   00001
03939   00005  +6648
03941   00004
03948   00001
03953   00005  +6312
03955   00004
03962   00001
03967   00005
03969   00004
03976   00001
03981   00005
03983   00004
03990   00001
03995   00005
03997   00004
04004   00001
04009   00005  +4942
04011   00004
04018   00001
04023   00005  +6872
04025   00004
04032   00001
04037   00005
04039   00004
04046   00001
04051   00005  +6332
04053   00004
04060   00001
04065   00005
04067   00004
04074   00001
04079   00005  +6290
04081   00004
04088   00001
04093   00005  +5576
04095   00004
04102   00001
04107   00005  +8150
04109   00004
04116   00001
04121   00005  +8172
04123   00004
04130   00001
04135   00005  +8192
04137   00004
04144   00001
04149   00005
04151   00004
04158   00001
04163   00005
04165   00004
04172   00001
```

```
0442        DC  5,-33000,,
0443        DAC 4,CF   ,,
0444        DC  1,0,,
0445        DC  5,-24000,,
0446        DAC 4,C    ,,
0447        DC  1,0,,
0448        DC  5,-46120,,
0449        DAC 4,BZ   ,,
0450        DC  1,0,,
0451        DC  5,-46140,,
0452        DAC 4,BV   ,,
0453        DC  1,0,,
0454        DC  5,-17100,,
0455        DAC 4,BTM  ,,
0456        DC  1,0,,
0457        DC  5,-27000,,
0458        DAC 4,BT   ,,
0459        DC  1,0,,
0460        DC  5,-46110,,
0461        DAC 4,BP   ,,
0462        DC  1,0,,
0463        DC  5,-47120,,
0464        DAC 4,BNZ  ,,
0465        DC  1,0,,
0466        DC  5,-47140,,
0467        DAC 4,BNV  ,,
0468        DC  1,0,,
0469        DC  5,-45000,,
0470        DAC 4,BNR  ,,
0471        DC  1,0,,
0472        DC  5,-47110,,
0473        DAC 4,BNP  ,,
0474        DC  1,0,,
0475        DC  5,-46130,,
0476        DAC 4,BNN  ,,
0477        DC  1,0,,
0478        DC  5,-47090,,
0479        DAC 4,BNLC,,
0480        DC  1,0,,
0481        DC  5,-46130,,
0482        DAC 4,BNL  ,,
0483        DC  1,0,,
0484        DC  5,-47000,,
0485        DAC 4,BNI  ,,
0486        DC  1,0,,
0487        DC  5,-47110,,
0488        DAC 4,BNH  ,,
0489        DC  1,0,,
0490        DC  5,-44000,,
0491        DAC 4,BNF  ,,
0492        DC  1,0,,
0493        DC  5,-47120,,
0494        DAC 4,BNE  ,,
0495        DC  1,0,,
0496        DC  5,-47040,,
0497        DAC 4,BNC4,,

04177   00005
04179   00004
04186   00001
04191   00005
04193   00004
04200   00001
04205   00005
04207   00004
04214   00001
04219   00005
04221   00004
04228   00001
04233   00005
04235   00004
04242   00001
04247   00005
04249   00004
04256   00001
04261   00005
04263   00004
04270   00001
04275   00005
04277   00004
04284   00001
04289   00005
04291   00004
04298   00001
04303   00005
04305   00004
04312   00001
04317   00005
04319   00004
04326   00001
04331   00005
04333   00004
04340   00001
04345   00005
04347   00004
04354   00001
04359   00005
04361   00004
04368   00001
04373   00005
04375   00004
04382   00001
04387   00005
04389   00004
04396   00001
04401   00005
04403   00004
04410   00001
04415   00005
04417   00004
04424   00001
04429   00005
04431   00004
```

```
0498        DC  1,0,,
0499        DC  5,-47030,,
0500        DAC 4,BNC3,,
0501        DC  1,0,,
0502        DC  5,-47020,,
0503        DAC 4,BNC2,,
0504        DC  1,0,,
0505        DC  5,-47010,,
0506        DAC 4,BNC1,,
0507        DC  1,0,,
0508        DC  5,-47190,,
0509        DAC 4,BNA  ,,
0510        DC  1,0,,
0511        DC  5,-47130,,
0512        DAC 4,BN   ,,
0513        DC  1,0,,
0514        DC  5,-46090,,
0515        DAC 4,BLC  ,,
0516        DC  1,0,,
0517        DC  5,-47130,,
0518        DAC 4,BL   ,,
0519        DC  1,0,,
0520        DC  5,-46000,,
0521        DAC 4,BI   ,,
0522        DC  1,0,,
0523        DC  5,-46110,,
0524        DAC 4,BH   ,,
0525        DC  1,0,,
0526        DC  5,-46120,,
0527        DAC 4,BE   ,,
0528        DC  1,0,,
0529        DC  5,-43000,,
0530        DAC 4,BD   ,,
0531        DC  1,0,,
0532        DC  5,-46040,,
0533        DAC 4,BC4  ,,
0534        DC  1,0,,
0535        DC  5,-46030,,
0536        DAC 4,BC3  ,,
0537        DC  1,0,,
0538        DC  5,-46020,,
0539        DAC 4,BC2  ,,
0540        DC  1,0,,
0541        DC  5,-46010,,
0542        DAC 4,BC1  ,,
0543        DC  1,0,,
0544        DC  5,-42000,,
0545        DAC 4,BB   ,,
0546        DC  1,0,,
0547        DC  5,-46190,,
0548        DAC 4,BA   ,,
0549        DC  1,0,,
0550        DC  5,-49000,,
0551        DAC 4,B    ,,
0552        DC  1,0,,
0553        DSA AST

04438   00001
04443   00005
04445   00004
04452   00001
04457   00005
04459   00004
04466   00001
04471   00005
04473   00004
04480   00001
04485   00005
04487   00004
04494   00001
04499   00005
04501   00004
04508   00001
04513   00005
04515   00004
04522   00001
04527   00005
04529   00004
04536   00001
04541   00005
04543   00004
04550   00001
04555   00005
04557   00004
04564   00001
04569   00005
04571   00004
04578   00001
04583   00005
04585   00004
04592   00001
04597   00005
04599   00004
04606   00001
04611   00005
04613   00004
04620   00001
04625   00005
04627   00004
04634   00001
04639   00005
04641   00004
04648   00001
04653   00005
04655   00004
04662   00001
04667   00005
04669   00004
04676   00001
04681   00005
04683   00004
04690   00001
04695   00005  +1162
```

```
0554          DAC  4,AST  ,,
0555          DC   1,0,,
0556          DC   5,-11100,,
0557          DAC  4,AM   .,
0558          DC   1,0,,
0559          DC   5,-21000,,
0560          DAC  4,A    ,,
0561          DC   1,0,,
0562          DS   5,,
0563 CTB      CM   CTA1C,CTA1T-126*14
0564          BL   CTB1  ,,,

0565          TF   CTB1C,CTA1C,,

0566          SM   CTA1C,14,10,,
0567          TF   CTB1P,CTA1P,,
0568          SM   CTB1P,14,10,

0569          TD   CTA1P,CTB1R,6,

0570          TD   CTA2S,CTB1R,,

0571          TR   CTA1C,CTB1C,611,

0572          BNR  CTB1  ,CTB1P,11,

0573          TR   CTB1P,CTA1R,6,

0574          TDM  CTA1P,0,6,

0575          B    CTB-1,,6,
0576          DORG *-3  ,
0577 CTB1     TDM  CTB1F,1,,

0578          B    CTB-1,,6,
0579          DORG *-4  ,
0580 CTB1F    DC   1,0,,

0581 CTB1R    DC   1,@,,
0582 CTB1C    DS   5,,

0583 CTB1P    DS   5,,

0584 DZE      TDM  CPR4R+7,0,,
0585          B    DNB12,,,
0586          DORG *-3
0587 DNB      TDM  CPR4R+7,,,
0588          DNB  1,*,
0589          SF   CPR4R+7,,,
0590 DNB12    TDM  CPR1P,1,,
0591          BTM  CPR,*+12,,
0592          TDM  CPR1P,1,,
0593          TDM  CPR4R+6,,,
0594          DC   1,@,*,
0595          TFM  SMB1E,RCD+30,,
0596          BTM   EVA  ,*+12,,
```

```
      04697     00004
      04704     00001
      04709     00005
      04711     00004
      04718     00001
      04723     00005
      04725     00004
      04732     00001
      04737     00005
      04738 14 02888 +2968
BRANCH IF TABLE FULL
      04750 47 04890 01300
STORE LIMIT COUNTER
      04762 26 04915 02888
      04774 12 02888 000J4
      04786 26 04920 02941
SET SYMBOL LH POSITION
      04798 12 04920 000J4
SET RM IN TABLE
      04810 25 0294J 04910
SET RM AFTER SYMBOL
      04822 25 02880 04910
MAKE ROOM IN TABLE
      04834 31 0288Q 0491N
TEST THAT SHIFT OCCURED
      04846 45 04890 0492+
INSERT NEW OPERATION AND VALUE
      04858 31 0492+ 02866
CLEAR RH RM
      04870 15 0294J 00000
      04882 49 0473P 00000
      04890
ERROR OR FULL
      04890 15 04909 00001
      04902 49 0473P 00000
      04909
ERROR OR FULL INDICATOR
      04909     00001
      04910     00001
OLD LIMIT COUNTER
      04915     00005
SYMBOL LH POSITION
      04920     00005
      04922 15 02526 00000
      04934 49 04966 00000
      04942
      04942 15 02526 00000
      04953     00001
      04954 32 02526 00000
      04966 15 02399 00001
      04978 17 01778 +4990
      04990 15 02399 00001
      05002 15 02525 00000
      05013     00001
      05014 16 24259 +0789
      05026 17 12152 +5038
```

```
0597          BD   DNB1 ,EVATR,,
0598          BD   DNB2 ,EVATL,,
0599 DNB1     BTM   DSP ,LPA,,
0600 DNB2     BNR DNB8 ,SMB1T,,
0601          SM   SMB1E,2,10,
0602 DNB8     TF   DNB1A,EVA1T,,
0603          BTM   EVA ,*+12,,
0604          BD   DNB3 ,EVATD,,
0605          BD   DNB9 ,EVATL,,
0606 DNB3     BTM   DSP ,LPA,,
0607 DNB9     BD   DNB4 ,EVATS,,
0608          TDM DNB1R,1,,
0609          TDM CPR1P,1,,
0610          A    ILC ,DNB1A,,
0611          TF   LOC ,ILC,,
0612          B    DNB5  ,,
0613 DNB1R    DS   ,*-4,
0614          DORG *-3,
0615 DNB4     TF   LOC,EVA1T,,
0616          TD   DNB1R,EVATR,,
0617 DNB5     BD   DNB6 ,LPA2T,,
0618          TD   LLA1R,DNB1R,,
0619          BTM LLA  ,LPA,,
0620 DNB6     TD   LLB1R,DNB1R,,
0621          BTM LLB  ,*+12
0622          TF   CPR4R+5,LOC,,
0623          AM   CPR4R+5,1,10,
0624          S    CPR4R+5,DNB1A,,
0625          BD   DNB7,DNB1R,,
0626          SF   CPR4R+5,,,
0627          SF   LOC,,,
0628 DNB7     TDM CPR4R,,,
0629          DC   1,@,*,
0630          CF   LOC-4,,,
0631          TF   CPR4R+12,DNB1A,,
0632          CF   DNB1A-4,,,
0633          TR   CPR4R+13,PTC1B-47,,
0634          TR   CPR4R+61,PTC1B-14,,
0635          TF   CPR4R+79,CPR3T,,
0636          WNCDCPR4R,,,
0637          AM   CPR3T,1,10,
0638          BD   LPA,LPA1S,,
0639          BTM   CDP ,*+12,
0640          TBTY,,,
0641          WNTYLOC-4,,,
0642          SPTY,,,
0643          WNTYDNB1A-4,,,
0644          B    LPA,,,
0645 DNB1A    DS   ,*,
0646          DC   1,@,,
0647 DND      BD   DND4 ,LPA2T,,
0648          MM   ILC ,5,10,
0649          BD   DND1 ,99,,
0650          AM   ILC,1,10,
0651 DND1     AM   ILC,1,10,
0652          TF   PTC4R+23,ILC,,
```

```
05038 43 05062 13563
05050 43 05074 13562
05062 17 11700 J5100
05074 45 05098 24853
05086 12 24259 000+2
05098 26 05573 13571
05110 17 12152 +5122
05122 43 05146 13564
05134 43 05158 13562
05146 17 11700 J5100
05158 43 05226 13565
05170 15 05225 00001
05182 15 02399 00001
05194 21 16282 05573
05206 26 16291 16282
05218 49 05250 00000
05225    00000
05226
05226 26 16291 13571
05238 25 05225 13563
05250 43 05286 16283
05262 25 14595 05225
05274 17 14564 J5100
05286 25 14883 05225
05298 17 14852 +5310
05310 26 02524 16291
05322 11 02524 000+1
05334 22 02524 05573
05346 43 05382 05225
05358 32 02524 00000
05370 32 16291 00000
05382 15 02519 00000
05393    00001
05394 33 16287 00000
05406 26 02531 05573
05418 33 05569 00000
05430 31 02532 17825
05442 31 02580 17858
05454 26 02598 02404
05466 38 02519 00400
05478 11 02404 000+1
05490 43 15100 15315
05502 17 01620 +5514
05514 34 00000 00108
05526 38 16287 00100
05538 34 00000 00101
05550 38 05569 00100
05562 49 15100 00000
05573    00000
05574    00001
05576 43 05896 16283
05588 13 16282 000+5
05600 43 05624 00099
05612 11 16282 000+1
05624 11 16282 000+1
05636 26 17897 16282
```

```
0653          MM   DTB1N,5,9,
0654          TFM  ILC,99999,,
0655          BE   DND12,,,
0656          TF   ILC,99,,
0657          BD   DND2 ,99
0658          SM   ILC,1,10,
0659          B    DND3
0660          DORG *-3
0661 DND2     AM   99,1,10,
0662 DND3     BTM  DTC,*+12,,
0663          A    PTC4R+5,99,,
0664          A    PTC4R+23,99,,
0665          BTM  ARS,*+12,,
0666 DND12    BTM  PTC,*+12,,
0667          TDM  LPA2T,1,,
0668          TDM  LPA1V,0,,
0669          TDM  LPA1S,0,,
0670          WATY DND1A,,,
0671          H    ,,,
0672          B    LPA,,,
0673          DORG *-3
0674 DND1A    DAC  14,END OF PASS 1@,,
0675 DND4     TDM  CPR1P,1,,
0676          BTM  CPR ,*+12,,
0677          TFM  SMB1E,RCD+30,,
0678          BTM  SMB ,*+12,,
0679          BD   DND5 ,SMB1D+1,,

0680          BD   DND5 ,SMB1D+7,,

0681          BD   LPA-1,LPA1S,6,
0682          BTM  CDP ,LPA-1,711,
0683 DND5     TDM  CPR4R,,,
0684          DC   1,@,*,
0685          TR   CPR4R+1,DND1R-4,,
0686          TR   CPR4R+19,PTC1B-47,,
0687          TR   CPR4R+67,PTC1B-8,,
0688          BD   DND9 ,SMB1D+6,,

0689          TFM  SMB1E,RCD+30,,
0690          BTM  EVA ,*+12,
0691          BD   DND7 ,EVATR,,
0692 DND6     BTM  DSP ,LPA-1,711,
0693 DND7     TF   CPR4R+5,EVA1T,,
0694 DND8     TF   CPR4R+79,CPR3T,,
0695          WNCD CPR4R,,,
0696          AM   CPR3T,1,10,
0697          BD   LPA-1,LPA1S,6,
0698          BTM  CDP ,*+12,,
0699          TBTY ,,,
0700          TF   LOC ,CPR4R+5,,
0701          CF   LOC-4,,,
0702          WNTY LOC-4,,,
0703          B    LPA-1,,6,
0704          DORG *-4
0705 DND9     TF   CPR4R+17,SMB2S-1,,
```

```
05648 13 11056 00+05
05660 16 16282 R9999
05672 46 05788 01200
05684 26 16282 00099
05696 43 05728 00099
05708 12 16282 000+1
05720 49 05740 00000
05728
05728 11 00099 000+1
05740 17 11074 +5752
05752 21 17879 00099
05764 21 17897 00099
05776 17 00946 +5788
05788 17 17498 +5800
05800 15 16283 00001
05812 15 16286 00000
05824 15 15315 00000
05836 39 05869 00100
05848 48 00000 00000
05860 49 15100 00000
05868
05869    00014
05896 15 02399 00001
05908 17 01778 +5920
05920 16 24259 +0789
05932 17 24236 +5944
PROCEED IF NOT BLANK
05944 43 05992 24825
OR IF ARITH
05956 43 05992 24831
05968 43 1509R 15315
05980 17 01620 J509R
05992 15 02519 00000
06003    00001
06004 31 02520 06271
06016 31 02538 17825
06028 31 02586 17864
BRANCH IF DOLLAR
06040 43 06228 24830
06052 16 24259 +0789
06064 17 12152 +6076
06076 43 06100 13563
06088 17 11700 J509R
06100 26 02524 13571
06112 26 02598 02404
06124 38 02519 00400
06136 11 02404 000+1
06148 43 1509R 15315
06160 17 01620 +6172
06172 34 00000 00108
06184 26 16291 02524
06196 33 16287 00000
06208 38 16287 00100
06220 49 1509R 00000
06227
06228 26 02536 24851
```

```
0706          BTM  SMB ,*+12,,                06240 17 24236 +6252
0707          BD  DND8,SMB1D+5,,          COMMA OR RECORD MARK
                                              06252 43 06112 24829
0708          B   DND6 ,,,                    06264 49 06088 00000
0709          DORG *-4                        06271
0710 DND1R    DC  5,-0,,                      06275    00005
0711          DC  13,@,,                      06288    00013
0712 DIN      TFM DNP1F,0,10,                 06290 16 06311 000+0
0713          B   DNP1,,,                     06302 49 06344 00000
0714 DNP1F    DS  ,*-2,                       06311    00000
0715          DORG *-1,                       06312
0716 DOP      TFM DNP1F,1,10,                 06312 16 06311 000+1
0717          B   DNP1,,,                     06324 49 06344 00000
0718          DORG *-3,                       06332
0719 DMC      TFM DNP1F,11,10,                06332 16 06311 000J1
0720 DNP1     BD  DNP6,LPA2T,,                06344 43 06600 16283
0721          TDM RCD+18,,,                   06356 15 00777 00000
0722          DC  1,@,*,                      06367    00001
0723          TR  CTA4S-1,RCD+9,,             06368 31 02872 00768
0724          CF  CTA4S+1,,,                  06380 33 02874 00000
0725          CF  CTA4S+3,,,                  06392 33 02876 00000
0726          CF  CTA4S+5,,,                  06404 33 02878 00000
0727          BTM  CTA ,*+12,,                06416 17 02642 +6428
0728          BD  DNP4 ,CTA1S,,               06428 43 06624 02936
0729          BD  DNP2 ,DNP1F-1,,             06440 43 06556 06310
0730          TD  CTA1V-4,RCD+30,,            06452 25 02867 00789
0731          TD  CTA1V-3,RCD+32,,            06464 25 02868 00791
0732          TD  CTA1V-2,RCD+34,,            06476 25 02869 00793
0733          TD  CTA1V-1,RCD+36,,            06488 25 02870 00795
0734          TD  CTA1V,RCD+38,,              06500 25 02871 00797
0735          SF  CTA1V-4,,,                  06512 32 02867 00000
0736          BD  DNP3 ,DNP1F                 06524 43 06568 06311
0737          SF  CTA1V,,,                    06536 32 02871 00000
0738          B   DNP3 ,,,                    06548 49 06568 00000
0739          DORG *-3 ,                      06556
0740 DNP2     TFM CTA1V,MAC,,                 06556 16 02871 J6500
0741 DNP3     BTM  CTB ,*+12,,                06568 17 04738 +6580
0742          BD  DNP5 ,CTB1F,,               06580 43 06636 04909
0743          B   LPA,,,                      06592 49 15100 00000
0744          DORG *-3                        06600
0745 DNP6     BD  LPA,LPA1S,,                 06600 43 15100 15315
0746          BTM  CDP ,LPA ,,                06612 17 01620 J5100
0747 DNP4     BTM  LLP ,LPA ,,                06624 17 11824 J5100
0748 DNP5     BTM  LLE ,LPA ,,                06636 17 11904 J5100
0749 DRG      TFM SMB1E,RCD+30,,          SET EXTRACTOR TO OPERAND FIELD
                                              06648 16 24259 +0789
0750          BTM  EVA ,*+12,,            EVALUATE OPERAND
                                              06660 17 12152 +6672
0751          BD  DRG1 ,EVATR,,           BRANCH IF REL
                                              06672 43 06696 13563
0752          BTM  REP ,LPA,,             RELOCATION ERROR, IGNORE CARD
                                              06684 17 12088 J5100
0753 DRG1     TF  ILC  ,EVA1T,,               06696 26 16282 13571
0754          SM  ILC,1,10,               SET ILC
                                              06708 12 16282 000+1
0755          TF  LOC  ,EVA1T,,           SET LOC
                                            06720 26 16291 13571
```

```
0756          BD   DRG2 ,LPA2T,,

0757          TDM LLA1R,1,,
0758          BTM  LLA ,LPA,,

0759 DRG2     TDM LLB1R,1,,
0760          BTM  LLB ,*+12,,

0761          TDM CPR1P,1,,

0762          BD   LPA ,LPA1S,,
0763          BTM  CDP ,*+12,,

0764          TBTY,,,
0765          CF   LOC-4
0766          WNTYLOC-4,,,

0767          B    LPA  ,,,
0768          DORG *-4,
0769 DNA      TDM DSA1F,0,,
0770          B    DSA8,,,
0771 DSA1F    DS   ,*,
0772 DSA      TDM DSA1F,1,,
0773 DSA8     TFM DSA1C,1,9,
0774          TFM DSA1S,CPR4R,,
0775          TF   LOC ,ILC,,
0776          AM   LOC ,5,10,
0777          BD   DSA3 ,LPA2T,,
0778          TDM LLA1R,1,,
0779          BTM  LLA ,*+12,,
0780          TFM SMB1E,RCD+30,,
0781 DSA1     BTM  DSS ,*+12,,
0782          BD   DSA2 ,DSS1M,,
0783          AM   DSA1C,1,10,
0784          CM   DSA1C,12,10
0785          BL   DSA1 ,,,
0786          BTM TMP  ,LPA,,
0787 DSA2     MM   DSA1C,5,10,
0788          A    ILC ,99,,
0789          B    LPA  ,,,
0790 DSA1C    DS   ,*-2,
0791          DORG *-1,
0792 DSA3     TDM LLB1R,1,,
0793          BTM LLB  ,*+12,,
0794          TFM SMB1E,RCD+30,,
0795 DSA4     BTM  EVA ,*+12,,
0796          BD   DSA5 ,EVATL,,
0797          BTM  DSP ,LPA,,
0798 DSA5     TF   DSA1V,EVA1T,,
0799          BD   DSA9,DSA1F,,
0800          SF   DSA1V,,,
0801 DSA9     SF   DSA1V+1,,,
0802          BD   DSA6 ,EVATR,,
0803          CF   DSA1V+1,,,
0804 DSA6     TR   DSA1S,DSA1V-4,6,
0805          BNR DSA7,SMB1T,,
```

```
BRANCH IF PASS 2
    06732 43 06768 16283
    06744 15 14595 00001
PROCESS LABEL PASS 1
    06756 17 14564 J5100
    06768 15 14883 00001
PROCESS LABEL PASS 2
    06780 17 14852 +6792
SET PUNCH OUT DIGIT
    06792 15 02399 00001
    06804 43 15100 15315
TYPE CARD
    06816 17 01620 +6828
    06828 34 00000 00108
    06840 33 16287 00000
TYPE LOC
    06852 38 16287 00100
    06864 49 15100 00000
    06871
    06872 15 06895 00000
    06884 49 06908 00000
    06895    00000
    06896 15 06895 00001
    06908 16 07109 00+01
    06920 16 07553 +2519
    06932 26 16291 16282
    06944 11 16291 000+5
    06956 43 07110 16283
    06968 15 14595 00001
    06980 17 14564 +6992
    06992 16 24259 +0789
    07004 17 09198 +7016
    07016 43 07076 09411
    07028 11 07109 000+1
    07040 14 07109 000J2
    07052 47 07004 01300
    07064 17 11312 J5100
    07076 13 07109 000+5
    07088 21 16282 00099
    07100 49 15100 00000
    07109    00000
    07110
    07110 15 14883 00001
    07122 17 14852 +7134
    07134 16 24259 +0789
    07146 17 12152 +7158
    07158 43 07182 13562
    07170 17 11700 J5100
    07182 26 07558 13571
    07194 43 07218 06895
    07206 32 07558 00000
    07218 32 07559 00000
    07230 43 07254 13563
    07242 33 07559 00000
    07254 31 0755L 07554
    07266 45 07518 24853
```

```
0806          MM   DSA1C,6,10
0807          TF   CPR3D,99,,
0808          TF   PNS1P,99,,
0809          TF   CPR3A,ILC,,
0810          AM   CPR3A,1,10,
0811          TDM  CPR1R,1,,
0812          BTM   CPR ,*+12,,
0813          MM   DSA1C,50,9,
0814          A    ILC ,98,,
0815          BD   LPA  ,LPA1S,,
0816          CF   LOC-4,,,
0817          TDM   99,,,
0818          DC   1,@,*,
0819          CF    94,,,
0820          BTM   CDP ,*+12,,
0821          TBTY,,,
0822          WNTYLOC-4,,,
0823          SPTY,,,
0824          WNTY 94,,,
0825          TDM  PNS1C,0,,
0826          BTM  PNS,LPA,,
0827 DSA7    AM   DSA1C,1,10,
0828          AM   DSA1S,6,10,
0829          B    DSA4 ,,,
0830 DSA1S   DS   ,*,
0831 DSA1V   DS   5,,
0832          DC   1,@,,
0833 DSB     TFM  SMB1E,RCD+30,,
0834          BTM   EVA ,*+12,,
0835          BD   DSB1 ,EVATR,,
0836          BD   DSB2 ,EVATL,,
0837 DSB1    BTM   DSP ,LPA,,
0838 DSB2    BNR  DSB3 ,SMB1T,,
0839          SM   SMB1E,2,10,
0840 DSB3    TF   DSB1A,EVA1T,,
0841          BTM   EVA ,*+12,,
0842          BD   DSB4 ,EVATR,,
0843          BD   DSB5 ,EVATL,,
0844 DSB4    BTM   DSP ,LPA,,
0845 DSB5    BNR  DSB6 ,SMB1T,,
0846          SM   SMB1E,2,10,
0847 DSB6    TF   DSB1B,EVA1T,,
0848          BTM   EVA ,*+12,,
0849          BD   DSB7 ,EVATD,,
0850          BD   DSB8 ,EVATL,,
0851 DSB7    BTM   DSP ,LPA,,
0852 DSB8    M    DSB1A,DSB1B
0853          SF   95,,,
0854          TF   DSB1C,99,,
0855          BD   DSB9 ,EVATS,,
0856          TDM  DSB1R,1,,
0857          TDM  CPR1P,1,,
0858          TF   LOC, ILC,,
0859          A    LOC ,DSB1A,,
0860          A    ILC,DSB1C,,
0861          B    DSB12,,,
```

```
07278 13 07109 000+6
07290 26 02416 00099
07302 26 17343 00099
07314 26 02411 16282
07326 11 02411 000+1
07338 15 02400 00001
07350 17 01778 +7362
07362 13 07109 00+50
07374 21 16282 00098
07386 43 15100 15315
07398 33 16287 00000
07410 15 00099 00000
07421    00001
07422 33 00094 00000
07434 17 01620 +7446
07446 34 00000 00108
07458 38 16287 00100
07470 34 00000 00101
07482 38 00094 00100
07494 15 17117 00000
07506 17 17050 J5100
07518 11 07109 000+1
07530 11 07553 000+6
07542 49 07146 00000
07553    00000
07558    00005
07559    00001
07560 16 24259 +0789
07572 17 12152 +7584
07584 43 07608 13563
07596 43 07620 13562
07608 17 11700 J5100
07620 45 07644 24853
07632 12 24259 000+2
07644 26 07907 13571
07656 17 12152 +7668
07668 43 07692 13563
07680 43 07704 13562
07692 17 11700 J5100
07704 45 07728 24853
07716 12 24259 000+2
07728 26 08123 13571
07740 17 12152 +7752
07752 43 07776 13564
07764 43 07788 13562
07776 17 11700 J5100
07788 23 07907 08123
07800 32 00095 00000
07812 26 08128 00099
07824 43 07908 13565
07836 15 07955 00001
07848 15 02399 00001
07860 26 16291 16282
07872 21 16291 07907
07884 21 16282 08128
07896 49 07932 00000
```

```
0862 DSB1A DS   ,*,
0863 DSB9  TD   DSB1R,EVATR,,
0864       TF   LOC ,EVA1T,,
0865 DSB12 BD   DSB11,LPA2T,,
0866       TDM  LLA1R,,,
0867 DSB1R DS   ,*,
0868       BTM   LLA ,LPA,,
0869 DSB11 TD   LLB1R,DSB1R,,
0870       BTM   LLB ,*+12,,
0871       BD   LPA,LPA1S,,
0872       BD   DSB13,DSB1R
0873       SF    LOC ,,,
0874 DSB13 CF   LOC-4,,,
0875       BTM   CDP ,*+12,,
0876       TBTY,,,
0877       WNTYLOC-4,,,
0878       SPTY,,,
0879       CF   DSB1C-4,,,
0880       WNTYDSB1C-4,,,
0881       B    LPA,,,
0882 DSB1B DS   ,*,
0883 DSB1C DS   5,,
0884       DC   1,@,,
0885 DS     TFM DSC1S,11,10,
0886       B    DSC1,,,
0887 DSC1R DS   ,*-4,

0888       DORG *-3,
0889 DC     TFM DSC1S,10,10,
0890       B    DSC1,,,
0891 DSC1S DS   ,*-2,
0892       DORG *-1,
0893 DAS    TFM DSC1S,1,10,
0894       B    DSC1,,,
0895       DORG *-3,
0896 DAC    TFM DSC1S,0,10,
0897 DSC1   TFM SMB1E,RCD+30,,
0898       BTM   EVA ,*+12,,
0899       BD   DSC2 ,EVATR,,
0900       BD   DSC3 ,EVATL,,
0901 DSC2  BTM   DSP ,LPA,,
0902 DSC3  BNR DSC4 ,SMB1T,,
0903       SM   SMB1E,2,10,
0904 DSC4  TF   DSC1C,EVA1T,,
0905       BD   DSC8 ,DSC1S-1,
0906       MM   DSC1C,2,10,
0907       SF   95,,,
0908       TF   DSC1C,99,,
0909       BD   DSC6 ,DSC1S,,
0910       TF   DSC1W,SMB1E,,
0911       A    DSC1W,DSC1C,,
0912       CM   DSC1W,RCD+150,,
0913       BL   DSC5 ,,,
0914       BTM   TMP ,LPA,,
0915 DSC5  TF   SCA1N,DSC1C,,
0916       BTM   SCA ,*+12,,
```

```
07907      00000
07908 25 07955 13563
07920 26 16291 13571
07932 43 07968 16283
07944 15 14595 00000
07955      00000
07956 17 14564 J5100
07968 25 14883 07955
07980 17 14852 +7992
07992 43 15100 15315
08004 43 08028 07955
08016 32 16291 00000
08028 33 16287 00000
08040 17 01620 +8052
08052 34 00000 00108
08064 38 16287 00100
08076 34 00000 00101
08088 33 08124 00000
08100 38 08124 00100
08112 49 15100 00000
08123      00000
08128      00005
08129      00001
08130 16 08171 000J1
08142 49 08204 00000
NON ZERO IF ADDRESS OPERAND REL
08149      00000
08150
08150 16 08171 000J0
08162 49 08204 00000
08171      00000
08172
08172 16 08171 000+1
08184 49 08204 00000
08192
08192 16 08171 000+0
08204 16 24259 +0789
08216 17 12152 +8228
08228 43 08252 13563
08240 43 08264 13562
08252 17 11700 J5100
08264 45 08288 24853
08276 12 24259 000+2
08288 26 09191 13571
08300 43 08516 08170
08312 13 09191 000+2
08324 32 00095 00000
08336 26 09191 00099
08348 43 08468 08171
08360 26 08719 24259
08372 21 08719 09191
08384 14 08719 +0909
08396 47 08420 01300
08408 17 11312 J5100
08420 26 23259 09191
08432 17 23076 +8444
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0917 DSC11 BNR DSC6 ,SMB1T,,
0918       SM  SMB1E,2,10,
0919 DSC6  BTM  EVA ,*+12,,
0920       BD  DSC7 ,EVATD,,
0921       BD  DSC12,EVATL,,
0922 DSC7  BTM  DSP ,LPA,,
0923 DSC8  BD  DSC6 ,DSC1S,,
0924       CM  DSC1C,68,,
0925       BNH DSC9 ,,,
0926       BTM  FLP ,LPA,,
0927 DSC9  TF  SCD1F,DSC1C,,
0928       BTM SCD  ,DSC11,,
0929 DSC12 BD  DSC15,EVATS,,
0930       TDM DSC1R,1,,
0931       BD  DSC14,DSC1S-1,,
0932       MM  ILC ,5,10,
0933       BD  DSC13,99,,
0934       AM  ILC ,1,10,
0935       TDM CPR1P,1,,
0936 DSC13 TF  LOC ,ILC,,
0937       AM  LOC ,2,10,
0938       A   ILC ,DSC1C,,
0939       B   DSC16,,,
0940 DSC1W DS  ,*,
0941 DSC14 A   ILC ,DSC1C,,
0942       TF  LOC ,ILC,,
0943       B   DSC16,,,
0944       DORG *-3,
0945 DSC15 TF  LOC ,EVA1T,,
0946       TDM CPR1P,1,,
0947       TD  DSC1R,EVATR,,
0948 DSC16 BD  DSC17,LPA2T,,
0949       TD  LLA1R,DSC1R,,
0950       BTM  LLA ,LPA,,
0951 DSC17 TD  LLB1R,DSC1R,,
0952       BTM  LLB ,*+12,,
0953       BD  DSC19,DSC1S,,
0954       TF  CPR3A,LOC,,
0955       TF  CPR3D,DSC1C,,
0956       TDM CPR1R,0,,
0957       BD  DSC24,DSC1S-1,,
0958       SM  CPR3A,1,10,
0959 DSC18 BD  DSC22,DSC1R,,
0960       SF  CPR3A,,,
0961 DSC22 BTM  CPR ,*+12,,
0962       TD  CPR1P,EVATS,,
0963       B   DSC21,,,
0964       DORG *-3,
0965 DSC19 TDM CPR1P,1,,
0966 DSC21 BD  LPA,LPA1S,,
0967       BD  DSC23,DSC1R,,
0968       SF  LOC  ,,,
0969 DSC23 TDM PNS1C,1,,
0970       TF  PNS1P,DSC1C,,
0971       BTM  CDP ,*+12,,
0972       CF  LOC-4,,,
```

```
08444 45 08468 24853
08456 12 24259 000+2
08468 17 12152 +8480
08480 43 08504 13564
08492 43 08588 13562
08504 17 11700 J5100
08516 43 08468 08171
08528 14 09191 +0068
08540 47 08564 01100
08552 17 11374 J5100
08564 26 23977 09191
08576 17 23332 +8444
08588 43 08752 13565
08600 15 08149 00001
08612 43 08720 08170
08624 13 16282 000+5
08636 43 08672 00099
08648 11 16282 000+1
08660 15 02399 00001
08672 26 16291 16282
08684 11 16291 000+2
08696 21 16282 09191
08708 49 08788 00000
08719    00000
08720 21 16282 09191
08732 26 16291 16282
08744 49 08788 00000
08752
08752 26 16291 13571
08764 15 02399 00001
08776 25 08149 13563
08788 43 08824 16283
08800 25 14595 08149
08812 17 14564 J5100
08824 25 14883 08149
08836 17 14852 +8848
08848 43 08976 08171
08860 26 02411 16291
08872 26 02416 09191
08884 15 02400 00000
08896 43 09156 08170
08908 12 02411 000+1
08920 43 08944 08149
08932 32 02411 00000
08944 17 01778 +8956
08956 25 02399 13565
08968 49 08988 00000
08976
08976 15 02399 00001
08988 43 15100 15315
09000 43 09024 08149
09012 32 16291 00000
09024 15 17117 00001
09036 26 17343 09191
09048 17 01620 +9060
09060 33 16287 00000
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0973          TBTY,,,                          09072 34 00000 00108
0974          WNTYLOC-4,,,                     09084 38 16287 00100
0975          CF  DSC1C-4,,,                   09096 33 09187 00000
0976          SPTY,,,                          09108 34 00000 00101
0977          WNTYDSC1C-4,,,                   09120 38 09187 00100
0978          BD  LPA,DSC1S,,                  09132 43 15100 08171
0979          BTM  PNS ,LPA,,                  09144 17 17050 J5100
0980 DSC24    AM  CPR3A,1,10,                  09156 11 02411 000+1
0981          S   CPR3A,DSC1C                  09168 22 02411 09191
0982          B   DSC18,,,                     09180 49 08920 00000
0983          DORG *-4,                        09187
0984 DSC1C    DS  5,,                          09191     00005
0985          DC  1,@,,                        09192     00001
0986          DS  5,,                          09197     00005
0987 DSS      TFM DSS1D,0,,                CLEAR INDICATORS
                                               09198 16 09413 +0000
0988 DSS2     BTM SMB,*+12,,               OBTAIN SYMBOL
                                               09210 17 24236 +9222
0989          BD  DSS1 ,SMB1D+4,,          BRANCH IF LEGAL
                                               09222 43 09242 24828
0990          B   DSS6,,,                      09234 49 09414 00000
0991          DORG *-3                         09242
0992 DSS1     BD  DSS3 ,SMB1D+6,,          BRANCH IF DOLLAR
                                               09242 43 09286 24830
0993          BD  DSS4 ,SMB1D+5,,          BRANCH IF COMMA OR RM
                                               09254 43 09366 24829
0994          TDM DSS1A,1,,                CUM ARITH
                                               09266 15 09412 00001
0995          B   DSS2 ,,,                     09278 49 09210 00000
0996          DORG *-3                         09286
0997 DSS3     TDM DSS1D,1,,                DOLLAR
                                               09286 15 09413 00001
0998          BD  DSS6 ,DSS1A,,            ERROR IF CUM ARITH
                                               09298 43 09414 09412
0999          BTM DTA,*+12,,               LOOK UP DOLLAR TABLE
                                               09310 17 09444 +9322
1000          BD  DSS2 ,DTA1S,,            IGNORE IF ALREADY IN TABLE
                                               09322 43 09210 09714
1001          BTM DTB,*+12,,               INSERT IN TABLE
                                               09334 17 10872 +9346
1002          BD  DSS6 ,DTB1F,,            ERROR OR FULL
                                               09346 43 09414 11057
1003          B   DSS2 ,,,                 SEEK NEXT SYMBOL
                                               09358 49 09210 00000
1004          DORG *-3                         09366
1005 DSS4     TDM DSS1L,1,,                SET LEGAL
                                               09366 15 09410 00001
1006 DSS5     BNR DSS-1,SMB1T,6,           EXIT IF NO RM
                                               09378 45 0919P 24853
1007          TDM DSS1M,1,,                RM TERMINATION
                                               09390 15 09411 00001
1008          B   DSS-1,,6,                EXIT
                                               09402 49 0919P 00000
1009          DORG *-3                         09410
1010 DSS1L    DS  1,,                      LEGAL
                                               09410     00001
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1011 DSS1M DS   1,,                          RM TERMINATION
                                                 09411     00001
1012 DSS1A DS   1,,                          CUM ARITH
                                                 09412     00001
1013 DSS1D DS   1,,                          DOLLAR
                                                 09413     00001
1014 DSS6  BTM DSP,*+12,,                    ERROR. OPERAND ERROR
                                                 09414 17 11700 +9426
1015       BTM SCM,DSS5,,                    SEEK TERMINATION COMMA OR RM
                                                 09426 17 23996 +9378
1016       DS   5,,                                09442     00005
1017 DTA   TR   DTA2A,DTA1A,,                SET INDICATOR AND DIRECTORS INITIALLY
                                                 09444 31 09713 09660
1018 DTA1  AM   DTA1D,5,10,                  ADD FIVE TO POWER TWO DIRECTOR
                                                 09456 11 09724 000+5
1019       C    DTA1E,DTA1C,,                COMPARE EXAMINER WITH LIMIT
                                                 09468 24 09729 09666
1020       BNH  DTA2 ,,,                           09480 47 09540 01100
1021       C    SMB2S,DTA1E,11,             COMPARE SYMBOL WITH TABLE ENTRY
                                                 09492 24 24852 0972R
1022       BH   DTA2 ,,,                           09504 46 09540 01100
1023       TF   DTA1P,DTA1E,,               TRANSFER EXAMINER TO SYMBOL POSITION
                                                 09516 26 09719 09729
1024       BE   DTA5 ,,,                           09528 46 09612 01200
1025 DTA2  BNR  DTA3 ,DTA1D,11,                  09540 45 09560 0972M
1026       B    DTA-1,,6,                   EXIT IF SYMBOL NOT PRESENT
                                                 09552 49 0944L 00000
1027       DORG *-3                              09560
1028 DTA3  BH   DTA4 ,,,                         09560 46 09592 01100
1029       A    DTA1E,DTA1D,11,             INCREASE SYMBOL EXAMINER
                                                 09572 21 09729 0972M
1030       B    DTA1 ,,,                        09584 49 09456 00000
1031       DORG *-3                              09592
1032 DTA4  S    DTA1E,DTA1D,11,             DECREASE SYMBOL EXAMINER
                                                 09592 22 09729 0972M
1033       B    DTA1 ,,,                        09604 49 09456 00000
1034       DORG *-3                              09612
1035 DTA5  TDM  DTA1S,1,,                   SYMBOL PRESENT IN TABLE
                                                 09612 15 09714 00001
1036       SM   DTA1E,13,10,                SET TO EXTRACT VALUE
                                                 09624 12 09729 000J3
1037       TF   DTA1V,DTA1E,11,                  09636 26 09712 0972R
1038       B    DTA-1,,6,                       09648 49 0944L 00000
1039       DC   2,0,,                           09661     00002
1040 DTA1A DS   ,*-1,                           09660     00000
1041 DTA1C DSA  DTA1T,DTA2D-5,DTA1T-31*18
                                                 09666     00005 J0866
                                                 09671     00005 +9677
                                                 09676     00005 J0308
1042       DC   1,@,                             09677     00001
1043 DTA2D DSA  16*18,8*18,4*18,2*18,1*18
                                                 09682     00005 +0288
                                                 09687     00005 +0144
                                                 09692     00005 +0072
                                                 09697     00005 +0036
                                                 09702     00005 +0018
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1044         DC   5,@,,                    09707     00005
1045 DTA1V   DS   5,,                   SYMBOL VALUE
                                             09712     00005
1046 DTA2A   DS   1,,                        09713     00001
1047 DTA1S   DS   1,,                   SYMBOL PRESENT IF DIGIT
                                             09714     00001
1048 DTA1P   DS   5,,                   SYMBOL R.H.POSITION
                                             09719     00005
1049 DTA1D   DS   5,,                   POWER TWO DIRECTOR
                                             09724     00005
1050 DTA1E   DS   5,,                   SYMBOL R.H.EXAMINER
                                             09729     00005
1051         DS   1,,                        09730     00001
1052         DAS  1,,                        09733     00001
1053         DORG *-1,                       09732
1054 DTA1T   DS   63*18+1,,                  10866     01135
1055         DS   5,,                        10871     00005
1056 DTB     CM   DTA1C,DTA1T-62*18,,        10872 14 09666 +9750
1057         BL   DTB1  ,,,             BRANCH IF TABLE FULL
                                             10884 47 11036 01300
1058         TF   DTB1C,DTA1C,,         STORE LIMIT COUNTER
                                             10896 26 11063 09666
1059         SM   DTA1C,18,10,               10908 12 09666 000J8
1060         TF   DTB1P,DTA1P,               10920 26 11068 09719
1061         SM   DTB1P,18,10,          SET SYMBOL L.H.POSITION
                                             10932 12 11068 000J8
1062         TD   DTA1P,DTB1R,6,        SET RM IN TABLE
                                             10944 25 0971R 11058
1063         TD   SMB2S,DTB1R,,         SET RM AFTER SYMBOL
                                             10956 25 24852 11058
1064         TR   DTA1C,DTB1C,611,      MAKE ROOM IN TABLE
                                             10968 31 09660 1106L
1065         BNR  DTB1  ,DTB1P,11,           10980 45 11036 1106Q
1066         TR   DTB1P,SMB1R,6,        INSERT NEW SYMBOL
                                             10992 31 1106Q 24834
1067         TDM  DTA1P,0,6                  11004 15 0971R 00000
1068         AM   DTB1N,1,,             ADD 1 TO SYMBOL COUNT
                                             11016 11 11056 +0001
1069         B    DTB-1,,6,                  11028 49 1087J 00000
1070         DORG *-3                        11036
1071 DTB1    TDM  DTB1F,1,,                  11036 15 11057 00001
1072         B    DTB-1,,6,                  11048 49 1087J 00000
1073         DORG *-4                        11055
1074 DTB1N   DC   2,0,,                      11056     00002
1075 DTB1F   DC   1,0,,                      11057     00001
1076 DTB1R   DC   1,@,,                      11058     00001
1077 DTB1C   DS   5                          11063     00005
1078 DTB1P   DS   5                          11068     00005
1079         DS   5,,                        11073     00005
1080 DTC     TF   DTC1N,DTB1N,,              11074 26 11180 11056
1081         TFM  DTC1S,DTA1T-13,,           11086 16 11140 J0853
1082         TFM  DTC1V,4,711,               11098 16 11145 +000M
1083 DTC1    SM   DTC1N,1,10,                11110 12 11180 000+1
1084         BL   DTC-1,,6,                  11122 47 1107L 01300
1085         TFM  ,,,                        11134 16 00000 +0000
1086 DTC1S   DS   0,*-5,                     11140     00000
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1087 DTC1V DS  0,*,                                    11145     00000
1088       SM  DTC1S,18,10,                            11146 12 11140 000J8
1089       SM  DTC1V,5,10,                             11158 12 11145 000+5
1090       B   DTC1 ,,,                                11170 49 11110 00000
1091       DORG *-2                                    11179
1092 DTC1N DS  2,,                                     11180     00002
1093       DS  5,,                                     11185     00005
1094 ERP   TDM LPA1X,1,,                          SET ERROR INDICATOR
                                                       11186 15 16284 00001
1095       BTM  CDP ,*+12,,                       PRINT CARD IF NOT ALREADY PRINTED
                                                       11198 17 01620 J1210
1096       TBTY,,,                                TABULATE TYPEWRITER
                                                       11210 34 00000 00108
1097       WATYERP1A,,,                           PRINT ERROR MESSAGE
                                                       11222 39 11255 00100
1098       RCTY,,,                                RETURN CARRIAGE
                                                       11234 34 00000 00102
1099       B   ERP-1,,6,                               11246 49 1118N 00000
1100       DORG *-4,                                   11253
1101 ERP1A DAS 26,,                               FOR ERROR MESSAGE
                                                       11255     00026
1102       DS  5,,                                     11310     00005
1103 TMP   TR  ERP1A-1,TMP1A-1,,                       11312 31 11254 11336
1104       BT  ERP  ,TMP-1,,                           11324 27 11186 11311
1105 TMP1A DAC 16,TOO MANY DIGITS@,,                   11337     00016
1106       DS  5,,                                     11372     00005
1107 FLP   TR  ERP1A-1,FLP1A-1,,                       11374 31 11254 11398
1108       BT  ERP  ,FLP-1,,                           11386 27 11186 11373
1109 FLP1A DAC 21,INVALID FIELD LENGTH@,,
                                                       11399     00021
1110       DS  5,,                                     11444     00005
1111 CEP   TR  ERP1A-1,CEP1A-1,,                       11446 31 11254 11470
1112       BT  ERP  ,CEP-1,,                           11458 27 11186 11445
1113 CEP1A DAC 21,PROGRAMME CARD ERROR@,,
                                                       11471     00021
1114       DS  5,,                                     11516     00005
1115 EVP   TR  ERP1A-1,EVP1A-1,,                       11518 31 11254 11542
1116       BT  ERP  ,EVP-1,,                           11530 27 11186 11517
1117 EVP1A DAC 14,COMMA MISSING@,,                     11543     00014
1118       DS  5,,                                     11574     00005
1119 SCP   TR  ERP1A-1,SCP1A-1,,                       11576 31 11254 11600
1120       BT  ERP  ,SCP-1,,                           11588 27 11186 11575
1121 SCP1A DAC 18,ILLEGAL CHARACTER@,,                 11601     00018
1122       DS  5,,                                     11640     00005
1123 LBP   TR  ERP1A-1,LBP1A-1,,                       11642 31 11254 11666
1124       BT  ERP  ,LBP-1,,                           11654 27 11186 11641
1125 LBP1A DAC 14,ILLEGAL LABEL@,,                     11667     00014
1126       DS  5,,                                     11698     00005
1127 DSP   TR  ERP1A-1,DSP1A-1,,                       11700 31 11254 11724
1128       BT  ERP  ,DSP-1,,                           11712 27 11186 11699
1129 DSP1A DAC 14,OPERAND ERROR@,,                     11725     00014
1130       DS  5,,                                     11756     00005
1131 LPP   TR  ERP1A-1,LPP1A-1,,                       11758 31 11254 11782
1132       BT  ERP  ,LPP-1,,                           11770 27 11186 11757
1133 LPP1A DAC 18,ILLEGAL OPERATION@,,                 11783     00018
1134       DS  5,,                                     11822     00005
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1135 LLP    TR  ERP1A-1,LLP1A-1,,          11824 31 11254 11848
1136        BT  ERP  ,LLP-1,,              11836 27 11186 11823
1137 LLP1A  DAC 25,LABEL PREVIOUSLY DEFINED@,,
                                           11849    00025
1138        DS  5,,                        11902    00005
1139 LLE    TR  ERP1A-1,LLE1A-1,,          11904 31 11254 11928
1140        BT  ERP  ,LLE-1,,              11916 27 11186 11903
1141 LLE1A  DAC 18,SYMBOL TABLE FULL@,,    11929    00018
1142        DS  5,,                        11968    00005
1143 LEP    TR  ERP1A-1,LEP1A-1,,          11970 31 11254 11994
1144        BT  ERP  ,LEP-1,,              11982 27 11186 11969
1145 LEP1A  DAC 12,PHASE ERROR@,,          11995    00012
1146        DS  5,,                        12022    00005
1147 UDP    TR  ERP1A-1,UDP1A-1,,          12024 31 11254 12048
1148        BT  ERP  ,UDP-1,,              12036 27 11186 12023
1149 UDP1A  DAC 17,UNDEFINED SYMBOL@,,     12049    00017
1150        DS  5,,                        12086    00005
1151 REP    TR  ERP1A-1,REP1A-1,,          12088 31 11254 12112
1152        BT  ERP  ,REP-1,,              12100 27 11186 12087
1153 REP1A  DAC 17,RELOCATION ERROR@,,     12113    00017
1154        DS  5                          12150    00005
1155 EVA    TR  EVASR,SMB1B+22,,      CLEAR INDICATORS
                                           12152 31 13557 24814
1156        TF  EVA1T,SMB1B+5,,       SET ZERO AND FLAG TOTAL FIELD
                                           12164 26 13571 24797
1157        TF  EVA2T,SMB1B+5,,       SET ZERO AND FLAG TOTALR FIELD
                                           12176 26 13577 24797
1158 EVA1   BTM SMB,*+12,,            OBTAIN NEW SYMBOL
                                           12188 17 24236 J2200
1159        BD  EVA3,SMB1D+4,,        PROCEDE IF LEGAL
                                           12200 43 12240 24828
1160        B   EVA31,,,              ERROR
                                           12212 49 13276 00000
1161        DORG *-3                       12220
1162 EVA2   TDM EVATS,1,,                  12220 15 13565 00001
1163        B   EVA4,,,                    12232 49 12252 00000
1164        DORG *-3                       12240
1165 EVA3   BD  EVA2,SMB1D+1,,             12240 43 12220 24825
1166 EVA4   BD  EVA5,SMB1D+6,,        DOLLAR
                                           12252 43 12380 24830
1167        BD   EVA7,SMB1D+2,,       NOT NUMBER
                                           12264 43 12484 24826
1168        TD  EVA1S,SMB1S+11,,      OBTAIN DECIMAL NUMBER
                                           12276 25 13595 24851
1169        TD  EVA1S-1,SMB1S+9,,          12288 25 13594 24849
1170        TD  EVA1S-2,SMB1S+7,,          12300 25 13593 24847
1171        TD  EVA1S-3,SMB1S+5,,          12312 25 13592 24845
1172        TD  EVA1S-4,SMB1S+3,,          12324 25 13591 24843
1173        TD  EVA1S-5,SMB1S+1,,          12336 25 13590 24841
1174        SF  EVA1S-5,,,                 12348 32 13590 00000
1175        TDM EVASR,0,,                  12360 15 13557 00000
1176        B   EVA11                      12372 49 12588 00000
1177        DORG *-3                       12380
1178 EVA5   BD  EVA31,EVATC,,         ERROR IF CUM ARITH
                                           12380 43 13276 13561
1179        BTM DTA,*+12,,            SEEK DOLLAR SYMBOL VALUE
                                           12392 17 09444 J2404
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1180          BD   EVA6,DTA1S,,          SYMBOL PRESENT
                                              12404 43 12428 09714
1181          BTM  LEP,EVA31,,           PHASE ERROR
                                              12416 17 11970 J3276
1182 EVA6     TF   EVA1T,DTA1V,,         SET SYMBOL VALUE IN TOTAL
                                              12428 26 13571 09712
1183          BTM  SMB,*+12,,            OBTAIN NEXT SYMBOL
                                              12440 17 24236 J2452
1184          BD   EVA31,SMB1D+1,,       ERROR IF NOT BLANK
                                              12452 43 13276 24825
1185          BD   EVA32,SMB1D+5,,       PROCEDE IF BLANK COMMA OR BLANK R.M.
                                              12464 43 13300 24829
1186          B    EVA31,,,              ERROR
                                              12476 49 13276 00000
1187          DORG *-3                        12484
1188 EVA7     BD   EVA8 ,SMB1D+3,,       ASTERISK
                                              12484 43 12532 24827
1189          BTM  RTA,*+12,,            SEEK SYMBOL VALUE
                                              12496 17 17960 J2508
1190          BD   EVA9,RTA1S,,          SYMBOL PRESENT
                                              12508 43 12564 18273
1191          BTM  UDP,EVA31,,           UNDEFINED SYMBOL PRINT, ERROR
                                              12520 17 12024 J3276
1192 EVA8     TF   EVA1S,ILC,,           OBTAIN ASTERISK VALUE
                                              12532 26 13595 16282
1193          TDM  EVASR,1,,             RELATIVE VALUE
                                              12544 15 13557 00001
1194          B    EVA11                      12556 49 12588 00000
1195          DORG *-3                        12564
1196 EVA9     TF   EVA1S,RTA1V,,         SET SYMBOL VALUE
                                              12564 26 13595 18271
1197          TD   EVASR,RTA1R,,         SET SYMBOL TYPE
                                              12576 25 13557 18274
1198 EVA11    TDM  EVATC,1,,             SET DIGIT IN CUM ARITH
                                              12588 15 13561 00001
1199          BD   EVA21,EVAPF,,         BRANCH IF PROD OCCUPIED
                                              12600 43 12872 13558
1200          BD   EVA17,SMB1D+8,,       BRANCH IF SYMBOL MULT
                                              12612 43 12784 24832
1201          BD   EVA15,EVATM,,         BRANCH IF TOTAL MINUS
                                              12624 43 12732 13560
1202          A    EVA1T,EVA1S,,         ADD SYMBOL TO TOTAL
                                              12636 21 13571 13595
1203          BD   EVA14,EVASR,,         BRANCH IF SYMBOL REL
                                              12648 43 12712 13557
1204 EVA12    BD   EVA13,SMB1D+7,,       BRANCH IF SYMBOL ARITH
                                              12660 43 12692 24831
1205          BD   EVA33,SMB1D+5,,       BRANCH IF COMMA OR RM
                                              12672 43 13344 24829
1206          B    EVA31,,,              ERROR
                                              12684 49 13276 00000
1207          DORG *-3                        12692
1208 EVA13    TD   EVATM,SMB1D+9,,       SYMBOL MINUS TO TOTAL MINUS
                                              12692 25 13560 24833
1209          B    EVA1,,,               READ NEW SYMBOL
                                              12704 49 12188 00000
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1210         DORG *-3                          12712
1211 EVA14   AM   EVA2T,1,10,                  ADD 1 TO TOTAL
                                                12712 11 13577 000+1
1212         B    EVA12,,,                     12724 49 12660 00000
1213         DORG *-3                          12732
1214 EVA15   S    EVA1T,EVA1S,,                SUBTRACT SYMBOL FROM TOTAL
                                                12732 22 13571 13595
1215         BD   EVA16,EVASR,,                BRANCH IF SYMBOL REL
                                                12744 43 12764 13557
1216         B    EVA12,,,                     12756 49 12660 00000
1217         DORG *-3                          12764
1218 EVA16   SM   EVA2T,1,10,                  SUBTRACT 1 FROM TOTALR
                                                12764 12 13577 000+1
1219         B    EVA12,,,                     12776 49 12660 00000
1220         DORG *-3                          12784
1221 EVA17   TD   EVAPR,EVASP,,                SYMBOL REL TO PROD REL
                                                12784 25 13559 13557
1222         TF   EVA1P,EVA1S,,                SYMBOL VALUE TO PROD
                                                12796 26 13583 13595
1223         BD   EVA19,EVASR,,                BRANCH IF SYMBOL REL
                                                12808 43 12852 13557
1224         TF   EVA2P,EVA1S,,                SYMBOL VALUE TO PRODR
                                                12820 26 13589 13595
1225 EVA18   TDM  EVAPF,1,,                    SET DIGIT IN PROD OCCUPIED
                                                12832 15 13558 00001
1226         B    EVA1,,,                      OBTAIN NEW SYMBOL
                                                12844 49 12188 00000
1227         DORG *-3                          12852
1228 EVA19   TFM  EVA2P,1,10,                  1 TO PRODR
                                                12852 16 13589 000+1
1229         B    EVA18,,,                     12864 49 12832 00000
1230         DORG *-3                          12872
1231 EVA21   BD   EVA22,EVASR,,                BRANCH IF SYMBOL REL
                                                12872 43 12892 13557
1232         B    EVA23                        12884 49 12916 00000
1233         DORG *-3                          12892
1234 EVA22   BD   EVA31,EVAPR,,                ERROR IF ALSO PROD REL
                                                12892 43 13276 13559
1235         TDM  EVAPR,1,,                    12904 15 13559 00001
1236 EVA23   M    EVA1P,EVA1S,,                MULTIPLY PROD BY SYMBOL VALUE
                                                12916 23 13583 13595
1237         SF   94,,,                        12928 32 00094 00000
1238         BD   EVA29,SMB1D+8,,              BRANCH IF SYMBOL MULT
                                                12940 43 13196 24832
1239         TDM  EVAPF,0,,                    CLEAR PROD OCCUPIED
                                                12952 15 13558 00000
1240         BD   EVA26,EVATM,,                BRANCH IF TOTAL MINUS
                                                12964 43 13084 13560
1241         A    EVA1T,99,,                   12976 21 13571 00099
1242         BD   EVA24,EVAPR,,                BRANCH IF DIGIT IN PROD REL
                                                12988 43 13008 13559
1243         B    EVA12,,,                     13000 49 12660 00000
1244         DORG *-3                          13008
1245 EVA24   BD   EVA25,EVASR,,                BRANCH IF DIGIT IN SYMB REL
                                                13008 43 13064 13557
1246         M    EVA2P,EVA1S,,                MULT PRODR BY SYMBOL VALUE
                                                13020 23 13589 13595
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1247         SF   94,,,                    13032 32 00094 00000
1248         A    EVA2T,99;,               ADD TO TOTALR
                                           13044 21 13577 00099
1249         B    EVA12,,,                 13056 49 12660 00000
1250         DORG *-3                      13064
1251 EVA25   A    EVA2T,EVA2P,,            ADD PRODR TO TOTALR
                                           13064 21 13577 13589
1252         B    EVA12,,,                 13076 49 12660 00000
1253         DORG *-3                      13084
1254 EVA26   S    EVA1T,99,,               SUBTRACT FROM TOTAL
                                           13084 22 13571 00099
1255         BD   EVA27,EVAPR,,            BRANCH IF PROD REL
                                           13096 43 13116 13559
1256         B    EVA12,,,                 13108 49 12660 00000
1257         DORG *-3                      13116
1258 EVA27   BD   EVA28,EVASR,,            BRANCH IF SYMBOL REL
                                           13116 43 13172 13557
1259         M    EVA2P,EVA1S,,            MULT PRODR BY SYMBOL VALUE
                                           13128 23 13589 13595
1260         SF   94,,,                    13140 32 00094 00000
1261         S    EVA2T,99,,               SUBTRACT FROM TOTALR
                                           13152 22 13577 00099
1262         B    EVA12                    13164 49 12660 00000
1263         DORG *-3                      13172
1264 EVA28   S    EVA2T,EVA2P,,            SUBTRACT PRODR FROM TOTALR
                                           13172 22 13577 13589
1265         B    EVA12                    13184 49 12660 00000
1266 EVA29   TF   EVA1P,99,,               TRANSFER PROD BY SYMBOL TO PROD
                                           13196 26 13583 00099
1267         BD   EVA1,EVASR,,             BRANCH IF SYMBOL REL
                                           13208 43 12188 13557
1268         M    EVA2P,EVA1S,,            MULT PRODR BY SYMBOL VALUE
                                           13220 23 13589 13595
1269         SF   94,,,                    13232 32 00094 00000
1270         TF   EVA2P,99,,               TRANSFER TO PRODR
                                           13244 26 13589 00099
1271         B    EVA1,,,                  OBTAIN NEW SYMBOL
                                           13256 49 12188 00000
1272         DORG *-3                      13264
1273 EVA37   BTM REP,*+12,,                RELOCATION ERROR PRINT
                                           13264 17 12088 J3276
1274 EVA31   BD   EVA35,SMB1D+5,,          FOR ERRORS. TEST IF END OF EXPRESSION
                                           13276 43 13392 24829
1275         BTM SMB,*-12,,                OBTAIN NEW SYMBOL AND TEST AGAIN
                                           13288 17 24236 J3276
1276 EVA32   TDM EVATD,1,,                 FOR DOLLAR SYMBOL
                                           13300 15 13564 00001
1277         TDM EVATR,1,,                 SET TOTAL DOLLAR,REL AND NOT BLANK
                                           13312 15 13563 00001
1278         TDM EVATS,1,,                 13324 15 13565 00001
1279         B    EVA34,,,                 13336 49 13356 00000
1280         DORG *-3                      13344
1281 EVA33   BD   EVA36,EVATS,,            BRANCH IF TOTAL NOT BLANK
                                           13344 43 13416 13565
1282 EVA34   SF   EVA1T-4,,,               SET FLAG ON 5TH DIGIT OF TOTAL
                                           13356 32 13567 00000
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1283         TDM EVATL,1,,          SET TOTAL LEGAL
                                        13368 15 13562 00001
1284         BD  EVA-1,EVATS,6,     EXIT IF TOTAL NOT BLANK
                                        13380 43 1215J 13565
1285 EVA35   TFM EVA1T,0,,          CLEAR AND SET FIVE DIGIT FIELD
                                        13392 16 13571 +0000
1286         B   EVA-1,,6,          EXIT
                                        13404 49 1215J 00000
1287 EVA36   CM  EVA2T,0,10,            13416 14 13577 000+0
1288         BE  EVA38,,,           BRANCH IF ABSOLUTE EXPRESSION
                                        13428 46 13476 01200
1289         CM  EVA2T,1,10,            13440 14 13577 000+1
1290         BNE EVA37,,,           BRANCH IF RELOCATION ERROR
                                        13452 47 13264 01200
1291         TDM EVATR,1,,          EXPRESSION RELOCATABLE
                                        13464 15 13563 00001
1292 EVA38   BNF EVA39,EVA1T,,      BRANCH IF NEGATIVE OR NEGATIVE ZERO
                                        13476 44 13508 13571
1293         A   EVA1T,EVACS,,       ADD CORE STORAGE SIZE
                                        13488 21 13571 13556
1294         B   EVA38,,,                13500 49 13476 00000
1295         DORG *-3,                  13508
1296 EVA39   C   EVA1T,EVACS,,       COMPARE TOTAL WITH CORE STORAGE SIZE
                                        13508 24 13571 13556
1297         BL  EVA34,,,           PROCEED IF WITHIN CORE STORAGE SIZE
                                        13520 47 13356 01300
1298         S   EVA1T,EVACS,,      OTHERWISE SUNTRACT CORE STORAGE SIZE
                                        13532 22 13571 13556
1299         B   EVA39                  13544 49 13508 00000
1300         DORG *-4                   13551
1301 EVACS   DC  6,60000,,          CORE STORAGE SIZE
                                        13556    00006
1302 EVASR   DS  1,,                SYMBOL REL INDICATOR
                                        13557    00001
1303 EVAPF   DS  1,,                PRODUCT OCCUPIED INDICATOR
                                        13558    00001
1304 EVAPR   DS  1,,                PRODUCT REL INDICATOR
                                        13559    00001
1305 EVATM   DS  1,,                TOTAL MINUS INDICATOR
                                        13560    00001
1306 EVATC   DS  1,,                TOTAL CUM ARITH INDICATOR
                                        13561    00001
1307 EVATL   DS  1,,                TOTAL LEGAL INDICATOR
                                        13562    00001
1308 EVATR   DS  1,,                TOTAL REL INDICATOR
                                        13563    00001
1309 EVATD   DS  1,,                TOTAL DOLLAR INDICATOR
                                        13564    00001
1310 EVATS   DS  1,,                TOTAL NOT BLANK INDICATOR
                                        13565    00001
1311 EVA1T   DS  6,,                6 DIGIT TOTAL FIELD
                                        13571    00006
1312 EVA2T   DS  6,,                6 DIGIT TOTALR FIELD
                                        13577    00006
1313 EVA1P   DS  6,,                6 DIGIT PROD FIELD
                                        13583    00006
```

```
1314 EVA2P DS   6,,

1315 EVA1S DS   6,,

1316       DS   5
1317 EVF   TDM  EVF1P,0,,

1318 EVF1P DS   0,*-1,

1319 EVF7F DS   0,*-2,

1320       BNR  EVF4,SMB1T,,
1321       B    EVF1,,,
1322       DORG *-3
1323 EVF4  TF   SMB1T,SMB1E,11,

1324       AM   SMB1E,2,10,
1325       BNR  EVF3 ,SMB1T,,
1326       BD   EVF-1,EVF1P,6,
1327 EVF1  BD   EVF2 ,EVF7F,,
1328       B    EVF-1,,6,
1329       DORG *-3
1330 EVF2  SF   CPR4R+9,,,
1331       B    EVF-1,,6,
1332       DORG *-3
1333 EVF3  BD   EVF6 ,EVF1P,,
1334       CM   SMB1T,0,10,
1335       BE   EVF4,,,

1336       CM   SMB1T,23,10,
1337       BE   EVF1,,,

1338       CM   SMB1T,70,10,
1339       BNL  EVF5,,,
1340       BTM  EVP,EVF1,,

1341 EVF5  TDM  EVF1P,1,,
1342 EVF6  CM   SMB1T,71,10,
1343       BL   EVF8 ,,,
1344       BE   EVF9 ,,,
1345 EVF7  TDM  SMB2S,0,11
1346       B    EVF16,,,
1347       DORG *-3
1348 EVF8  CM   SMB1T,70,10,
1349       BL   EVF-1,,6,
1350       BE   EVF7 ,,,
1351 EVF9  BNR  EVF11,SMB1E,11,
1352       B    EVF7
1353       DORG *-3
1354 EVF11 CM   SMB1E,71,610,
1355       BE   EVF14,,,
1356       BH   EVF7 ,,,
1357 EVF12 CM   SMB1E,70,610,
1358       BL   EVF7 ,,,
1359 EVF13 TD   SMB1T,SMB1E,11,
1360       AM   SMB1E,2,10,
```

```
6 DIGIT PRODR FIELD
    13589    00006
5 OR 6 DIGIT SYMBOL VALUE FIELD
    13595    00006
    13600    00005
CLEAR FLAGS PRESENT INDICATOR
    13602 15 13612 00000
FLAGS PRESENT INDICATOR
    13612    00000
FLAG 7 INDICATOR
    13611    00000
    13614 45 13634 24853
    13626 49 13682 00000
    13634
TRANSFER CHARACTER TO STORE
    13634 26 24853 2425R
    13646 11 24259 000+2
    13658 45 13722 24853
    13670 43 1360J 13612
    13682 43 13702 13611
    13694 49 1360J 00000
    13702
SET 13702 32 02528 00000 ELD INSTRUCTIO ,
    13714 49 1360J 00000
    13722
    13722 43 13830 13612
    13734 14 24853 000+0
IGNORE BLANKS
    13746 46 13634 01200
    13758 14 24853 000K3
EXIT IF NO FLAGS SPECIFIED
    13770 46 13682 01200
    13782 14 24853 000P0
    13794 46 13818 01300
ERROR, COMMA MISSING
    13806 17 11518 J3682
    13818 15 13612 00001
    13830 14 24853 000P1
    13842 47 13886 01300
    13854 46 13922 01200
    13866 15 24852 0000+
    13878 49 14126 00000
    13886
    13886 14 24853 000P0
    13898 47 1360J 01300
    13910 46 13866 01200
    13922 45 13942 2425R
    13934 49 13866 00000
    13942
    13942 14 2425R 000P1
    13954 46 14046 01200
    13966 46 13866 01100
    13978 14 2425R 000P0
    13990 47 13866 01300
    14002 25 24853 2425R
    14014 11 24259 000+2
```

```
1361          TDM SMB2S,1,11,
1362          B   EVF16,,,
1363          DORG *-3
1364 EVF14   TF  EVF1E,SMB1E,,
1365          AM  EVF1E,2,10,
1366          BNR EVF15,*,,
1367 EVF1E   DS  0,*,
1368          B   EVF13,,,
1369          DORG *-3,
1370 EVF15   CM  EVF1E,70,610,
1371          BL  EVF13,,,
1372          BNL EVF7 ,,,
1373 EVF16   TFM EVF1S,CPR4R,,
1374          CM  SMB1T,6,10,
1375          BH  EVF17,,,
1376          CM  SMB1T,1,10,
1377          BH  EVF18,,,
1378          B   EVF19,,,
1379          DORG *-3,
1380 EVF17   AM  SMB1T,1,10,
1381 EVF18   AM  SMB1T,1,10,
1382 EVF19   A   EVF1S,SMB1T,,
1383          SF    *   ,,,
1384 EVF1S   DS  0,*-5,
1385          B   EVF4 ,,,
1386          DORG *-4
1387          DS  5
1388 LAB     TDM RCD+22,,,
1389          DC  1,@,*,
1390          TFM SMB1E,RCD+10,,
1391          TFM LAB2D+4,0,,
1392          BTM SMB,*+12,,
1393          TR  LAB1D+1,SMB1D+1,,
1394          BD  LAB1 ,LAB1D+4,,
1395          B   LAB8 ,,,
1396          DORG *-3
1397 LAB1    BD  LAB6 ,LAB1D+6,,
1398          BNR LAB8 ,LAB1T,,
1399          BD  LAB2 ,LAB1D+1,,
1400          B   LAB-1,,6,
1401          DORG *-3
1402 LAB2    BD  LAB3 ,LAB1D+2,,
1403          B   LAB8 ,,,
1404          DORG *-3
1405 LAB3    BD  LAB8 ,LAB1D+3,,

     14026 15 24852 0000J
     14038 49 14126 00000
     14046
     14046 26 14081 24259
     14058 11 14081 000+2
     14070 45 14090 14070
     14081    00000
     14082 49 14002 00000
     14090
     14090 14 1408J 000P0
     14102 47 14002 01300
     14114 46 13866 01300
     14126 16 14236 +2519
     14138 14 24853 000+6
     14150 46 14194 01100
     14162 14 24853 000+1
     14174 46 14206 01100
     14186 49 14218 00000
     14194
     14194 11 24853 000+1
     14206 11 24853 000+1
     14218 21 14236 24853
     14230 32 14230 00000
     14236    00000
     14242 49 13634 00000
     14249
     14253    00005
SET RM
     14254 15 00781 00000
     14265    00001
SET EXTRACTOR FOR LABEL
     14266 16 24259 +0769
CLEAR LABEL INDICATORS
     14278 16 14526 +0000
     14290 17 24236 J4302
TRANSFER SYMBOL AND INDICATORS
     14302 31 14528 24825
IS SYMBOL LEGAL
     14314 43 14334 14531
ERROR
     14326 49 14510 00000
     14334
IS SYMBOL DOLLAR
     14334 43 14446 14533
ERROR
     14346 45 14510 14556
IS SYMBOL BLANK
     14358 43 14378 14528
     14370 49 1425L 00000
     14378
IS SYMBOL NUMBER
     14378 43 14398 14529
ERROR
     14390 49 14510 00000
     14398
IS SYMBOL ASTERISK
     14398 43 14510 14530
```

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1406 LAB4   TDM LAB2D+2,1,,          REL TABLE
                                          14410 15 14524 00001
1407 LAB5   TDM LAB2D+1,1,,          SYMBOL PRESENT
                                          14422 15 14523 00001
1408        B   LAB-1,,6,            EXIT
                                          14434 49 1425L 00000
1409 LAB6   TDM LAB2D+3,1,,          DOLLAR
                                          14446 15 14525 00001
1410        BD  LAB7 ,LAB1D+1,,      IS SYMBOL BLANK
                                          14458 43 14490 14528
1411        TDM LAB1D+4,1,,          BLANK DOLLAR
                                          14470 15 14531 00001
1412        B   LAB5 ,,,                  14482 49 14422 00000
1413        DORG *-3                      14490
1414 LAB7   BD  LAB4 ,LAB1D+2,,           14490 43 14410 14529
1415        B   LAB5 ,,,                  14502 49 14422 00000
1416        DORG *-3                      14510
1417 LAB8   BTM LBP,LAB-1,711,       ERROR PRINT AND EXIT
                                          14510 17 11642 J425L
1418 LAB2D  DSB 1,5,,                     14522    00001 00005
1419 LAB1D  DS  1,,                       14527    00001
1420 LAB1R  DS  10,,                      14537    00010
1421 LAB1V  DS  5,,                       14542    00005
1422 LAB1S  DS  1,,                       14543    00001
1423 LAB2S  DS  12,,                      14555    00012
1424 LAB1T  DS  1,,                       14556    00001
1425        DS  2,,                       14558    00002
1426        DS  5,,                       14563    00005
1427 LLA    BTM  LAB ,*+12,,         OBTAIN LABEL
                                          14564 17 14254 J4576
1428        BD  LLA1 ,LAB2D+1,,           14576 43 14596 14523
1429        B   LLA-1,,6,            EXIT IF NO LABEL
                                          14588 49 1456L 00000
1430 LLA1R  DS  ,*-4,                LABEL REL INDICATOR
                                          14595    00000
1431        DORG *-3,                     14596
1432 LLA1   BD  LLA7 ,LAB2D+2,,      EXAMINE REL TABLE INDICATOR
                                          14596 43 14744 14524
1433 LLA2   BD  LLA3 ,LAB2D+3,,      EXAMINE DOLLAR INDICATOR
                                          14608 43 14628 14525
1434        B   LLA-1,,6,                 14620 49 1456L 00000
1435        DORG *-3,                     14628
1436 LLA3   BD  LLA4 ,LLA1R,,        EXAMINE LABEL REL INDICATOR
                                          14628 43 14652 14595
1437        BTM  LBP ,LLA-1,711,     ERROR, ILLEGAL LABEL
                                          14640 17 11642 J456L
1438 LLA4   BD  LLA-1,LPA1V,6,       EXAMINE TITLE INDICATOR
                                          14652 43 1456L 16286
1439        TF  SMB1V,LOC,,          SET VALUE
                                          14664 26 24839 16291
1440        TDM SMB2S,,,             SET RM
                                          14676 15 24852 00000
1441        DC  1,@,*,                    14687    00001
1442        TR  PTC4R,SMB1R,,        SET TITLE CARD
                                          14688 31 17874 24834
1443        TDM LPA1V,1,,            AND INDICATOR
                                          14700 15 16286 00001
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1444          B    LLA-1,,6,                EXIT
                                                14712 49 1456L 00000
1445          DORG *-3,                             14720
1446 LLA5     BTM  LLE ,LLA2,,              ERROR, SYMBOL TABLE FULL
                                                14720 17 11904 J4608
1447 LLA6     BTM  LLP ,LLA8,,              ERROR, SYMBOL PREV DEFINED
                                                14732 17 11824 J4768
1448 LLA7     BTM  RTA ,*+12,,              LOOK UP LABEL
                                                14744 17 17960 J4756
1449          BD   LLA6 ,RTA1S,,            BRANCH IF ALREADY DEFINED
                                                14756 43 14732 18273
1450 LLA8     TF   SMB1V,LOC,,              SET VALUE
                                                14768 26 24839 16291
1451          SF   SMB1V,,,                 SET FLAG
                                                14780 32 24839 00000
1452          BD   *+24 ,LLA1R,,                    14792 43 14816 14595
1453          CF   SMB1V,,,                 CLEAR FLAG IF ABSOLUTE
                                                14804 33 24839 00000
1454          BTM  RTB ,*+12,,              ENTER LABEL
                                                14816 17 22888 J4828
1455          BD   LLA5 ,RTB1F,,            BRANCH IF FULL
                                                14828 43 14720 23059
1456          B    LLA2 ,,,                 EXIT
                                                14840 49 14608 00000
1457          DORG *-4                              14847
1458          DS   5,,                              14851    00005
1459 LLB      BTM  LAB ,*+12,,              OBTAIN LABEL
                                                14852 17 14254 J4864
1460          BD   LLB1 ,LAB2D+1,,                  14864 43 14884 14523
1461          B    LLB-1,,6,                EXIT IF NO LABEL
                                                14876 49 1485J 00000
1462 LLB1R    DS   ,*-4,                    LABEL REL INDICATOR
                                                14883    00000
1463          DORG *-3,                             14884
1464 LLB1     BD   LLB6 ,LAB2D+2,,          EXAMINE LABEL REL INDICATOR
                                                14884 43 14984 14524
1465 LLB2     BD   LLB3 ,LAB2D+3,,          EXAMINE DOLLAR INDICATOR
                                                14896 43 14916 14525
1466          B    LLB-1,,6,                EXIT
                                                14908 49 1485J 00000
1467          DORG *-3 ,                            14916
1468 LLB3     BD   LLB4 ,LLB1R,,            EXAMINE LABEL REL INDICATOR
                                                14916 43 14940 14883
1469          BTM  LBP ,LLB-1,711,          ERROR, ILLEGAL LABEL
                                                14928 17 11642 J485J
1470 LLB4     BD   LLB5 ,LPA1V,,            EXAMINE TITLE INDICATOR
                                                14940 43 14972 16286
1471          TDM  LPA1V,1,,                SET TITLE INDICATOR
                                                14952 15 16286 00001
1472          B    LLB-1,,6,                EXIT
                                                14964 49 1485J 00000
1473          DORG *-3 ,                            14972
1474 LLB5     BTM  PSC ,LLB-1,711,          PUNCH OUT SYN CARD AND EXIT
                                                14972 17 17354 J485J
1475 LLB6     BTM  RTA ,*+12,,              LOOK UP LABEL
                                                14984 17 17960 J4996
1476          BD   LLB8 ,RTA1S,,            BRANCH IF PRESENT
                                                14996 43 15020 18273
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1477 LLB7   BTM  LEP ,LLB2,,
1478 LLB8   BD   LLB11,RTA1R,,
1479        BD   LLB7 ,LLB1R,,
1480 LLB9   C    RTA1V,LOC,,
1481        BE   LLB2 ,,,
1482        B    LLB7 ,,,
1483        DORG *-3 ,
1484 LLB11  BD   LLB9 ,LLB1R,,
1485        B    LLB7 ,,,
1486        DORG *-4
1487        DS   5
1488 LPA    BNR  LPA1,RCT,,
1489        RACDRCD
1490        TDM  LPA1P,0,,
1491        TFM  LPA1E,RCD+150,,
1492 LPA21  SM   LPA1E,2,10,
1493        TF   LPA1B,,,
1494 LPA1E  DS   ,*,
1495        BNF  LPA22,LPA1B-1,,
1496        BD   LPA23,LPA1B-1,,
1497        BD   LPA23,LPA1B,,
1498        B    LPA21,,,
1499        DORG *-4,
1500 LPA1B  DS   9,,
1501 LPA22  AM   LPA1E,2,10,
1502 LPA23  AM   LPA1E,2,10,
1503        TFM  LPA1E,,6,
1504        DC   2,@,*
1505        TDM  CDP1P,1,,
1506        CM   LPA1E,RCD+70,,
1507        BNH  LPA2 ,,,
1508        TDM  CDP1P,0,,
1509        B    LPA2 ,,,
1510 LPA1S  DS   ,*-4,
1511        DORG *-3
1512 LPA1   TR   RCD-1,RCT,11,
1513        TR   RCT-4,RCT+1,,
1514        TDM  LPA1P,1,,
1515 LPA2   BD   LPA18,LPA1S,,
1516        BD   LPA24,LPA2T,,
1517        B    LPA18,,,
1518        DORG *-3,
1519 LPA24  RCTY ,,,
1520 LPA18  CM   RCD+10,14,10,
1521        BNE  LPA17
1522        BD   LPA,LPA1S,,
1523        BD   LPA16,LPA2T
1524        B    LPA ,,,
1525        DORG *-3 ,
1526 LPA16  WATYRCD+10,,,
1527        B    LPA , ,
```

```
PHASE ERROR
    15008 17 11970 J4896
COMPARE
    15020 43 15076 18274
DIGITS
    15032 43 15008 14883
COMPARE VALUES
    15044 24 18271 16291
    15056 46 14896 01200
    15068 49 15008 00000
    15076
    15076 43 15044 14883
    15088 49 15008 00000
    15095
    15099    00005
BRANCH IF MACRO
    15100 45 15316 16297
    15112 37 00759 00500
    15124 15 16285 00000
    15136 16 15171 +0909
    15148 12 15171 000+2
    15160 26 15223 00000
    15171    00000
    15172 44 15224 15222
    15184 43 15236 15222
    15196 43 15236 15223
    15208 49 15148 00000
    15215
    15223    00009
    15224 11 15171 000+2
    15236 11 15171 000+2
    15248 16 1517J 00000
    15259    00002
    15260 15 01763 00001
    15272 14 15171 +0829
    15284 47 15352 01100
    15296 15 01763 00000
    15308 49 15352 00000
    15315    00000
    15316
    15316 31 00758 1629P
    15328 31 16293 16298
    15340 15 16285 00001
    15352 43 15396 15315
    15364 43 15384 16283
    15376 49 15396 00000
    15384
    15384 34 00000 00102
    15396 14 00769 000J4
    15408 47 15484 01200
    15420 43 15100 15315
    15432 43 15452 16283
    15444 49 15100 00000
    15452
    15452 39 00769 00100
    15464 49 15100 00000
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1528         DORG *-3,                          15472
1529 LPA29   B    CTA1V,,6,                     15472 49 0287J 00000
1530 LPA17   TF   CDP3S+4,RCD+8,,           SERIAL NO.
                                                15484 26 01769 00767
1531         TF   CTA4S+6,RCD+28,,          OPERATION
                                                15496 26 02879 00787
1532         TDM  RCD+22,,,                     15508 15 00781 00000
1533         DC   1,@,*,                        15519    00001
1534         BTM  CTA,*+12,,                    15520 17 02642 J5532
1535         BD   LPA3 ,CTA1S                   15532 43 15568 02936
1536         BTM  LPP,*+12,,                ILLEGAL OP CODE
                                                15544 17 11758 J5556
1537         TFM  CTA1V,41000,711,              15556 16 02871 M100+
1538 LPA3    BNF  LPA29,CTA1V,,                 15568 44 15472 02871
1539         CF   CTA1V,,,                      15580 33 02871 00000
1540         MM   ILC ,5,10,                    15592 13 16282 000+5
1541         BD   LPA4 ,99,,                SET ILC ODD
                                                15604 43 15640 00099
1542         AM   ILC ,1,10,                    15616 11 16282 000+1
1543         TDM  CPR1P,1,,                     15628 15 02399 00001
1544 LPA4    AM   ILC ,1,10,                    15640 11 16282 000+1
1545         TF   LOC ,ILC,,                    15652 26 16291 16282
1546         BD   LPA6 ,LPA2T,,             BRANCH FOR 2ND PASS
                                                15664 43 15768 16283
1547         TDM  LLA1R,1,,                 SET REL
                                                15676 15 14595 00001
1548         BTM  LLA ,*+12,,               PROCESS LABEL PASS 1
                                                15688 17 14564 J5700
1549         TFM  SMB1E,RCD+30,,            SET TO OPERAND FIELDS
                                                15700 16 24259 +0789
1550         BTM  DSS,*+12,,                DOLLAR SEARCH P FIELD
                                                15712 17 09198 J5724
1551         BD   LPA5,DSS1M                    15724 43 15748 09411
1552         BTM  DSS,*+12,,                DOLLAR SEARCH Q FIELD
                                                15736 17 09198 J5748
1553 LPA5    AM   ILC ,11,10,                   15748 11 16282 000J1
1554         B    LPA ,,,                       15760 49 15100 00000
1555         DORG *-3                           15768
1556 LPA6    TDM  LLB1R,1,,                     15768 15 14883 00001
1557         BTM  LLB ,*+12,,               PROCESS LABEL PASS 2
                                                15780 17 14852 J5792
1558         TF   CPR4R+1,CTA1V-3,,             15792 26 02520 02868
1559         CF   CPR4R,,,                      15804 33 02519 00000
1560         TDM  CPR4R+2,,,                    15816 15 02521 00000
1561         DC   1,@,*,                        15827    00001
1562         TR   CPR4R+3,LPA1A-4,,             15828 31 02522 16272
1563         TR   CPR4R+9,LPA1A-4,,             15840 31 02528 16272
1564         TFM  SMB1E,RCD+30,,                15852 16 24259 +0789
1565         BTM  EVA,*+12,,                EVALUATE P FIELD
                                                15864 17 12152 J5876
1566         BD   LPA7 ,EVATL                   15876 43 15908 13562
1567         TR   CPR4R+3,PTC1B-4,,         BLANKS IF NOT LEGAL
                                                15888 31 02522 17868
1568         B    LPA9 ,,,                      15900 49 15964 00000
1569         DORG *-3                           15908
1570 LPA7    TF   CPR4R+7,EVA1T,,               15908 26 02526 13571
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1571         CF   CPR4R+3 ,,,
1572         BD   LPA8,EVATR,,
1573         B    LPA9 ,,,
1574         DORG *-3
1575 LPA8   SF   CPR4R+8 ,,,
1576 LPA9   BNR  LPA11,SMB1T,,
1577         B    LPA13
1578         DORG *-3
1579 LPA11  BTM  EVA,*+12,,
1580         BD   LPA19,EVATL,,
1581         TR   CPR4R+9,PTC1B-4,,
1582         B    LPA13,,,
1583         DORG *-3
1584 LPA19  TF   CPR4R+13,EVA1T,,
1585         CF   CPR4R+9,,,
1586         BD   LPA12,EVATR,,
1587         B    LPA13,,,
1588         DORG *-3,
1589 LPA12  SF   CPR4R+14,,,
1590 LPA13  TDM  EVF7F,0,,
1591         BD   LPA15,CTA1V-1,,
1592         TD   EVF7F,CTA1V-2,,
1593 LPA14  BTM  EVF,*+12,,
1594         TDM  CPR1R,1,,
1595         TF   CPR3A,LOC,,
1596         TFM  CPR3D,15,10,
1597         BTM  CPR,*+12,,
1598         BD   LPA5,LPA1S,,
1599         BTM  CDP,*+12,,
1600         BTM  LPW,LPA5,,
1601 LPA15  TD   CPR4R+10,CTA1V-2,,
1602         TD   CPR4R+11,CTA1V-1,,
1603         TD   CPR4R+13,CTA1V,,
1604         CF   CPR4R+14,,
1605         B    LPA14,,,
1606         DORG *-4 ,,,
1607 LPA1A  DC   6,,,
1608         DC   1,@,,
1609 ILC    DC   5,99999,,
1610 LPA2T  DC   1,,,
1611 LPA1X  DC   1,,,
1612 LPA1P  DC   1,,,
1613 LPA1V  DC   1,,,
1614 LOC    DS   5,,
1615         DC   1,@,,
1616 RCT    DSB  5,5,,
1617         DC   1,@,RCT,
1618         DS   5,,
1619 LPW    TBTY
1620         CF   LOC-4,,,
1621         WNTYLOC-4,,,
1622         SPTY
1623         WNTYCPR4R,,,
```

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15920 33 02522 00000
15932 43 15952 13563
15944 49 15964 00000
15952
15952 32 02527 00000
15964 45 15984 24853
15976 49 16084 00000
15984
EVALUATE Q FIELD
15984 17 12152 J5996
15996 43 16028 13562
16008 31 02528 17868
16020 49 16084 00000
16028
16028 26 02532 13571
16040 33 02528 00000
16052 43 16072 13563
16064 49 16084 00000
16072
16072 32 02533 00000
16084 15 13611 00000
TEST FOR Q MODIFIER
16096 43 16216 02870
16108 25 13611 02869
FLAG REQUIREMENTS
16120 17 13602 J6132
16132 15 02400 00001
16144 26 02411 16291
16156 16 02416 000J5
16168 17 01778 J6180
16180 43 15748 15315
16192 17 01620 J6204
16204 17 16324 J5748
16216 25 02529 02869
16228 25 02530 02870
16240 25 02532 02871
16252 33 02533 00000
16264 49 16120 00000
16271
16276    00006
16277    00001
16282    00005
16283    00001
16284    00001
16285    00001
16286    00001
16291    00005
16292    00001
16297    00005 00005
16297    00001
16322    00005
16324 34 00000 00108
16336 33 16287 00000
16348 38 16287 00100
16360 34 00000 00101
16372 38 02519 00100
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1624          SPTY
1625          WNTYCPR4R+3,,,
1626          BNF LPW1,CPR4R+8,,
1627          WATYLPW1A,,,

1628          B   LPW2 ,,,
1629          DORG *-3
1630 LPW1    SPTY
1631 LPW2    WNTYCPR4R+9,,,
1632          BNF LPW-1,CPR4R+14,6,
1633          WATYLPW1A,,,
1634          B   LPW-1,,6,
1635          DORG *-4
1636 LPW1A   DAC 2,*@
1637 MAC     TFM SMB1E,RCD+30,,
1638          TFM MAC1C,5,9,
1639 MAC1    AM  MAC1C,5,10,
1640          BTM  SCM ,*+12,,
1641          BNR MAC1 ,SMB1T,,
1642          BD  MAC2 ,MAC1C,,
1643          AM  MAC1C,1,10,
1644 MAC2    AM  MAC1C,2,10,
1645          TDM MAC2S+36,,,
1646 MAC1C   DS  3,*,
1647          TD  MAC2S+34,MAC1C-1,,
1648          TR  RCT-4,MAC1A-4,,
1649          TR  MAC1S+9,RCD+9,,
1650          TFM MAC1S+22,42,10,,
1651          TF  MAC1S+36,CTA4S+6,,
1652          SF  MAC1S+31,,,
1653          SF  MAC1S+33,,,
1654          SF  MAC1S+35,,,
1655          TR  MAC2S+39,RCD+29,,
1656          BD  LPA,LPA1S,,
1657          BD  MAC3 ,LPA2T,,
1658          B   LPA,,,
1659          DORG *-3 ,
1660 MAC3    BTM CDP ,*+12,,
1661          B    LPA ,,,
1662 MAC1A   DSA MAC1S-1,MAC2S-1,MAC3S-1


1663          DC  5,@,,
1664 MAC1S   DAC 2,  ,,
1665          DAC 3,   ,,
1666          DAS 6,
1667          DAC 4,BTM ,,
1668          DAS 4,
1669          DAC 1,$
1670          DAC 1,
1671          DAC 1,*
1672          DAC 1,+
1673          DAC 1,1
1674          DAC 1,2
1675          DC  1,-0,,
1676          DC  1,@,,
1677 MAC2S   DAC 2,  ,,
```

```
16384 34 00000 00101
16396 38 02522 00100
16408 44 16440 02527
MARK REL WITH ASTERISK
16420 39 16497 00100
16432 49 16452 00000
16440
16440 34 00000 00101
16452 38 02528 00100
16464 44 1632L 02533
16476 39 16497 00100
16488 49 1632L 00000
16495
16497     00002
16500 16 24259 +0789
16512 16 16607 00+05
16524 11 16607 000+5
16536 17 23996 J6548
16548 45 16524 24853
16560 43 16584 16607
16572 11 16607 000+1
16584 11 16607 000+2
16596 15 16881 00000
16607     00003
16608 25 16879 16606
16620 31 16293 16772
16632 31 16802 00768
16644 16 16815 000M2
16656 26 16829 02879
16668 32 16824 00000
16680 32 16826 00000
16692 32 16828 00000
16704 31 16884 00788
16716 43 15100 15315
16728 43 16748 16283
16740 49 15100 00000
16748
16748 17 01620 J6760
16760 49 15100 00000
16776     00005 J6792
16781     00005 J6844
16786     00005 J7006
16791     00005
16793     00002
16797     00003
16803     00006
16815     00004
16823     00004
16831     00001
16833     00001
16835     00001
16837     00001
16839     00001
16841     00001
16842     00001
16843     00001
16845     00002
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1678          DAC 3,    ,,                  16849      00003
1679          DAC 1,  ,,                    16855      00001
1680          DAC 1,  ,,                    16857      00001
1681          DAC 1,  ,,                    16859      00001
1682          DAC 1,  ,,                    16861      00001
1683          DAC 1,  ,,                    16863      00001
1684          DAC 1,  ,,                    16865      00001
1685          DAC 4,DSA  ,,                 16867      00004
1686          DAC 1,*                       16875      00001
1687          DAC 1,+                       16877      00001
1688          DAC 1,1                       16879      00001
1689          DAC 1,7                       16881      00001
1690          DAC 1,,                       16883      00001
1691          DAS 61                        16885      00061
1692 MAC3S    DAC 2,   ,,                   17007      00002
1693          DAC 3,    ,,                  17011      00003
1694          DAC 1,  ,,                    17017      00001
1695          DAC 1,  ,,                    17019      00001
1696          DAC 1,  ,,                    17021      00001
1697          DAC 1,  ,,                    17023      00001
1698          DAC 1,  ,,                    17025      00001
1699          DAC 1,  ,,                    17027      00001
1700          DAC 4,DC   ,,                 17029      00004
1701          DAC 1,1                       17037      00001
1702          DAC 1,,                       17039      00001
1703          DC  2,34,,                    17041      00002
1704          DC  1,-0,,                    17042      00001
1705          DC  1,@,,                     17043      00001
1706          DS  5,,                       17048      00005
1707 PNS      TBTY,,,                       17050 34 00000 00108
1708          TFM PNS1E,CPR4R-1,,           17062 16 17263 +2518
1709          TFM PNS1L,24,10,              17074 16 17119 000K4
1710 PNS3     SM  PNS1P,1,10,               17086 12 17343 000+1
1711          BNL PNS1,,,                   17098 46 17120 01300
1712          B   PNS-1,,6,                 17110 49 1704R 00000
1713 PNS1C    DS  ,*-4,                     17117      00000
1714 PNS1L    DS  ,*-2,                     17119      00000
1715          DORG *-1,                     17120
1716 PNS1     AM  PNS1E,1,10,               17120 11 17263 000+1
1717          SM  PNS1L,1,10,               17132 12 17119 000+1
1718          BNL PNS2 ,,,                  17144 46 17204 01300
1719          RCTY,,,                       17156 34 00000 00102
1720          TBTY,,,                       17168 34 00000 00108
1721          TBTY,,,                       17180 34 00000 00108
1722          TFM PNS1L,23,10,              17192 16 17119 000K3
1723 PNS2     BD  PNS5 ,PNS1C,,             17204 43 17284 17117
1724          BNR PNS5 ,PNS1E,11,           17216 45 17284 1726L
1725          BNF PNS4 ,PNS1E,11,           17228 44 17264 1726L
1726          WATYPNS1A,,,                  17240 39 17345 00100
1727          B   PNS3 ,,,                  17252 49 17086 00000
1728 PNS1E    DS  ,*,                       17263      00000
1729 PNS4     SPTY,,,                       17264 34 00000 00101
1730          B   PNS3 ,,,                  17276 49 17086 00000
1731 PNS1S    DS  ,*-4,                     17283      00000
1732          DORG *-3,                     17284
1733 PNS5     TD  PNS1S,19999,,             17284 25 17283 19999
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1734         TD   19999,PNS1E,11,                  17296 25 19999 1726L
1735         DNTY19999,,,                          17308 35 19999 00100
1736         TD   19999,PNS1S,,                    17320 25 19999 17283
1737         B    PNS3 ,,7,                        17332 49 17086 +0000
1738 PNS1P   DS   ,*,                              17343    00000
1739 PNS1A   DAC  2,*@,,                           17345    00002
1740         DS   5                                17352    00005
1741 PSC     BD   PSC1 ,LAB2D+4,,                  17354 43 17486 14526
1742         TF   SMB1V,LOC,,            SET SYMBOL VALUE
                                                   17366 26 24839 16291
1743         TDM  SMB1R,1,,              SET SYN IDENTIFICATION
                                                   17378 15 24834 00001
1744         TDM  SMB2S,,,                         17390 15 24852 00000
1745         DC   1,@,*,                           17401    00001
1746         TR   PTC4R,SMB1R,,                    17402 31 17874 24834
1747         TR   PTC4R+19,PTC1B-47,,              17414 31 17893 17825
1748         TR   PTC4R+67,PTC1B-8,,               17426 31 17941 17864
1749         TF   PTC4R+79,CPR3T,,                 17438 26 17953 02404
1750         WNCDPTC4R,,,                          17450 38 17874 00400
1751         AM   CPR3T,1,10,                      17462 11 02404 000+1
1752         B    PSC-1,,6,                        17474 49 1735L 00000
1753 PSC1    BTM  LBP  ,PSC-1,711,                 17486 17 11642 J735L
1754         DORG *-4                              17493
1755         DS   5,,                              17497    00005
1756 PTC     TF   PTC4R+25,DTB1N,,                 17498 26 17899 11056
1757         TF   PTC1C,DTB1N,,                    17510 26 17718 11056
1758         TFM  PTC4R+27,0,10,                   17522 16 17901 000+0
1759         TFM  PTC1E,DTA1T-1,,                  17534 16 17661 J0865
1760         B    PTC5 ,,,                         17546 49 17602 00000
1761         DORG *-3                              17554
1762 PTC1    TF   PTC4R+25,PTC1A+25,,              17554 26 17899 17849
1763         TDM  PTC4R,0,,                        17566 15 17874 00000
1764         TD   PTC4R+18,PTC1R,,                 17578 25 17892 17873
1765         SF   PTC4R+18,,,                      17590 32 17892 00000
1766 PTC5    TR   PTC4R+28,PTC1A+1,,               17602 31 17902 17825
1767         TFM  PTC1S,PTC4R+39,,                 17614 16 17656 J7913
1768 PTC2    SM   PTC1C,1,10,                      17626 12 17718 000+1
1769         BL   PTC3 ,,,                         17638 47 17720 01300
1770         TF   ,,,                              17650 26 00000 00000
1771 PTC1S   DS   ,*-5,                            17656    00000
1772 PTC1E   DS   ,,                               17661    00000
1773         SM   PTC1E,18,10,                     17662 12 17661 000J8
1774         CM   PTC1S,PTC4R+75,,                 17674 14 17656 J7949
1775         BNL  PTC4 ,,                          17686 46 17756 01300
1776         AM   PTC1S,12,10,                     17698 11 17656 000J2
1777         B    PTC2 ,,,                         17710 49 17626 00000
1778 PTC1C   DS   2,*-3,                           17718    00002
1779         DORG *-1                              17720
1780 PTC3    BNF  PTC4 ,PTC4R+18,,                 17720 44 17756 17892
1781         CM   PTC1S,PTC4R+39,,                 17732 14 17656 J7913
1782         BE   PTC-1,,6,                        17744 46 1749P 01200
1783 PTC4    TF   PTC4R+79,CPR3T,,                 17756 26 17953 02404
1784         WNCDPTC4R,,,                          17768 38 17874 00400
1785         AM   CPR3T,1,10,                      17780 11 02404 000+1
1786         AM   PTC4R+27,1,10,                   17792 11 17901 000+1
1787         BNF  PTC1 ,PTC1C                      17804 44 17554 17718
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1788         B    PTC-1,,6,                    17816 49 1749P 00000
1789         DORG *-3,                         17824
1790 PTC1A   DC   1,-0,,                       17824    00001
1791 PTC1B   DNB  48,,                         17872    00048
1792 PTC1R   DC   1,@,,                        17873    00001
1793 PTC4R   DSB  1,80,                        17874    00001 00080
1794         DS   5,,                          17958    00005
1795 RTA     TR   RTA2A,RTA1A,,           SET INDICATORS AND DIRECTORS INITIALLY
                                               17960 31 18272 18208
1796 RTA1    AM   RTA1D,5,10,             ADD FIVE TO POWER TWO DIRECTOR
                                               17972 11 18284 000+5
1797         C    RTA1E,RTA1C,,           COMPARE EXAMINER WITH LIMIT
                                               17984 24 18289 18215
1798         BNH  RTA2 ,,,                     17996 47 18056 01100
1799         C    SMB2S,RTA1E,11,         COMPARE SYMBOL WITH TABLE ENTRY
                                               18008 24 24852 1828R
1800         BH   RTA2 ,,,                     18020 46 18056 01100
1801         TF   RTA1P,RTA1E,,           TRANSFER SYMBOL EXAMINER TO POSITION
                                               18032 26 18279 18289
1802         BE   RTA5 ,,,                     18044 46 18128 01200
1803 RTA2    BNR  RTA3 ,RTA1D,11,              18056 45 18076 1828M
1804         B    RTA-1,,6,               EXIT IF SYMBOL NOT PRESENT
                                               18068 49 1795R 00000
1805         DORG *-3                          18076
1806 RTA3    BH   RTA4                         18076 46 18108 01100
1807         A    RTA1E,RTA1D,11,         INCREASE SYMBOL EXAMINER
                                               18088 21 18289 1828M
1808         B    RTA1                         18100 49 17972 00000
1809         DORG *-3                          18108
1810 RTA4    S    RTA1E,RTA1D,11,         DECREASE SYMBOL EXAMINER
                                               18108 22 18289 1828M
1811         B    RTA1                         18120 49 17972 00000
1812         DORG *-3                          18128
1813 RTA5    TDM  RTA1S,1,,               SYMBOL PRESENT IN TABLE
                                               18128 15 18273 00001
1814         SM   RTA1E,13,10,            SET TO EXTRACT VALUE
                                               18140 12 18289 000J3
1815         TF   RTA1V,RTA1E,11,              18152 26 18271 1828R
1816         BNF  RTA-1,RTA1V,6,          TEST FOR ABSOLUTE SYMBOL
                                               18164 44 1795R 18271
1817         CF   RTA1V,                       18176 33 18271 00000
1818         TDM  RTA1R,1,,               RELOCATABLE SYMBOL
                                               18188 15 18274 00001
1819         B    RTA-1,,6,                    18200 49 1795R 00000
1820         DORG *-3,                         18208
1821         DC   3,0,,                        18210    00003
1822 RTA1A   DS   ,*-2,                        18208    00000
1823 RTA1C   DSA  RTA1T,RTA2D-5,RTA1T-127*18
                                               18215    00005 K2882
                                               18220    00005 J8226
                                               18225    00005 K0596
1824         DC   1,@                          18226    00001
1825 RTA2D   DSA  64*18,32*18,16*18,8*18,4*18,2*18,1*18
                                               18231    00005 +1152
                                               18236    00005 +0576
                                               18241    00005 +0288
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1826        DC   5,@                    18246     00005 +0144
1827 RTA1V  DS   5,,                     18251     00005 +0072
                                         18256     00005 +0036
1828 RTA2A  DS   1,,                     18261     00005 +0018
1829 RTA1S  DS   1,,                     18266     00005
                                    SYMBOL VALUE
1830 RTA1R  DS   1,,                     18271     00005
                                         18272     00001
1831 RTA1P  DS   5,,                SYMBOL PRESENT IF DIGIT
                                         18273     00001
1832 RTA1D  DS   5,,                SYMBOL RELOCATABLE IF DIGIT
                                         18274     00001
1833 RTA1E  DS   5,,                SYMBOL R.H. POSITION
                                         18279     00005
1834        DS   1,,                POWER TWO DIRECTOR
1835        DAS  1,,                     18284     00005
1836        DORG *-1,               SYMBOL R.H. EXAMINER
1837 RTA1T  DS   255*18+1,               18289     00005
1838        DS   5,,                     18290     00001
1839 RTB    CM   RTA1C,RTA1T-254*18,     18293     00001
1840        BL   RTB1,,,                 18292
                                         22882     04591
1841        TF   RTB1C,RTA1C,,           22887     00005
                                         22888 14 18215 J8310
1842        SM   RTA1C,18,10,       BRANCH IF TABLE FULL
1843        TF   RTB1P,RTA1P,,           22900 47 23040 01300
1844        SM   RTB1P,18,10,       STORE LIMIT COUNTER
                                         22912 26 23065 18215
1845        TD   RTA1P,RTB1R,6,          22924 12 18215 000J8
                                         22936 26 23070 18279
1846        TD   SMB2S,RTB1R,,      SET SYMBOL L.H. POSITION
                                         22948 12 23070 000J8
1847        TR   RTA1C,RTB1C,611,   SET R.M IN TABLE
1848        BNR  RTB1,RTB1P,11,          22960 25 1827R 23060
1849        TR   RTB1P,SMB1R,6,     SET R.M AFTER SYMBOL
1850        TDM  RTA1P,0,6,              22972 25 24852 23060
1851        B    RTB-1,,6,               22984 31 1821N 2306N
1852        DORG *-3                     22996 45 23040 2307+
1853 RTB1   TDM  RTB1F,1,,               23008 31 2307+ 24834
1854        B    RTB-1,,6                23020 15 1827R 00000
1855        DORG *-4                     23032 49 2288P 00000
1856 RTB1F  DC   1,0                     23040
1857 RTB1R  DC   1,@                     23040 15 23059 00001
1858 RTB1C  DS   5                       23052 49 2288P 00000
1859 RTB1P  DS   5                       23059
1860        DS   5,,                     23059     00001
1861 SCA    TR   SCA2A,SCA1A,,           23060     00001
1862 SCA1   SM   SCA1N,2,10,             23065     00005
                                         23070     00005
1863        BL   SCA3  ,,,               23075     00005
1864        BH   SCA5  ,,,               23076 31 23315 23303
1865        BNR  SCA2,SMB1E,11,     REDUCE CHARACTER COUNT
                                         23088 12 23259 000+2
                                         23100 47 23236 01300
                                         23112 46 23272 01100
                                         23124 45 23204 2425R
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1866 SCA4   TF   SCA1S, MB1E,611,
1867        AM   SMB1E, ,10,
1868 SCA6   CF   SCA1C,,6,
1869        AM   SCA1S,2, 0,
1870        AM   SCA1C,2,10,
1871        B    SCA1 ,,,
1872        DORG *-3
1873 SCA2   CM   SMB1E,34,610,

 4       25  S    YYY
1875        B    SCA4 ,,,
1876        DORG *-3
1877 SCA3   TR   SCA1C,SCA1B,6,
1878        SF   CPR4R,,,
1879 SCA1N  DS   0,*,
1880        BTM  SCM,SCA-1,711,

1881 SCA5   BNR  SCA4,SMB1E,11,
1882        TFM  SCA1S,0,610,
1883        B    SCA6,,,
1884        DORG *-4,
1885 SCA1A  DS   0,*+1
1886        DSA  CPR4R+1,CPR4R

1887 SCA1B  DC   1,0,
1888 SCA1R  DC   1,@,
1889 SCA2A  DS   0,*+1,
1890 SCA1S  DS   5,,
1891 SCA1C  DS   5,,
1892        DS   2,,
1893        DS   5,,
1894 SCD    TR   SCD2A,SCD1A,,

1895        TF   SCD2F,SCD1F,,

1896        TF   SCD1E,SMB1E,,

1897 SCD1   TF   SMB1T,SMB1E,11,

1898        AM   SMB1E,2,10,

1899        BNR  SCD4 ,SMB1T,,
1900 SCD2   S    SCD1F,SCD1C,,
1901        BL   SCD17,,,

1902 SCD3   SM   SCD1F,1,10,
1903        BL   SCD7 ,,,

1904        AM   SCD1S,1,10,

1905        TDM  SCD1S,0,6,

1906        B    SCD3 ,,,
1907        DORG *-3
1908 SCD4   CM   SMB1T, ,10,
```

```
    23136 26 2331R 2425R
    23148 11 24259 000+2
    23160 33 2332M 00000
    23172 11 23319 000+2
    23184 11 23324 000+2
    23196 49 23088 00000
    23204
TEST FOR TERMINAL @
    23204 14 2425R 000L4
  2 216 46 23236 01200
    23228 49 23136 00000
    23236
    23236 31 2332M 23313
    23248 32 02519 00000
    23259    00000
SEEKS COMMA OR RM TERMINATION
    23260 17 23996 K307N
    23272 45 23136 2425R
    23284 16 2331R 000+0
    23296 49 23160 00000
    23303
    23303    00000
    23307    00005 +2520
    23312    00005 +2519
    23313    00001
    23314    00001
    23315    00000
    23319    00005
    23324    00005
    23326    00002
    23331    00005
RESETS INDICATORS AND COUNTERS
    23332 31 23978 23960
STORE FIELD LENGTH
    23344 26 23871 23977
STORES EXTRACTOR
    23356 26 23675 24259
OBTAINS NEXT CHARACTER
    23368 26 24853 2425R
INCREASE EXTRACTOR BY TWO
    23380 11 24259 000+2
    23392 45 23484 24853
SUBT23404 22 23977 23982 OM FIELD LENGT
ERROR IF NEGATIVE
    23416 47 23948 01300
    23428 12 23977 000+1
NO MORE HIGH ORDER ZEROS
    23440 47 23664 01300
ADD 1 TO DIGIT SET
    23452 11 23989 000+1
SET HIGH ORDER ZERO
    23464 15 2398R 00000
    23476 49 23428 00000
    23484
COMPARE WITH BLANK
    23484 14 24853 000+0
```

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1909         BE   SCD1 ,,,                IGNORE BLANKS
                                               23496 46 23368 01200
1910         BD   SCD5 ,SCD2M,,                23508 43 23564 23983
1911         CM   SMB1T,20,10,          COMPARE WITH MINUS
                                               23520 14 24853 000K0
1912         BNE  SCD5 ,,,                     23532 47 23564 01200
1913         TDM  SCD2M,1,,             SET DIGIT IF MINUS
                                               23544 15 23983 00001
1914         B    SCD1 ,,,                     23556 49 23368 00000
1915         DORG *-3                          23564
1916 SCD5    CM   SMB1T,70,10,          COMPARE WITH ZERO
                                               23564 14 24853 000P0
1917         BNL  SCD6 ,,,                     23576 46 23644 01300
1918         CM   SMB1T,34,10,          COMPARE WITH @
                                               23588 14 24853 000L4
1919         BE   SCD6 ,,,                     23600 46 23644 01200
1920         CM   SMB1T,23,10,          COMPARE WITH COMMA
                                               23612 14 24853 000K3
1921         BNE  SCD16,,,              ERROR, ILLEGAL CHARACTER
                                               23624 47 23924 01200
1922         B    SCD2 ,,,                     23636 49 23404 00000
1923         DORG *-3                          23644
1924 SCD6    AM   SCD1C,1,10,           INCR23644 11 23982 000+1 R NUMBER OR RM
1925         B    SCD1 ,,,                     23656 49 23368 00000
1926         DORG *-3                          23664
1927 SCD7    TF   SMB1T,*,,             OBTAIN CHARACTER
                                               23664 26 24853 23664
1928 SCD1E   DS   0,*,                         23675    00000
1929         AM   SCD1E,2,10,           INCREASE STORED EXTRACTOR BY TWO
                                               23676 11 23675 000+2
1930         BNR  SCD8 ,SMB1T,,                23688 45 23708 24853
1931         B    SCD9 ,,,                     23700 49 23756 00000
1932         DORG *-3                          23708
1933 SCD8    CM   SMB1T,70,10,          COMPARE WITH ZERO
                                               23708 14 24853 000P0
1934         BNL  SCD15,,,              BRANCH IF NUMBER
                                               23720 46 23892 01300
1935         CM   SMB1T,23,10,                 23732 14 24853 000K3
1936         BNE  SCD7 ,,,                     23744 47 23664 01200
1937 SCD9    BD   SCD11,SCD2M,,         TEST FOR MINUS
                                               23756 43 23776 23983
1938         B    SCD12,,,                     23768 49 23788 00000
1939         DORG *-3                          23776
1940 SCD11   SF   SCD1S,,6,                    23776 32 2398R 00000
1941 SCD12   AM   SCD1S,1,10,                  23788 11 23989 000+1
1942         TD   SCD1S,SCD4R,6,               23800 25 2398R 23972
1943         TDM  SCD2L,1,,             FOR LEGAL EXIT
                                               23812 15 23984 00001
1944         CM   SCD2F,1,10,                  23824 14 23871 000+1
1945         BNH  SCD-1,,6,             IF NOT SINGLE DIGIT
                                               23836 47 2333J 01100
1946         SF   CPR4R,,,              SET HIGH ORDER FLAG
                                               23848 32 02519 00000
1947         B    SCD-1,,6,                    23860 49 2333J 00000
1948 SCD2F   DS   ,*,                          23871    00000
1949 SCD14   SF   CPR4R,,,              SET HIGH ORDER FLAG
                                               23872 32 02519 00000
```

```
1950         B    SCD-1,,6,
1951         DORG *-3
1952 SCD15   AM   SCD1S,1,10,
1953         TD   SCD1S,SMB1T,6,
1954         B    SCD7 ,,,
1955         DORG *-3
1956 SCD16   BTM  SCP,*+12,,
1957         BTM  SCM,SCD-1,711,
1958 SCD17   BTM  FLP,SCD-1,711,
1959 SCD1A   DS   0,*+1,
1960         DC   7,0,,
1961         DSA  CPR4R-1
1962 SCD4R   DC   1,@,,
1963 SCD1F   DS   5,,
1964 SCD2A   DS   1,,
1965 SCD1C   DS   4,,
1966 SCD2M   DS   1,,
1967 SCD2L   DS   1,,
1968 SCD1S   DS   5,,
1969         DS   1,,
1970         DS   5,,
1971 SCM     TF   SMB1T,SMB1E,11,
1972         AM   SMB1E,2,10,
1973         BNR  SCM1 ,SMB1T,,
1974         B    SCM-1,,6,
1975         DORG *-3
1976 SCM1    CM   SMB1T,23,10,
1977         BNE  SCM  ,,,
1978         B    SCM-1,,6,
1979         DORG *-4,
1980 SKP     BD    LPA ,LPA1S,,
1981         BD   SKP1 ,LPA2T,,
1982         B    LPA,,,
1983         DORG *-3,
1984 SKP1    TFM  SMB1E,RCD+30,,
1985         BTM   EVA ,*+12,,
1986         BD   SKP2 ,EVATR,,
1987         BD   SKP3 ,EVATL,,
1988 SKP2    BTM   DSP ,LPA,,
1989 SKP3    TF   SKP1C,EVA1T,,
1990         SF   SKP1C-1,,,
1991 SKP1C   DS   ,*,
1992 SKP4    SM   SKP1C,1,10,
1993         BL    LPA ,,,
1994         RCTY,,,
1995         B    SKP4,,,
1996         DORG *-4,
1997         DS   5,,
```

```
    23884 49 2333J 00000
    23892
    23892 11 23989 000+1
    23904 25 2398R 24853
    23916 49 23664 00000
    23924
ERROR, ILLEGAL CHARACTER PRINT
    23924 17 11576 K3936
SEEKS TERMINAL COMMA
    23936 17 23996 K333J
ERROR  INVALID FIELD LENGTH
    23948 17 11374 K333J
    23960    00000
    23966    00007
    23971    00005 +2518
    23972    00001
    23977    00005
    23978    00001
    23982    00004
    23983    00001
    23984    00001
    23989    00005
    23990    00001
    23995    00005
OBTAINS CHARACTER
    23996 26 24853 2425R
INCREASES EXTRACTOR
    24008 11 24259 000+2
    24020 45 24040 24853
EXIT IF RM
    24032 49 2399N 00000
    24040
    24040 14 24853 000K3
REPEAT IF NOT COMMA
    24052 47 23996 01200
EXIT IF COMMA
    24064 49 2399N 00000
    24071
    24072 43 15100 15315
    24084 43 24104 16283
    24096 49 15100 00000
    24104
    24104 16 24259 +0789
    24116 17 12152 K4128
    24128 43 24152 13563
    24140 43 24164 13562
    24152 17 11700 J5100
    24164 26 24187 13571
    24176 32 24186 00000
    24187    00000
    24188 12 24187 000+1
    24200 47 15100 01300
    24212 34 00000 00102
    24224 49 24188 00000
    24231
FOR RETURN ADDRESS
    24235    00005
```

```
1998 SMB    TR   SMB1D,SMB1B,,          CLEAR WORKING AREA
                                            24236 31 24824 24792
1999 SMB1   TF   SMB1T,0,,              EXTRACT CHARACTER
                                            24248 26 24853 00000
2000 SMB1E  DS   ,*,                    CHARACTER EXTRACTOR
                                            24259    00000
2001        BNR  SMB5,SMB1T,,          TEST FOR TERMINAL RECORD MARK
                                            24260 45 24352 24853
2002 SMB2   TDM  SMB1D+5,1,,           , OR RM
                                            24272 15 24829 00001
2003 SMB3   TDM  SMB1D+4,1,,           LEGAL TERMINATION
                                            24284 15 24828 00001
2004 SMB4   SF   SMB1S,,,              ERROR EXIT
                                            24296 32 24840 00000
2005        SF   SMB1V-4,,,                 24308 32 24835 00000
2006        TDM  SMB2S,0,,             FINAL ZERO FOR TABLE LOOK@UP
                                            24320 15 24852 00000
2007        AM   SMB1E,2,10,           INCREASE EXTRACTOR COUNTER BY TWO
                                            24332 11 24259 000+2
2008        B    SMB-1,,6,             EXIT
                                            24344 49 2423N 00000
2009        DORG *-3                        24352
2010 SMB5   BD   SMB6,SMB2S,,          CHARACTER NOT BLANK
                                            24352 43 24384 24852
2011        BD   SMB4,SMB1T,,          ERROR
                                            24364 43 24296 24853
2012        B    SMB8,,,               BLANK
                                            24376 49 24504 00000
2013        DORG *-3                        24384
2014 SMB6   CM   SMB1T,40,10,          TEST FOR LETTER OR NUMBER
                                            24384 14 24853 000M0
2015        BNH  SMB9,,,               TERMINAL SYMBOL OR ASTERISK
                                            24396 47 24524 01100
2016        BD   SMB4,SMB1D+3,,        ERRO24408 43 24296 24827 DDRESS ASTERIS ,
2017        TDM  SMB1D+1,1,,           SYMBOL NOT BLANK
                                            24420 15 24825 00001
2018        BD   SMB7,SMB1D+2,,        TEST FOR PURE NUMBER TO DATE
                                            24432 43 24480 24826
2019        CM   SMB1T,70,10,          TEST FOR NUMBER
                                            24444 14 24853 000P0
2020        BNL  SMB7,,,               BRANCH IF NUMBER
                                            24456 46 24480 01300
2021        TDM  SMB1D+2,1,,           SYMBOL NOT NUMBER
                                            24468 15 24826 00001
2022 SMB7   CF   SMB2S,,,              CLEAR FLAG BEFORE SHIFTING
                                            24480 33 24852 00000
2023        TR   SMB1S,SMB1S+2,,       SHIFT SYMBOL LEFT
                                            24492 31 24840 24842
2024 SMB8   AM   SMB1E,2,10,           INCREASE EXTRACTOR COUNTER BY TWO
                                            24504 11 24259 000+2
2025        B    SMB1,,,               OBTAIN NEXT CHARACTER
                                            24516 49 24248 00000
2026        DORG *-3                        24524
2027 SMB9   CM   SMB1T,23,10,          COMPARE WITH COMMA
                                            24524 14 24853 000K3
2028        BE   SMB2,,,               COMMA TERMINATION
                                            24536 46 24272 01200
```

```
2029         BH   SMB4,,,                ERROR
                                              24548 46 24296 01100
2030         CM   SMB1T,14,10,            COMPARE WITH ASTERISK
                                              24560 14 24853 000J4
2031         BE   SMB13,,,                TEST24572 46 24660 01200 PLIER ASTERISK
2032         BL   SMB12,,,                TEST FOR PLUS, DOLLAR, OR ERROR
                                              24584 47 24640 01300
2033         BD   SMB4,SMB1T,,            ERROR
                                              24596 43 24296 24853
2034         TDM  SMB1D+9,1,,             MINUS TERMINATION
                                              24608 15 24833 00001
2035 SMB11   TDM  SMB1D+7,1,,             ARITHMATIC TERMINATION
                                              24620 15 24831 00001
2036         B    SMB3,,,                 FOR LEGAL EXIT
                                              24632 49 24284 00000
2037         DORG *-3                          24640
2038 SMB12   BD   SMB15,SMB1T,,           FOR DOLLAR TEST
                                              24640 43 24736 24853
2039         B    SMB11,,,                PLUS TERMINATION
                                              24652 49 24620 00000
2040         DORG *-3                          24660
2041 SMB13   BD   SMB14,SMB1D+1,,         FOR MULTIPLIER ASTERISK
                                              24660 43 24716 24825
2042         TDM  SMB1D+1,1,,             SYMBOL NOT BLANK
                                              24672 15 24825 00001
2043         TDM  SMB1D+2,1,,             SYMBOL NOT NUMBER
                                              24684 15 24826 00001
2044         TDM  SMB1D+3,1,,             SYMBOL ASTERISK
                                              24696 15 24827 00001
2045         B    SMB7,,,                 SHIFT AND OBTAIN NEXT CHARACTER
                                              24708 49 24480 00000
2046         DORG *-3                          24716
2047 SMB14   TDM  SMB1D+8,1,,             ASTERISK TERMINATION
                                              24716 15 24832 00001
2048         B    SMB11,,,                FOR ARITH. TERMINATION AND LEGAL EXIT
                                              24728 49 24620 00000
2049         DORG *-3                          24736
2050 SMB15   CM   SMB1T,13,10,            COMPARE WITH DOLLAR
                                              24736 14 24853 000J3
2051         BNE  SMB4,,,                 ERROR
                                              24748 47 24296 01200
2052         BD   SMB4,SMB1D+3,,                24760 43 24296 24827
2053         TDM  SMB1D+6,1,,           DOLL24772 15 24830 00001 T WITH ASTERIS
2054         B    SMB3,,,                 FOR LEGAL EXIT
                                              24784 49 24284 00000
2055         DORG *-3                          24792
2056 SMB1B   DS   ,*+1                         24792    00000
2057         DC   32,@,,                  FOR CLEARING WORKING AREA
                                              24823    00032
2058 SMB1D   DS   1,,                     FOR FLAGGED ZERO PRECEDING INDICATORS
                                              24824    00001
2059 SMB1R   DS   10,,                    FOR ZERO PRECEDING SYMBOL AND VALUE
                                              24834    00010
2060 SMB1V   DS   5,,                     FOR SYMBOL VALUE
                                              24839    00005
2061 SMB1S   DS   1,,                     HIGH ORDER SYMBOL POSITION
                                              24840    00001
```

```
2062 SMB2S DS   12,,
2063 SMB1T DS   1,,
2064       DS   2
2065 TYP   TDM  LPA1S,0,,
2066       B    LPA,,,
2067       DORG *-3
2068 SUP   TDM  LPA1S,1,,
2069       B    LPA,,
2070       DORG *-4
2071 WST   BD   WST5,LPA2T,,
2072       TDM  WST1P,1,,
2073 WST1P DS   ,*-1,
2074       TFM  WST1E,RTA1T+5,,
2075 WST1  TFM  WST1S,CPR4R+3,,
2076       TR   CPR4R,PTC1B-47,,
2077       TR   CPR4R+48,PTC1B-27,,
2078 WST2  SM   WST1E,18,10,
2079       C    WST1E,RTA1C,,
2080       BL   WST4  ,,,
2081       BNF  WST3  ,,,
2082 WST1E DS   ,*,
2083       B    WST2  ,,,
2084 WST1R DS   ,*,
2085 WST3  TF   WST1R,WST1E,,
2086       AM   WST1R,13,10,
2087       TF   WST1L,WST1E,,
2088       SM   WST1L,5,10,
2089       TDM  WST1R,,6,
2090       DC   1,@,*,
2091       TR   ,,,
2092 WST1S DS   ,*-5,
2093 WST1L DS   ,*,
2094       TDM  WST1R,0,6,
2095       TDM  CPR4R+2,,,
2096       DC   1,@,*,
2097       TDM  WST1P,0,,
2098       AM   WST1S,18,10,
2099       CM   WST1S,CPR4R+75,,
2100       BL   WST2  ,,,
2101 WST4  BD   LPA,WST1P,,
2102       TF   CPR4R+79,CPR3T,,
2103       WNCDCPR4R,,,
2104       AM   CPR3T,1,10,
2105       BNR  LPA ,CPR4R+2,,
2106       B    WST1  ,,,
2107       DORG *-3
2108 WST5  BD   LPA, LPA1S
2109       BTM  CDP , LPA,,
2110       DORG SET1-24
2111       BTM  RDA ,*+12,,
21111      DORG AST8,
21112      BD   LPA,LPA1S,,
21113      BTM  CDP,LPA,,
2112       DORG DND12+48
```

```
L.H.CHARACTER DIGIT,FINALLY ZERO
     24852     00012
R.H.CHARACTER DIGIT
     24853     00001
     24855     00002
     24856 15  15315 00000
     24868 49  15100 00000
     24876
     24876 15  15315 00001
     24888 49  15100 00000
     24895
     24896 43  25240 16283
     24908 15  24918 00001
     24918     00000
     24920 16  25015 K2887
     24932 16  25094 +2522
     24944 31  02519 17825
     24956 31  02567 17845
     24968 12  25015 000J8
     24980 24  25015 18215
     24992 47  25172 01300
     25004 44  25028 00000
     25015     00000
     25016 49  24968 00000
     25027     00000
     25028 26  25027 25015
     25040 11  25027 000J3
     25052 26  25099 25015
     25064 12  25099 000+5
     25076 15  2502P 00000
     25087     00001
     25088 31  00000 00000
     25094     00000
     25099     00000
     25100 15  2502P 00000
     25112 15  02521 00000
     25123     00001
     25124 15  24918 00000
     25136 11  25094 000J8
     25148 14  25094 +2594
     25160 47  24968 01300
     25172 43  15100 24918
     25184 26  02598 02404
     25196 38  02519 00400
     25208 11  02404 000+1
     25220 45  15100 02521
     25232 49  24932 00000
     25240
     25240 43  15100 15315
     25252 17  01620 J5100
     00558
     00558 17  25270 +0570
     01518
     01518 43  15100 15315
     01530 17  01620 J5100
     05836
```

```
2113          TF   RDB1E,RDA1C,,
2114          SF   RDB1E,,,
2115          DORG LPA+12
2116          TDM  LPA1P,0,,
2117          BTM  RDB ,LPA2,,
2118          DORG WST5+24
2119          DS   5,,
2120 RDA      TF   RDA1C,EVACS,,
2121          SM   RDA1C,1,10,
2122          SF   RDA1C-4,,,
2123          TF   RDA1E,RDA1C,,
2124          TFM  RDA1S,RCDT,,
2125 RDA1     RACD RCD ,,,
2126          TFM  RDA1R,RCD+150,,
2127 RDA2     SM   RDA1R,2,10,
2128          TF   RDA1T,,,
2129 RDA1R    DS   ,*,
2130          BNF  RDA3 ,RDA1T-1,,
2131          BD   RDA4 ,RDA1T-1,,
2132          BD   RDA4 ,RDA1T,,
2133          B    RDA2 ,,,
2134          DORG *-4 ,
2135 RDA1T    DS   9,,
2136 RDA3     AM   RDA1R,2,10,
2137 RDA4     AM   RDA1R,2,10,
2138          TFM  RDA1R,,6,
2139          DC   2,@,*
2140          TR   ,RCD-1,,
2141 RDA1S    DS   ,*-5,
2142          TF   ,RDA1S,,
2143 RDA1E    DS   ,*-5,
2144          SM   RDA1E,5,10,
2145          TDM  RDA1E,,6,
2146          DC   1,@,*,
2147          SM   RDA1R,RCD-2,,
2148          A    RDA1S,RDA1R,,
2149          C    RDA1S,RDA1E,,
2150          BNL  RDA5 ,,,
2151          C    RCD+28,RDA1A,,
2152          BNE  RDA1 ,,,
2153          CM   RCD+10,14,10,
2154          BE   RDA1
2155          TF   RDB1E,RDA1C,,
2156          SF   RDB1E,,,
2157          BT   LPA,RDA-1,,
2158 RDA5     RCTY,,,
2159          WATYRDA2A,,,
2160          H    ,,,
2161          B    *-12,,,
2162          DORG *-3 ,
2163 RDA2A    DAC  15,TOO MANY CARDS@,,
2164          DAC  4,DEND,,
2165 RDA1A    DS   ,*,
2166 RDA1C    DS   6,
2167          DS   5,,
2168 RDB      TR   RCD-1,,,
```

```
05836 26 25751 25733
05848 32 25751 00000
15112
15112 15 16285 00000
15124 17 25740 J5352
25264
25268    00005
25270 26 25733 13556
25282 12 25733 000+1
25294 32 25729 00000
25306 26 25484 25733
25318 16 25472 K5858
25330 37 00759 00500
25342 16 25377 +0909
25354 12 25377 000+2
25366 26 25429 00000
25377    00000
25378 44 25430 25428
25390 43 25442 25428
25402 43 25442 25429
25414 49 25354 00000
25421
25429    00009
25430 11 25377 000+2
25442 11 25377 000+2
25454 16 2537P 00000
25465    00002
25466 31 00000 00758
25472    00000
25478 26 00000 25472
25484    00000
25490 12 25484 000+5
25502 15 2548M 00000
25513    00001
25514 12 25377 +0757
25526 21 25472 25377
25538 24 25472 25484
25550 46 25646 01300
25562 24 00787 25727
25574 47 25330 01200
25586 14 00769 000J4
25598 46 25330 01200
25610 26 25751 25733
25622 32 25751 00000
25634 27 15100 25269
25646 34 00000 00102
25658 39 25691 00100
25670 48 00000 00000
25682 49 25670 00000
25690
25691    00015
25721    00004
25727    00000
25733    00006
25738    00005
25740 31 00758 00000
```

```
2169 RDB1E DS   .*,                          25751     00000
2170       SM   RDB1E,5,1011,                25752 12  25751  000+N
2171       TFM  RDB1R,RCD+28,,                25764 16  25799  +0787
2172 RDB1  AM   RDB1R,2,10,                   25776 11  25799  000+2
2173       BNR  RDB1  ,,,                     25788 45  25776  00000
2174 RDB1R DS   .*,                          25799     00000
2175       TDM  CDP1P,1,,                     25800 15  01763  00001
2176       CM   RDB1R,RCD+70,,                25812 14  25799  +0829
2177       BNH  RDB-1,,6,                     25824 47  2573R  01100
2178       TDM  CDP1P,0,,                     25836 15  01763  00000
2179       B    RDB-1,,6,                     25848 49  2573R  00000
2180       DORG *-4,                          25855
2181       DAS  1                             25857     00001
2182 RCDT  DS   1                             25858     00001
2183       DEND SET                           00402
```

APPENDIX L

THE LOADER

A listing of the programme loader follows.

The standard SPS processor was modified to assemble DC 1, 0 as an unflagged zero digit.

THE LOADER

```
0001          DORG 52142
0002 USA1T    DS   1,,
0003          DAS  1,,
0004          DORG *-1,
0005 TLA1T    DS   255*18+1,,
0006 RLD      RNCD RNC,,
0007          BNR  RLD2  ,RNC,,
0008          BNF  RLD1  ,RNC,,
0009          B    REL   ,,,
0010          DORG *-3  ,
0011 RLD1     BNR  STC   ,RNC+6,,
0012          B    DDC   ,,,
0013          DORG *-3  ,
0014 RLD2     BNR  RLD4  ,RNC+2,,
0015 RLD3     RNCD RNC   ,,
0016          BNR  RLD   ,RNC+2,,
0017          B    RLD3  ,,,
0018          DORG *-3  ,
0019 RLD4     BNR  TCD   ,RNC+18,,
0020          BD   SYN   ,RNC,,
0021          BNF  TLC   ,RNC+18,,
0022          B    ERR   ,402,7,
0023 ORG      DS   5,*,
0024 DDC      BNF  DDC3  ,RNC+5,,
0025          CF   RNC+5,,,
0026 DDC1     TF   DDC1C,RNC+5,,
0027          A    DDC1C,RNC+12,,
0028          CM   USA1C,,,
0029 DDC1C    DS   5,*,
0030          BL   REL7  ,,,
0031          CF   RNC+7,,,
0032          BNF  DDC2  ,RNC+6,,
0033          SF   RNC+7,,,
0034 DDC2     SM   RNC+12,1,10,
0035          BL   RLD   ,,,
0036          TD   RNC+5,RNC+7,6,
0037          AM   RNC+5,1,10,
0038          B    DDC2  ,,,
0039          DORG *-3,
0040 DDC3     A    RNC+5,ORG,,
0041          B    DDC1  ,,,
0042          DORG *-4  ,
0043 REL      TFM  REL1E,RNC+7,,
0044          BNF  REL6  ,RNC+5,,
0045          CF   RNC+5,,,
0046 REL1     TF   REL1C,RNC+5,,
0047          A    REL1C,RNC+7,,
0048          CM   USA1C,,,
0049 REL1C    DS   ,*,
0050          BNL  REL2  ,,,
0051 REL7     TFM  ERT-1,ERT1C,,
0052          B    ERT1  ,,,
0053          DORG *-3,
0054 REL2     CM   RNC+7,68,10,
0055          BH   ERR   ,,,
0056          SM   RNC+5,1,10,

52142
52142         00001
52145         00001
52144
56734         04591
56736 36 57958 00500
56748 45 56800 57958
56760 44 56780 57958
56772 49 57076 00000
56780
56780 45 57702 57964
56792 49 56892 00000
56800
56800 45 56844 57960
56812 36 57958 00500
56824 45 56736 57960
56836 49 56812 00000
56844
56844 45 58038 57976
56856 43 57910 57958
56868 44 58966 57976
56880 49 59932 +0402
56891         00005
56892 44 57056 57963
56904 33 57963 00000
56916 26 56951 57963
56928 21 56951 57970
56940 14 59597 +0000
56951         00005
56952 47 57160 01300
56964 33 57965 00000
56976 44 57000 57964
56988 32 57965 00000
57000 12 57970 000+1
57012 47 56736 01300
57024 25 5796L 57965
57036 11 57963 000+1
57048 49 57000 00000
57056
57056 21 57963 56891
57068 49 56916 00000
57075
57076 16 57263 N7965
57088 44 57658 57963
57100 33 57963 00000
57112 26 57147 57963
57124 21 57147 57965
57136 14 59597 +0000
57147         00000
57148 46 57180 01300
57160 16 59727 N9859
57172 49 59764 00000
57180
57180 14 57965 00008
57192 46 59932 01100
57204 12 57963 000+1
```

```
0057 REL3   SM   RNC+7,1,10,
0058        BL    RLD  ,,,
0059        AM   REL1E,1,10,
0060        BNR  REL5  ,,,
0061 REL1E  DS   ,*,
0062        BNF  REL5  ,REL1E,11,
0063        TF   REL2S,RNC+5,,
0064        SM   REL2S,1,10,
0065        TF   REL3S,REL2S,,
0066        SM   REL3S,1,10,
0067        TF   REL4S,REL3S,,
0068        SM   REL4S,1,10,
0069        TF   REL5S,REL4S,,
0070        SM   REL5S,1,10,
0071        CF   RNC+5,,6,
0072        CF   ,,,
0073 REL2S  DS   ,*-5,
0074        CF   ,,,
0075 REL3S  DS   ,*-5,
0076        CF   ,,,
0077 REL4S  DS   ,*-5,
0078        SF   ,,,
0079 REL5S  DS   ,*-5,
0080        A    RNC+5,ORG,6,
0081        TF   REL1F,REL1E,,
0082        SM   REL1F,5,10,
0083        TR   REL5F,,,
0084 REL1F  DS   ,*,
0085        CF   REL5S,,6,
0086        BNF   *+24,REL5F,,
0087        SF   REL5S,,6,
0088        BNF   *+24,REL5F+1,,
0089        SF   REL4S,,6,
0090        BNF   *+24,REL5F+2,,
0091        SF   REL3S,,6,
0092        BNF   *+24,REL5F+3,,
0093        SF   REL2S,,6,
0094        BNF  REL3  ,REL5F+4,,
0095        SF   RNC+5,,6,
0096        B    REL3  ,,,
0097        DORG *-3
0098 REL5F  DSB  1,6,,
0099 REL5   AM   RNC+5,1,10,
0100        TD   RNC+5,REL1E,611,
0101        B    REL3  ,,,
0102        DORG *-3  ,
0103 REL6   A    RNC+5,ORG,,
0104        BNR  REL1  ,RNC+8,,
0105        BNF  REL1  ,RNC+8,,
0106        B     ERR  ,,,
0107       DORG *-4  ,
0108 STC    BD   STC2  ,STC1T,,
0109        TDM  STC1T,1,,
0110        CM   RNC+17,0,10,
0111        BNE  STC1  ,,,
0112        A    RNC+5,ORG,,
```

```
57216 12 57965 000+1
57228 47 56736 01300
57240 11 57263 000+1
57252 45 57626 00000
57263    00000
57264 44 57626 5726L
57276 26 57390 57963
57288 12 57390 000+1
57300 26 57402 57390
57312 12 57402 000+1
57324 26 57414 57402
57336 12 57414 000+1
57348 26 57426 57414
57360 12 57426 000+1
57372 33 5796L 00000
57384 33 00000 00000
57390    00000
57396 33 00000 00000
57402    00000
57408 33 00000 00000
57414    00000
57420 32 00000 00000
57426    00000
57432 21 5796L 56891
57444 26 57479 57263
57456 12 57479 000+5
57468 31 57620 00000
57479    00000
57480 33 57420 00000
57492 44 57516 57620
57504 32 57420 00000
57516 44 57540 57621
57528 32 5741M 00000
57540 44 57564 57622
57552 32 5740K 00000
57564 44 57588 57623
57576 32 5739+ 00000
57588 44 57216 57624
57600 32 5796L 00000
57612 49 57216 00000
57620
57620    00001 00006
57626 11 57963 000+1
57638 25 5796L 5726L
57650 49 57216 00000
57658
57658 21 57963 56891
57670 45 57112 57966
57682 44 57112 57966
57694 49 59932 00000
57701
57702 43 57898 57781
57714 15 57781 00001
57726 14 57975 000+0
57738 47 57782 01200
57750 21 57963 56891
```

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0113          TF   RLD1B,RNC+5,,
0114          B    RLD   ,,,
0115 STC1T    DS   1,*-4,
0116          DORG *-3  ,
0117 STC1     TDM  RNC  ,0,,
0118          TDM RNC+18,,,
0119          DC   1,@,*,
0120          TFM RNC+5,RLD1B,,
0121          TF   STC1C,ORG,,
0122          A    STC1C,TLC1D,,
0123          SM   USA1C,18,10,
0124          CM   USA1C,,,
0125 STC1C    DS   5,*,
0126          BL   TLC14,,,
0127          TR   USA1C,RNC,6,
0128          B    TLC15,,,
0129          DORG *-3  ,
0130 STC2     BTM  ERT  ,ERT1D,,
0131 SYN      TDM RNC   ,0,,
0132          A    RNC+5,ORG,,
0133          TR   RNC+24,SYN1A,,
0134          B    TLC1,,79,
0135 SYN1A    DS   ,*-4,
0136          DC   1,@,*,
0137 RNC      DSB  1,80,,
0138 TCD      CM   USA1C,USA1T,,
0139          BE   TCD6  ,,,
0140 TCD1     RCTY,,,
0141          WATY TCD2A,,,
0142          TF   TCD1C,USA1C,,
0143          TDM RNC+19,,,
0144          DC   1,@,*,
0145          SM   TCD1C,12,10,
0146 TCD2     RCTY  ,,,
0147 TCD3     AM   TCD1C,18,10,
0148          CM   TCD1C,USA1T,,
0149          BH   TCD4,,,
0150          TR   RNC+6,TCD1C,11,
0151          BTM TLA  ,*+12,,
0152          BD   TCD3,TLA1S,,
0153          WATY RNC+7,,,
0154          B    TCD2,,,
0155 TCD1C    DS   5,*,
0156 TCD4     BNR ERT2,RLD1B,,
0157 TCD5     TFM ERT-1,TCD1A,,
0158          B    ERT1,,,
0159          DORG *-3,
0160 TCD6     BD   TCD1,TLC2A,,
0161          BNR TCD7,RLD1B,,
0162          B    TCD5,,,
0163          DORG *-3,
0164 TCD7     BLC *+12,
0165          RCTY  ,,,
0166          WATY TCD3A,,,
0167          RCTY  ,,,
0168          H
```

```
57762 26 58360 57963
57774 49 56736 00000
57781    00001
57782
57782 15 57958 00000
57794 15 57976 00000
57805    00001
57806 16 57963 N8360
57818 26 57865 56891
57830 21 57865 59685
57842 12 59597 000J8
57854 14 59597 +0000
57865    00005
57866 47 59710 01300
57878 31 5959P 57958
57890 49 59526 00000
57898
57898 17 59728 N9895
57910 15 57958 00000
57922 21 57963 56891
57934 31 57982 57953
57946 49 59038 +0+00
57953    00000
57957    00001
57958    00001 00080
58038 14 59597 N2142
58050 46 58262 01200
58062 34 00000 00102
58074 39 58417 00100
58086 26 58229 59597
58098 15 57977 00000
58109    00001
58110 12 58229 000J2
58122 34 00000 00102
58134 11 58229 000J8
58146 14 58229 N2142
58158 46 58230 01100
58170 31 57964 5822R
58182 17 58476 N8194
58194 43 58134 58764
58206 39 57965 00100
58218 49 58122 00000
58229    00005
58230 45 59788 58360
58242 16 59727 N8363
58254 49 59764 00000
58262
58262 43 58062 59557
58274 45 58294 58360
58286 49 58242 00000
58294
58294 46 58306 00900
58306 34 00000 00102
58318 39 58451 00100
58330 34 00000 00102
58342 48 00000 00000
```

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0169          B                                    58354 49 00000 00000
0170 RLD1B    DC   1,@,*-5,                        58360    00001
0171          DORG *-3,                            58362
0172 TCD1A    DAC 27,TRANSFER LOCATION REQUIRED@,,
                                                   58363    00027
0173 TCD2A    DAC 17,LOAD SUBROUTINES@,,           58417    00017
0174 TCD3A    DAC 10,LOAD DATA@,,                  58451    00010
0175          DS   5,,                             58474    00005
0176 TLA      TR   TLA2A,TLA1A,,                   58476 31 58764 58707
0177          TDM RNC+18,0,,                       58488 15 57976 00000
0178 TLA1     AM   TLA1D,5,10,                     58500 11 58774 000+5
0179          C    TLA1E,TLA1C,,                   58512 24 58779 58712
0180          BNH  TLA2  ,,,                       58524 47 58584 01100
0181          C    RNC+18,TLA1E,11,                58536 24 57976 5877R
0182          BH   TLA2  ,,,                       58548 46 58584 01100
0183          TF   TLA1P,TLA1E,,                   58560 26 58760 58779
0184          BE   TLA5  ,,,                       58572 46 58660 01200
0185 TLA2     BNR  TLA3  ,TLA1D,11,                58584 45 58604 5877M
0186          B    TLA-1,,6,                       58596 49 5847N 00000
0187          DORG *-3,                            58604
0188 TLA3     BH   TLA4  ,,,                       58604 46 58636 01100
0189          A    TLA1E,TLA1D,11,                 58616 21 58779 5877M
0190          B    TLA1  ,,,                       58628 49 58500 00000
0191          DORG *-3                             58636
0192 TLA4     S    TLA1E,TLA1D,11,                 58636 22 58779 5877M
0193          B    TLA1  ,,7,                      58648 49 58500 +0000
0194 TLA1V    DS   ,*,                             58659    00000
0195 TLA5     TDM  TLA1S,1,,                       58660 15 58764 00001
0196          SM   TLA1E,13,10,                    58672 12 58779 000J3
0197          TF   TLA1V,TLA1E,11,                 58684 26 58659 5877R
0198          B    TLA-1,,6,                       58696 49 5847N 00000
0199 TLA1A    DS   ,*,                             58707    00000
0200 TLA1C    DSA  TLA1T,TLA2D-5,TLA1T-127*18
                                                   58712    00005 N6734
                                                   58717    00005 N8723
                                                   58722    00005 N4448
0201          DC   1,@,,                           58723    00001
0202 TLA2D    DSA  64*18,32*18,16*18,8*18,4*18,2*18,1*18
                                                   58728    00005 +1152
                                                   58733    00005 +0576
                                                   58738    00005 +0288
                                                   58743    00005 +0144
                                                   58748    00005 +0072
                                                   58753    00005 +0036
                                                   58758    00005 +0018
0203          DC   5,@,,                           58763    00005
0204 TLA2A    DS   1,,                             58764    00001
0205 TLA1S    DS   ,*,                             58764    00000
0206 TLA1P    DS   5,,                             58769    00005
0207 TLA1D    DS   5,,                             58774    00005
0209          DS   1,,                             58780    00001
0210          DS   5,,                             58785    00005
0211 TLB      TDM  RNC+18,,,                       58786 15 57976 00000
0212          DC   1,@,*,                          58797    00001
0213          CM   TLA1C,TLA1T-254*18,,            58798 14 58712 N2162
0214          BL   TLB1  ,,,                       58810 47 58942 01300
```

```
0215          TF   TLB1C,TLA1C,,
0216          SM   TLA1C,18,10,
0217          TF   TLB1P,TLA1P,,
0218          SM   TLB1P,18,10,
0219          TDM  TLA1P,,6,
0220          DC   1,@,*,
0221          TR   TLA1C,TLB1C,611,
0222          BNR  TLB1,TLB1P,11,
0223          TR   TLB1P,RNC,6,
0224          TDM  TLA1P,0,6,
0225          B    TLB-1,,6,
0226 TLB1C   DS   ,*,
0227 TLB1    TDM  TLB1F,1,,
0228 TLB1F   DS   ,*-1,
0229          B    TLB-1,,6,
0230 TLB1P   DS   ,*,
0231 TLC     A    ORG  ,TLC1D,,
0232          MM   ORG,5,10,
0233          BD   TLC16,99,,
0234 TLC17   TF   TLC1D,RNC+23,,
0235          A    RNC+5,ORG,,
0236          BD   TLC8 ,TLC2A,,
0237 TLC1    CM   RNC+17,0,10,,
0238          BE   TLC2 ,,,
0239          BTM  TLA ,*+12,,
0240          BD   TLC12,TLA1S,,
0241          BTM  TLB ,*+12,,
0242          BD   TLC13,TLB1F,,
0243 TLC2    TF   TLC1N,RNC+25,,
0244          TF   RNC+5,ORG,,
0245          AM   RNC+5,4,10,,
0246          TF   TLC1C,RNC+27,,
0247 TLC3    AM   TLC1C,1,10,
0248          TFM  TLC1E,RNC+39,,
0249 TLC4    SM   TLC1N,1,10,
0250          BL   TLC7 ,,,
0251          TF   RNC+17,,,
```

```
    58822 26 58941 58712
    58834 12 58712 000J8
    58846 26 58965 58769
    58858 12 58965 000J8
    58870 15 5876R 00000
    58881    00001
    58882 31 5871K 5894J
    58894 45 58942 5896N
    58906 31 5896N 57958
    58918 15 5876R 00000
    58930 49 5878N 00000
    58941    00000
    58942 15 58952 00001
    58952    00000
    58954 49 5878N 00000
    58965    00000
PREV DIGITS TO PREVIOUS ORIGIN
    58966 21 56891 59685
TEST IF EVEN
    58978 13 56891 000+5
BRANCH IF ODD
    58990 43 59642 00099
    59002 26 59685 57981
ADD ORIGIN TO REL VALUE
    59014 21 57963 56891
BRANCH IF DOLLAR REQ
    59026 43 59562 59557
TEST FOR ZERO LABEL
    59038 14 57975 000+0
BRANCH IF ZERO
    59050 46 59110 01200
LOOK UP SYMBOL TABLE
    59062 17 58476 N9074
ERROR IF ALREADY PRESENT
    59074 43 59686 58764
ENTER SYMBOL AND VALUE
    59086 17 58786 N9098
SYMBOL NOT ENTERED
    59098 43 59698 58952
STORE EX SYMBOL COUNT
    59110 26 59559 57983
ORIGIN TO SYMBOL VALUE STORE
    59122 26 57963 56891
AND ADD 4
    59134 11 57963 000+4
CONT COUNT TO STORE
    59146 26 59561 57985
ADD 1
    59158 11 59561 000+1
SET LABEL EXTRACTOR
    59170 16 59217 N7997
SUBTRACT 1 FROM STORED EX SYMBOL COUNT
    59182 12 59559 000+1
TRANSFER IF EXHAUSTED
    59194 47 59478 01300
EXTRACT WANTED SYMBOL
    59206 26 57975 00000
```

```
0252 TLC1E DS   ,*,                          59217    00000
0253       CM   RNC+17,0,10,                 TEST FOR ZERO LABEL
                                             59218 14 57975 000+0
0254       BE   TLC9 ,,,                     59230 46 59598 01200
0255       SM   USA1C,18,10,                 OBTAIN LH POSITION
                                             59242 12 59597 000J8
0256       C    RNC+5,USA1C,,                TEST FOR ROOM
                                             59254 24 57963 59597
0257       BNL  TLC14,,,                     NO ROOM
                                             59266 46 59710 01300
0258       TR   USA1C,RNC,6,                 SET NEXT SYMBOL WANTED
                                             59278 31 5959P 57958
0259 TLC5  AM   RNC+5,5,10,                  OBTAIN NEXT SYMBOL POSITION
                                             59290 11 57963 000+5
0260       CM   TLC1E,RNC+75,,               IS EXTRACTOR AT MAXIMUM
                                             59302 14 59217 N8033
0261       BL   TLC11,,,                     BRANCH IF NOT AT MAXIMUM
                                             59314 47 59662 01300
0262       CM   TLC1N,0,10,                  IS COUNT EXHAUSTED
                                             59326 14 59559 000+0
0263       BE   TLC7 ,,,                     BRANCH IF EXHAUSTED
                                             59338 46 59478 01200
0264       TF   TLC1F,RNC+5,,                SAVE SYMBOL POSITION
                                             59350 26 59385 57963
0265       RNCD RNC ,,,                      OBTAIN NEW CARD
                                             59362 36 57958 00500
0266       TFM  RNC+5,,,                     SET SYMBOL POSITION
                                             59374 16 57963 +0000
0267 TLC1F DS   5,*,                         59385    00005
0268       BD   ERR ,RNC,,                   ERROR
                                             59386 43 59932 57958
0269       BNR  ERR ,RNC+18,,                ERROR
                                             59398 45 59932 57976
0270       BNF  ERR ,RNC+18,,                ERROR
                                             59410 44 59932 57976
0271       C    TLC1C,RNC+27,,               TEST CARD SEQUENCE
                                             59422 24 59561 57985
0272       BE   TLC3 ,,,                     PROCEED
                                             59434 46 59158 01200
0273       B    ERR  ,,,                     CARD ERROR
                                             59446 49 59932 00000
0274       DORG *-3,                         59454
0275 TLC6  TF   RNC+5,TLA1V,6,               ENTER FOUND SYMBOL VALUE
                                             59454 26 57961 58659
0276       AM   USA1C,18,10,                 RESET LH SYMBOL INDICATOR
                                             59466 11 59597 000J8
0277 TLC7  CM   USA1C,USA1T,,                ANY SYMBOLS WANTED
                                             59478 14 59597 N2142
0278       BNL  RLD ,,,                      NO SYMBOLS LEFT
                                             59490 46 56736 01300
0279       TDM  USA1C,0,6,                   SET ZERO
                                             59502 15 5959P 00000
0280       TR   RNC  ,USA1C,11,              EXTRACT SYMBOL AND VALUE POSITION
                                             59514 31 57958 5959P
0281 TLC15 BTM  TLA ,*+12,,                  SEEK VALUE
                                             59526 17 58476 N9538
```

```
0282          BD   TLC6 ,TLA1S,,
0283          B     RLD ,,,
0284          DORG *-4
0285 TLC2A    DS   1,,
0286 TLC1N    DS   2,,
0287 TLC1C    DS   2,,
0288 TLC8     TDM  TLC2A,0,,
0289          TF   ,RNC+5,,
0290 TLC1B    DS   ,*-5,
0291          B    TLC1,USA1T,7,
0292 USA1C    DS   ,*,
0293 TLC9     BD    ERR ,TLC2A,,
0294          TDM  TLC2A,1,,
0295          TF   TLC1B,RNC+5,,
0296          B    TLC5 ,,,
0297          DORG *-3
0298 TLC16    AM   ORG,1,10,
0299          B    TLC17,,,
0300          DORG *-3,
0301 TLC11    AM   TLC1E,12,10,
0302          B    TLC4 ,,7,
0303 TLC1D    DS   ,*,
0304 TLC12    BTM  ERT  ,ERT1A,,
0305 TLC13    BTM  ERT  ,ERT1B,,
0306 TLC14    BTM  ERT  ,ERT1C,,
0307          DS   5,
0308 ERT      RCTY,,,
0309          TDM  RNC+19,,,
0310          DC   1,@,*,
0311          WATYRNC+7,,,
0312 ERT1     WATYERT-1,,6,
0313          RCTY,,,
0314 ERT2     H    ,,,
0315          B    RLD,,
0316          DORG *-3
0317 ERT1A    DAC  12, DUPLICATED@,,
0318 ERT1B    DAC  13, NOT ENTERED@,,
0319 ERT1C    DAC  18, AT STORAGE LIMIT@,,
0320 ERT1D    DAC  19, MULTIPLE TRANSFER@,,
0321 ERR      RCTY,,,
0322          WATYERR1A,,,
0323          H    ,,,
0324          B    RLD,,
0325          DORG *-3
0326 ERR1A    DAC  11,CARD ERROR@,,
0327          DEND RLD
```

```
VALUE PRESENT
    59538 43 59454 58764
NOT PRESENT, READ NEXT CARD
    59550 49 56736 00000
    59557
DOLLAR INDICATOR
    59557    00001
EX SYMBOLS COUNT STORE
    59559    00002
CONTINUATION COUNT STORE
    59561    00002
RESET INDICATOR
    59562 15 59557 00000
SET DOLLAR VALUE LOCATION
    59574 26 00000 57963
    59580    00000
    59586 49 59038 N2142
    59597    00000
ERROR IF DIGIT
    59598 43 59932 59557
SET DIGIT
    59610 15 59557 00001
SET LOCATION OF DOLLAR
    59622 26 59580 57963
    59634 49 59290 00000
    59642
    59642 11 56891 000+1
    59654 49 59002 00000
    59662
    59662 11 59217 000J2
    59674 49 59182 +0000
    59685    00000
    59686 17 59728 N9809
    59698 17 59728 N9833
    59710 17 59728 N9859
    59726    00005
    59728 34 00000 00102
    59740 15 57977 00000
    59751    00001
    59752 39 57965 00100
    59764 39 5972P 00100
    59776 34 00000 00102
    59788 48 00000 00000
    59800 49 56736 00000
    59808
    59809    00012
    59833    00013
    59859    00018
    59895    00019
    59932 34 00000 00102
    59944 39 59977 00100
    59956 48 00000 00000
    59968 49 56736 00000
    59976
    59977    00011
    56736
```