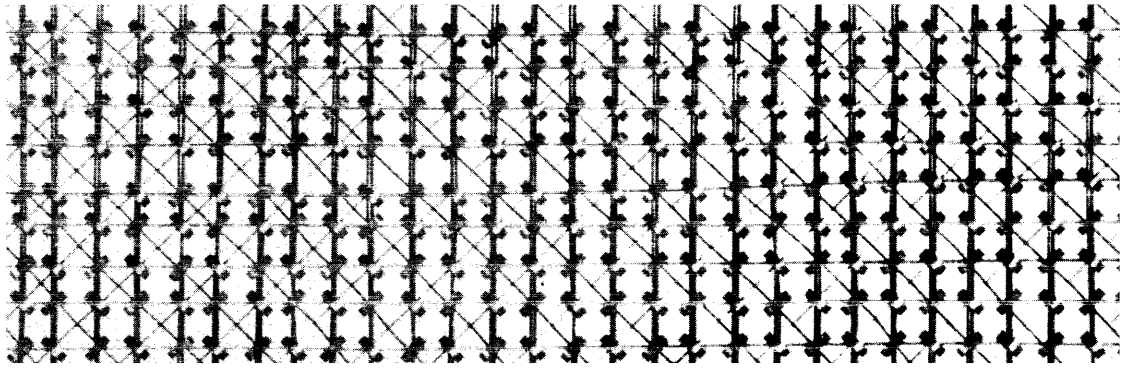
Data Processing Package for the IBM 704



DATA PROCESSING PACKAGE FOR THE IBM 704

This manual describes the Data Processing Package for the IBM 704, which is intended to facilitate the coding of commercial programs.

The Data Processing Package was developed for the Applied Programming Department of IBM by the following staff members of the New York Data Processing Center, The Service Bureau Corporation:

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The Data Processing Package program decks (symbolic or binary instruction cards) are available from:

704 Program Librarian
Applied Programming Publications
IBM Corporation
590 Madison Avenue
New York 22, N. Y.

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PART I: SUBROUTINE SPECIFICATIONS

INTRODUCTION

The Data Processing Package is an integrated set of subroutines which allow the 704 to operate on binary coded decimal (BCD) information. Input, output, information transfer and manipulation, and arithmetic are all performed on packed BCD data.

Flexibility is provided for interweaving binary 704 operations with BCD subroutine operations. Subroutines are provided to facilitate preparation of commercial reports. BCD arithmetic is performed in a 24-digit pseudo-accumulator.

The basic aim of the package is to reduce greatly the time and cost of initial programming of certain types of problems. Among these are:

1. Problems involving the reading and processing (with a modest amount of calculation) of successive input records and the writing of successive output records (file maintenance).

2. Problems involving considerable internal data manipulation.

3. Problems requiring an elaborate output format.

4. Problems involving mixed alphabetic and numerical input.

5. Problems of a one-time nature.

Use of the Data Processing Package does not require memory provision for the entire package. Only those subroutines actually to be used in an application need be in memory at any time. A simple scheme is available for loading these subroutines from a library tape at the time the program is run.

TERMINOLOGY AND SYMBOLS

The following terms and symbols are used to describe calling sequences:

Block	=	Group of sequential words.
A or B	=	Origin (first word) of a block.
W	=	Number of words in a block.

C	=	Origin of a control word table.
Field	=	Group of sequential characters imbedded in a block.
Numerical Field	=	Field whose units (rightmost) character is either a signed or unsigned digit and whose remaining characters are unsigned digits.
N	=	Number of characters in a field.
R, S	=	Position of the first (leftmost) character of a field.
T	=	Tape unit number (1-10).
t	=	Tag for indexing A, B, or C (t=0, 1 or 2).
W	=	Number of words in a block.

EXAMPLE

Assume that the first 72 columns of the card

Estimate No.	Job No.	Man No.	Date	Hours	Description
8039	01	363	072277	11.6	CLASSIFIED
1- -4	5- -6	7- -9	10- -14	15- -17	18- -72

are read into core storage as a 12-word packed BCD block (six characters per word) beginning at symbolic location INPUT. The block would appear in core storage as follows, letting b stand for a blank character:

803901	363072	27116C	LASSIF	IEDbbb	bb------b	bbbbbb
INPUT	+1	+2	+3	+4		+11

The following table indicates how each field of this card would be described in terms of the previously defined parameters:

A (or B) = INPUT

FIELD	N	R (or S)
Estimate No.	4	1
Job No.	2	5
Man No.	3	7
Date	5	10
Hours	3	15
Description	55	18

It is important to note that a field may be thus described without explicit information concerning the position of its individual characters within a

block; i.e., we do not need to concern ourselves with the fact that the leftmost character of the HOURS field is the third character (counting from the left) of (INPUT +2). We need only realize that the HOURS field begins with the fifteenth character of the block starting at INPUT and is three characters in length.

To facilitate the processing of fields which are known to begin with the leftmost character of a word, omitting R or S in a field description will always have the same effect as setting R or S equal to 1.

GENERAL SPECIFICATIONS

Regardless of which subroutines are called into use, a section of the Data Processing Package known as the Universal Routine must always be present. The principal function of the Universal Routine is to supply a mechanism for reference to the various subroutines and to provide universal constants and erasable storage.

All of the subroutines in the Data Processing Package are entered by executing an instruction of the form TSX SUBR, 4 followed by an appropriate calling sequence, where SUBR stands for the beginning location of the subroutine.

The contents of index registers 1 and 2 prior to entry into a subroutine are always restored prior to exit from the subroutine. The contents of the MQ prior to entry into a subroutine remain the same upon exit from the subroutine in the case of BPB, ZAC, TZE, TNZ, TMI, TPL, TOV, TNO, and ALS. In all other cases the contents of the MQ are changed. The contents of the Accumulator are changed by all subroutines except ZAC.

READ CARD INTO PACKED BCD

Purpose

To read columns 1-72 of a decimal card, perform Hollerith to BCD conversion, and store the resulting packed BCD characters in a 12-word block of core storage, starting at A, t.

Calling Sequence

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	α	T S X	RCD, 4	
	α + 1		A, t	
	α + 2			ERROR RETURN
	α + 3			EOF RETURN
	α + 4			NORMAL RETURN

Error Return

The presence of illegal Hollerith punching will result in an error return. Illegal punching does not terminate the conversion process and all legal columns will be properly converted. (See the appendix for legal Hollerith characters.)

Timing

To keep the card reader in motion, do not exceed 21 ms between the normal return and subsequent TSX to RCD.

Note

On an EOF return, the 12-word block starting at A, t will be cleared to zeros.

PUNCH PACKED BCD

Purpose

To convert to Hollerith a packed BCD block of W words beginning at A, t and punch a card. Punching will begin in column 1, assuming a SHARE punch control panel is used.

Calling Sequence

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	α	T S X	WPU, 4	
	α + 1		A, t, W	W≤12
	α + 2			RETURN

Timing

To keep the card punch in motion, do not exceed 24.8 ms between the return and subsequent TSX to WPU.

PRINT PACKED BCD

Purpose

To convert to Hollerith a packed BCD block of W words beginning at A, t and print one line on the on-line printer. Printing will begin with the first (leftmost) type wheel, assuming a SHARE I or II printer control panel is used.

Calling Sequence

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	α	T S X	WPR, 4	
	α + 1		A, t, W	W≦20
	α + 2			RETURN

Timing

To keep the printer in motion, do not exceed 114.7 ms between the return and subsequent TSX to WPR.

READ BCD TAPE

Purpose

To read one BCD record from tape T into a block of core storage beginning at A, t.

Calling Sequence

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		RTD, 4	
	α + 1				A, t, T	T = 1, 2, ···, 10
	α + 2					ERROR RETURN
	α + 3					EOF RETURN
	α + 4					NORMAL RETURN

Error Return

An RTT check failure or false EOR or EOF skips result in an error return. In the case of false EOR or EOF skips, the accumulator is set to zero.

Usage

On either an RTT error return or a normal return, a word count is left in the decrement field of the accumulator. If the input record is not an exact multiple of six characters, the characters in the final incomplete word (< six characters) will be left in the low-order (rightmost) positions of the MQ.

Timing

(11.1 + .4W) ms per record. There is no "free" calculating time available between successive entries to RTD.

WRITE BCD TAPE

Purpose

To write a W-word block starting at A, t as one BCD record on tape T.

Calling Sequence

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	α	T S X	WTD, 4	
	α + 1		W	
	α + 2		A, t, T	
	α + 3			RETURN

Example

The following program will write 50 BCD records onto tape 6, each record 10 words long, from a 500-word block starting at OUTPUT. Note the indexing of the block origin, OUTPUT + 500, 1; index register 1 is initially set to 500 and reduced by 10 after each record has been written.

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
		L X A	500A, 1	
	AGAIN	T S X	WTD, 4	
			10	
			OUTPUT + 500, 1, 6	
		T I X	AGAIN, 1, 10	
	500A		500	

Timing

(11.1 + .4W) ms per record. There is no "free" calculating time available between successive entries to WTD.

If it is desired to make an end-of-tape test after exiting from this subroutine, the test must be made within 148 μ s.

READ BINARY TAPE

Purpose

To read part or all of one binary record from tape T into one or several blocks of core storage specified by a control word table beginning at C, t.

Calling Sequence

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		RTB, 4	
	α + 1				C, t, T	
	α + 2					ERROR RETURN
	α + 3					EOF RETURN
	α + 4					NORMAL RETURN

Usage

Each word of the control word table has the form A, 0, W indicating a core block to be read into. Control words are automatically sequenced once reading begins. Reading continues until either

a) The end of record is reached.
or b) The end of the control word table is reached, as indicated by a 1 in the sign bit of the end-of-table word.

The last word of the record read is assumed to be a complemented ACL record checksum (as written by the "Write Binary Tape" routine). A checksum is always made of the entire record. An error return occurs on a checksum failure. The checksum will not appear in memory unless the sum of the number of words specified to be read ($\sum W$) is equal to or greater than the total number of words in the record, including the checksum. See examples 1 and 2.

On either a checksum error return or normal return, the total effective word count is left in the decrement field of the accumulator. By "effective word count" is meant the number of words of the binary record which are stored in the specified block or blocks of core storage, not counting the checksum.

If false EOR or EOF skips are detected, an error return occurs with the accumulator set to zero.

As a consequence of the rules for the termination of reading, given in a) and b) on the preceding page, the control word

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	(C , , t)		A, 0, -1	

will suffice to read a binary record of indefinite extent into a single block beginning at A. In this case, an end-of-table word (i.e., a word with a 1 in the sign bit) is unnecessary.

Note that while the beginning (C) of the control word table is indexable, the block origins specified in the table are not indexable. This restriction has been made because of timing considerations between copies and because it is desirable to avoid pre-editing the control word table.

Example 1

Consider a 100 word + checksum = 101 word binary record read under control of the control word table:

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	(C , , t)		PART 1, 0, 20	
			PART 2, 0, 30	
			PART 3, 0, 10	
		M Z E	( )	

101 words will actually be read. However, since $\sum W = 60 < 100$, only 60 words will be stored, and the resulting word count will be 60. The checksum will not be stored.

Example 2

Assume the above record is read under control of the control word table:

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	(C , , t)		SAVE, 0, 40	
			DUP, 0, 50	
			MORE, 0, 5	
			LAST, 0, 25	
		M Z E	( )	

Since $\sum W = 120 > 100$, reading will terminate with the 102nd copy instruction. The word count will be 100. However, 101 words will actually appear in the specified blocks of memory, the 101st being the checksum.

Timing

(11.1 + .4W') ms per record. There is no "free" calculating time available between successive entries to RTB. (W'= size of record read including checksum.)

WRITE BINARY TAPE

Purpose

To write one binary record on tape T from one or several core blocks specified by a control word table beginning at C, t. (See previous subroutine.)

Calling Sequence

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	α	T S X	WTB, 4	
	α + 1		C, t, T	
	α + 2			RETURN

Usage

Core blocks indicated by the control word table are written as one binary record, the last word of which is a complemented ACL record checksum.

Timing

(11.1 + .4W') ms per record ($W' = 1 + \sum W$). There is no "free" calculating time between successive entries to WTB.

If it is desired to make an end-of-tape test after exiting from this subroutine, the test must be made within 124 μs.

MOVE

Purpose

To move **a block** of W words starting at A, t to a block of W words starting at B, t.

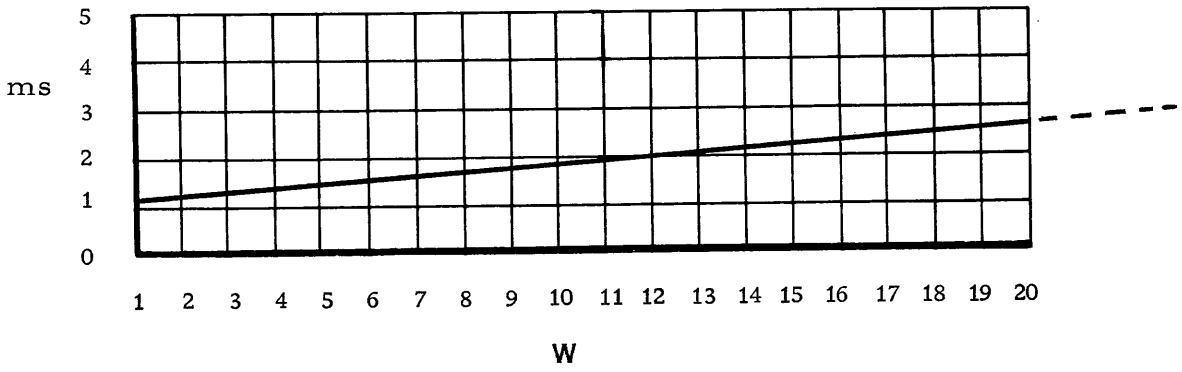
Calling Sequence

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	α	T S X	MOV, 4	
	α + 1		W	
	α + 2		A, t	FROM
	α + 3		B, t	TO
	α + 4			RETURN

Restriction

If A, t < B, t, the blocks must not overlap.

Timing



EXTRACT AND INSERT

Purpose

To move one or more fields from one block to another.

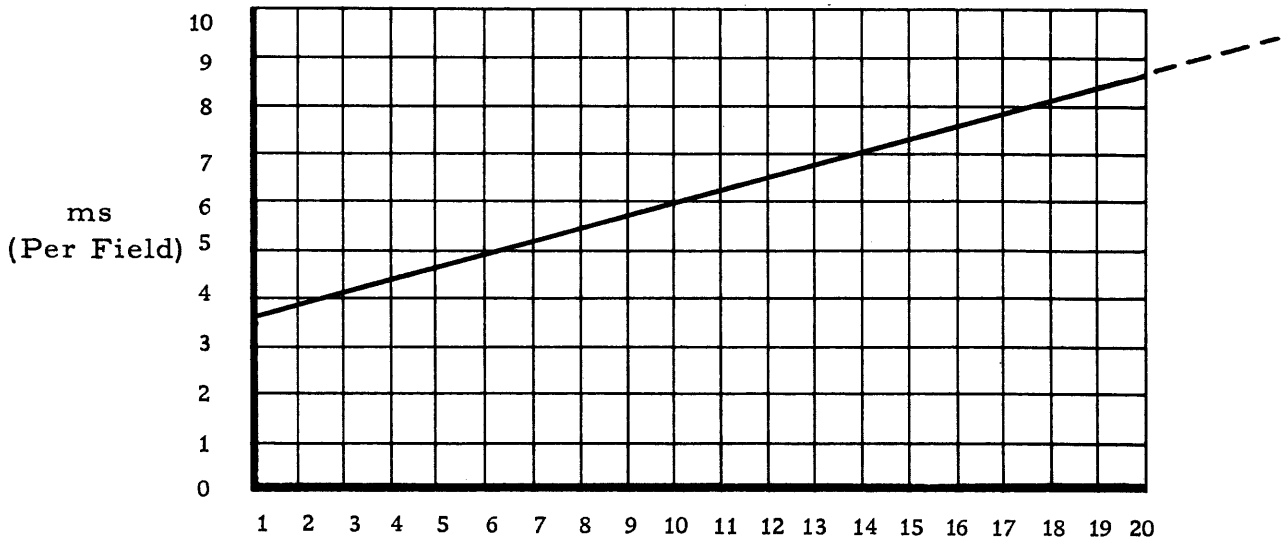
Calling Sequence (K = number of fields to be moved.)

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	α	TSX	XIN, 4	
	α + 1		N	N≦84
	α + 2		A, t, R	FROM
	α + 3		B, t, S	TO
	α + 4		N	
	α + 5		A, t, R	
	α + 6		B, t, S	
	.		.	
	.		.	
	.		.	
	.		.	
	.		.	
	α + 3K - 2		N	
	α + 3K - 1		A, t, R	
	α + 3K	MZE	B, t, S	
	α + 3K + 1			RETURN

Usage

Each group of three words in the calling sequence specifies a field to be moved. The calling sequence is terminated with a 1 in the sign bit of the third word of a group.

Timing



ALPHANUMERICAL COMPARISON

Purpose

To compare two fields.

Calling Sequence

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		COM, 4	
	α + 1				N	
	α + 2				A, t, R	FIELD 1
	α + 3				B, t, S	FIELD 2
	α + 4					ILLEGAL BCD RETURN
	α + 5					FIELD 1 > FIELD 2
	α + 6					FIELD 1 = FIELD 2
	α + 7					FIELD 1 < FIELD 2

Collating Sequence

Blank ·) + $ * - / , (= $\overset{+}{0}$ A····I $\overset{-}{0}$ J····Z 0····9

Restrictions

Control returns to (α + 4) if either of corresponding unequal characters is illegal BCD. (See the appendix.) Corresponding equal characters are assumed to be legal BCD.

The COM subroutine cannot be used to compare signed numerical fields.

Since $\overset{+}{0} < (\overset{+}{1}\cdots\overset{+}{9}) < \overset{-}{0} < (\overset{-}{1}\cdots\overset{-}{9}) < 0\cdots 9$,

the following results would occur:

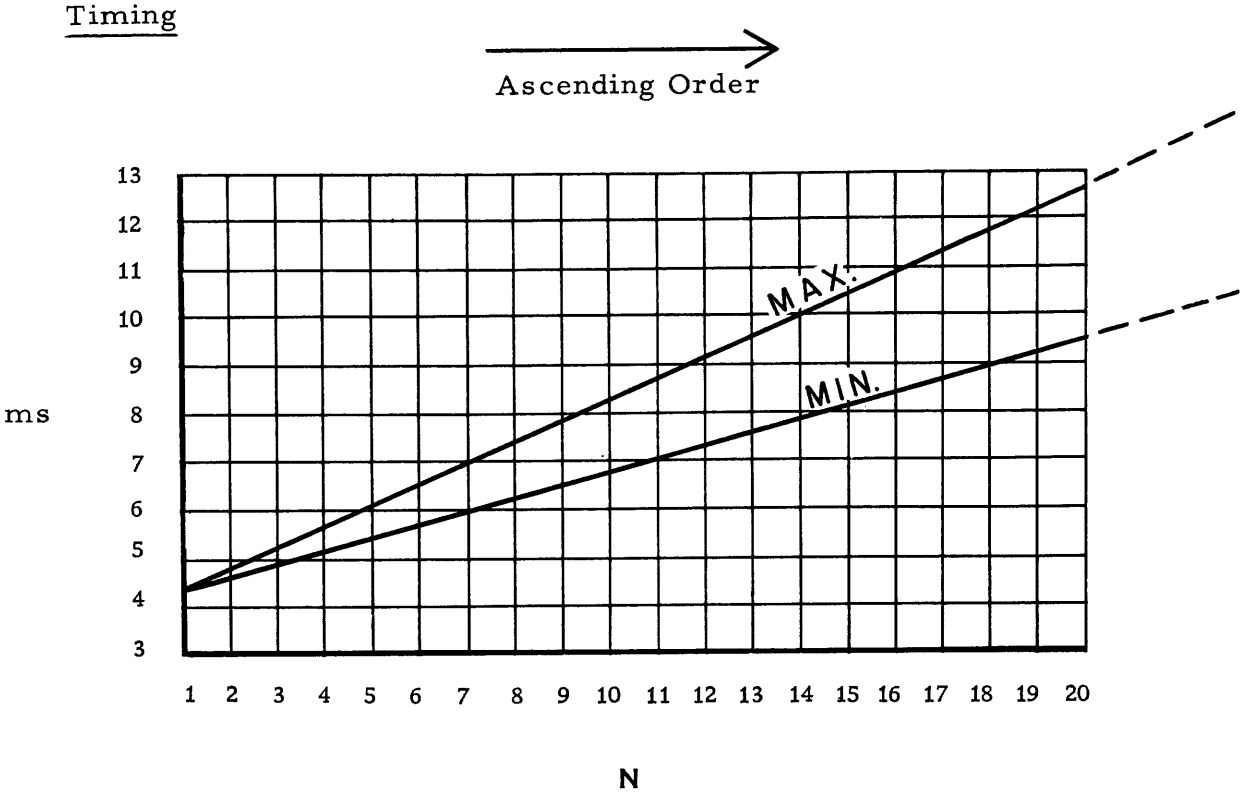
$$\overset{+}{15} < \overset{-}{15}$$

$$\overset{+}{39} < \overset{-}{30}$$

$$\overset{-}{21} < \overset{-}{24}$$

Signed numerical fields may be easily compared by means of either BCD arithmetic or conversion to binary.

Timing


Ascending Order
13
12
11
10
9
8
7
6
5
4
3
ms
MAX.
MIN.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
N

BLANK PACKED BLOCK

Purpose

To initialize a block of W packed BCD words starting at A, t to BCD blanks.

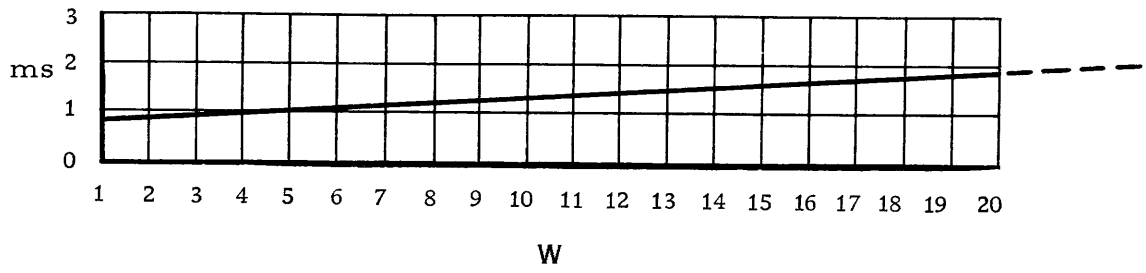
Calling Sequence

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		BPB, 4	
	α + 1				A, t, W	
	α + 2					RETURN

Usage

Each word of the specified block is set to $(606060606060)_8$, i.e., to six blanks.

Timing



BCD TO BINARY CONVERSION

Purpose

To convert a numerical field (units position digit may be signed plus or minus) to a binary integer. If the units position digit is not signed, the field is considered positive. The field may exceed one word in length.

Calling Sequence

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		DTB, 4	
	α + 1				N	N≤84
	α + 2				A, t, R	
	α + 3					ERROR RETURN
	α + 4					NORMAL RETURN

Restrictions

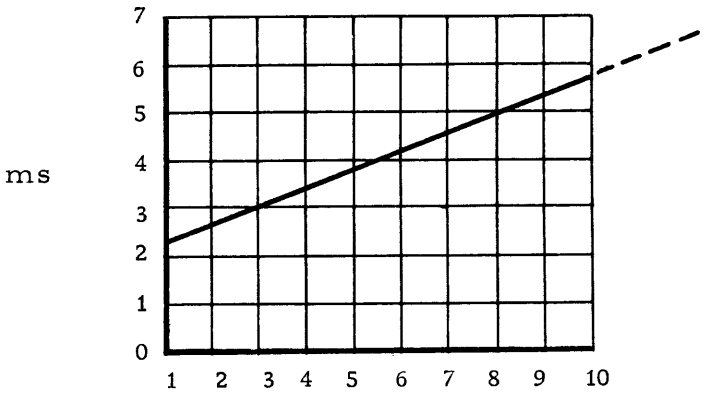
1. If the input field is non-numerical, control returns to (α + 3) with zero in the decrement field of the accumulator.

2. If the input field is not less than 2^{35} in absolute value, control returns to (α + 3) with $(00001)_8$ in the decrement field of the accumulator.

Usage

The result is left in the accumulator.

Timing



BINARY TO BCD CONVERSION

Purpose

To convert a binary integer to a numerical field, which may exceed one word in length.

Calling Sequence

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	8 10	12	72
	α	T S X	BTD, 4	
	α + 1		N	N≦84
	α + 2		A, t, R	
	α + 3			RETURN

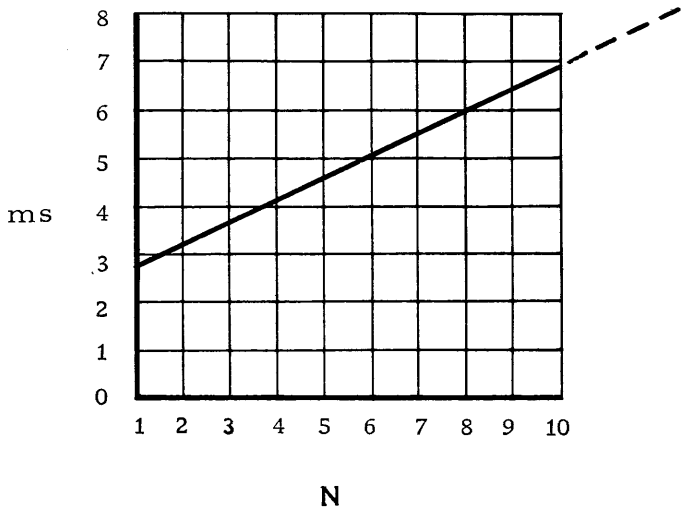
Usage

Place (CLA) the (signed) binary integer to be converted in the accumulator and execute the above calling sequence. The resulting field will be signed over the units digit when negative and will not be signed when positive.

Restrictions

The P and Q bits of the accumulator are cleared prior to conversion. Thus, binary integers greater than $(2^{35}-1)$ will not convert properly.

Timing



BCD ARITHMETIC

Purpose

To perform the common arithmetical operations on numerical fields, using a 24-digit signed pseudo-accumulator (hereafter referred to as AC).

Restrictions

Input fields must be numerical. Output (STO, STS) is signed over the units digit when negative and not signed when positive. Input fields are not checked for an excess of 24 digits.

Overflow is possible on addition, subtraction, and multiplication but not on shifts.

The sign of the pseudo-accumulator behaves in the same manner as that of the real 704 accumulator.

Usage and Calling Sequences

The following six routines use the calling sequence

H	LOCATION	OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7 8 10	11	12	72
	α	T S X		OP, 4	
	α + 1			N	FIELD; N≤24
	α + 2			A, t, R	
	α + 3				ERROR RETURN
	α + 4				NORMAL RETURN

OP

CLA — Clear and Add: Clears AC and adds specified field to AC.

CLS — Clear and Subtract: Clears AC and subtracts specified field from AC.

ADD — Add: Adds specified field to AC; overflow is possible.

SUB — Subtract: Subtracts specified field from AC; overflow is possible.

MPY — Multiply: Multiplies AC by specified field (magnitude of which must be less than 2^{35}). Product is left in low-order part of AC. Overflow occurs if product exceeds 24 significant digits.

DIV — Divide: Divides AC by specified field (magnitude of which must be less than 2^{35}). Quotient is left in low-order part of AC. No provision is made for obtaining remainder.

An error return occurs with an indication in the decrement field of the real accumulator:

Decrement	Cause
0	Specified field non-numerical.
$(00001)_8$	MPY and DIV only: specified field not less than 2^{35}.
$(00002)_8$	DIV only: specified field equals zero.

The following two store routines use the calling sequence

LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
α	T S X	OP, 4	
α + 1		N	FIELD; N≦24
α + 2		A, t, R	
α + 3			RETURN

OP

STO — Store: Stores N low-order digits of AC in specified field.

STS — Store Suppressed: Stores N low-order digits of AC in specified field with leading zeros replaced by blanks, regardless of the sign of the field. This subroutine permits direct insertion of positive integers, computed in the AC, into an output block for printing without use of the MAC subroutine.

The following three shifts use the calling sequence

LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
α	T S X	OP, 4	
α + 1		N	AMOUNT OF SHIFT
α + 2			RETURN

OP

ALS AC Left Shift: Shifts contents of AC N positions left. High-order digits are lost; vacated low-order positions are filled in by zeros.

ARS AC Right Shift: Shifts contents of AC N positions right. Low-order digits are lost; vacated high-order positions are filled in by zeros.

SRD Shift Right and Round: Same as ARS except that units position of AC is rounded after shifting from high-order digit lost; i.e., one is added to the units position of the AC if the last digit shifted out of the AC is equal to or greater than five.

The following routine uses the calling sequence

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		ZAC, 4	
	α + 1					RETURN

OP

ZAC Zero Accumulator: Sets AC to zero.

The following six transfer routines use the calling sequence

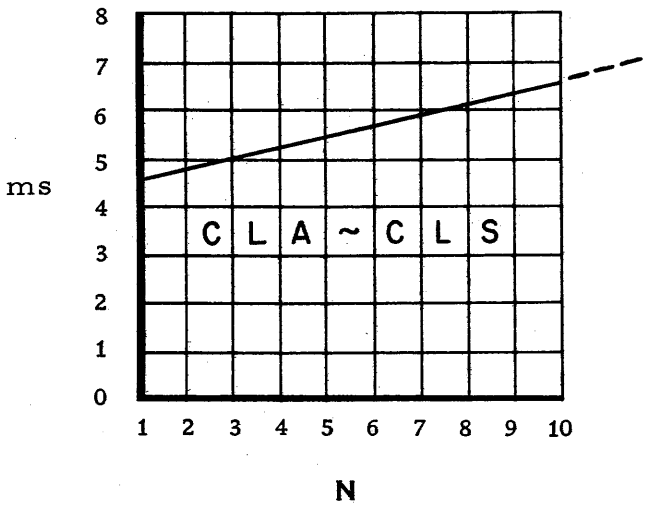
H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		OP, 4	
	α + 1					CONDITION MET
	α + 2					CONDITION NOT MET

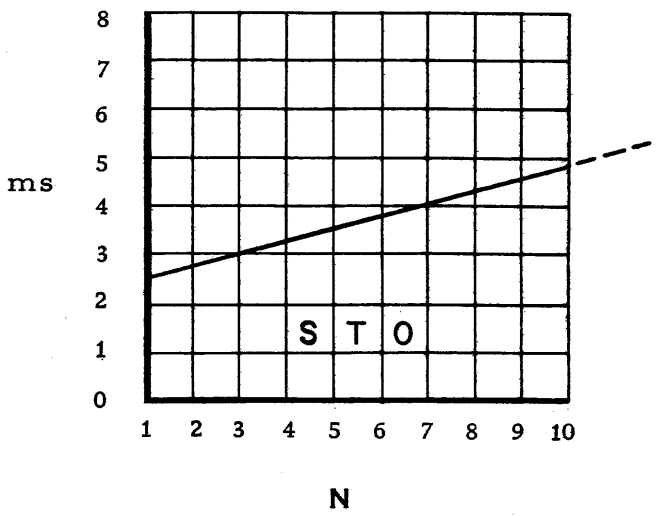
OP

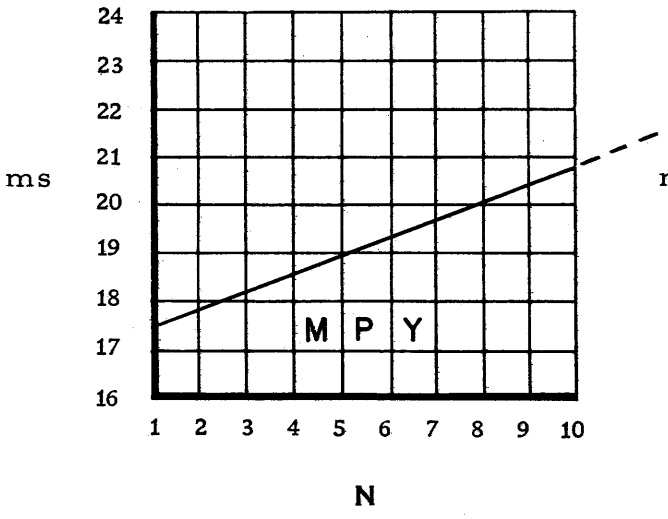
TZE Transfer on AC Zero.
TNZ " " " Non-Zero.
TMI " " " Minus.
TPL " " " Plus.
TOV " " " Overflow.
TNO " " No AC Overflow.

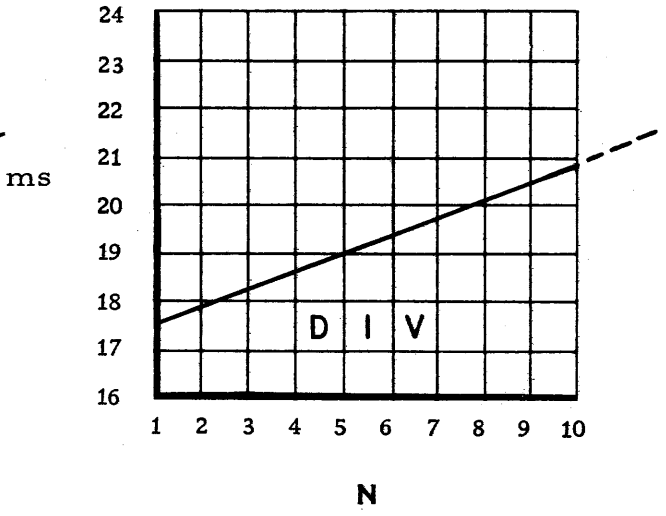
TOV and TNO will turn off pseudo-overflow trigger if it is on.

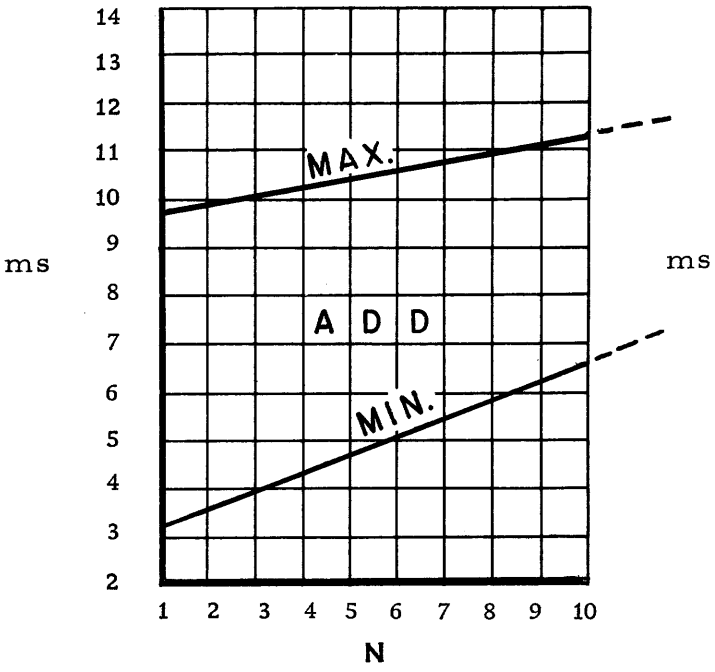
Timing

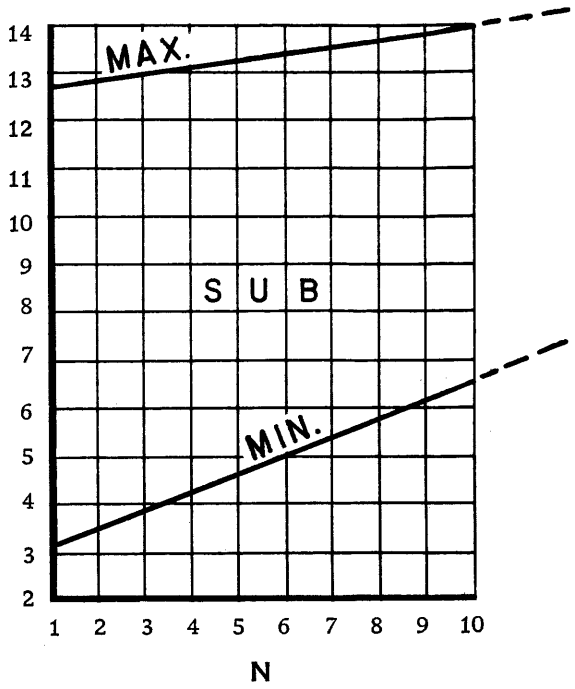

ms
8
7
6
5
4
3
2
1
0
C L A ~ C L S
1 2 3 4 5 6 7 8 9 10
N

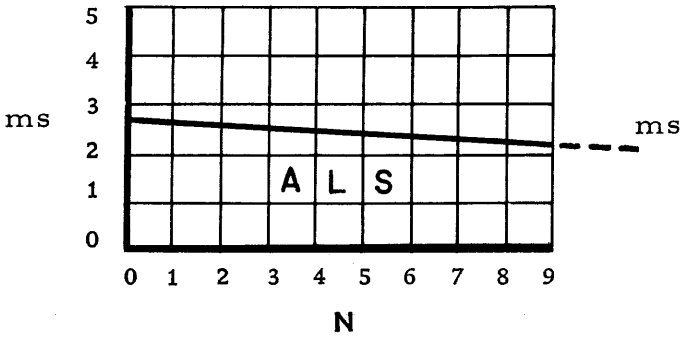

ms
8
7
6
5
4
3
2
1
0
S T O
1 2 3 4 5 6 7 8 9 10
N

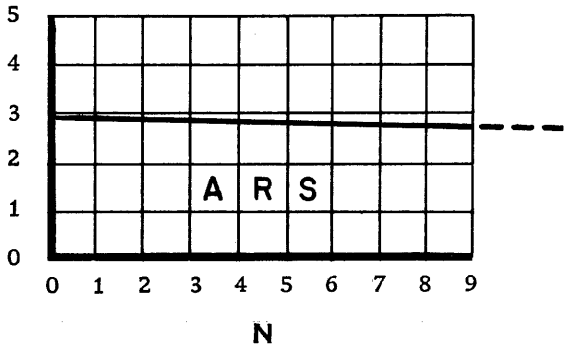

ms
24
23
22
21
20
19
18
17
16
M P Y
1 2 3 4 5 6 7 8 9 10
N

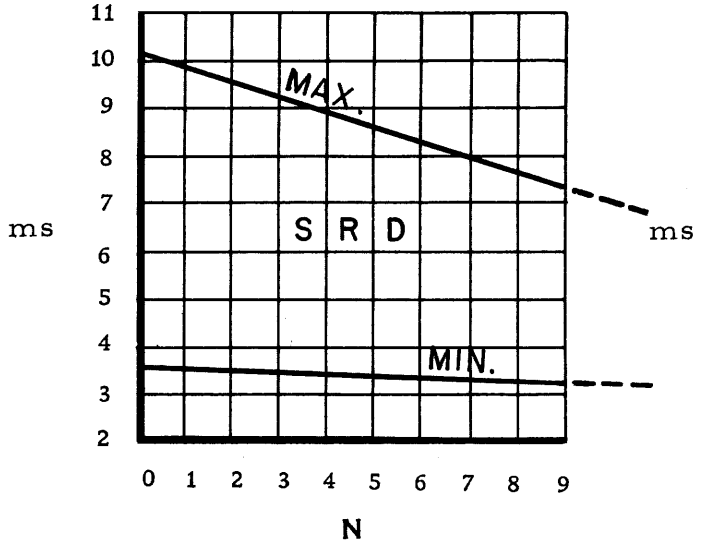

ms
24
23
22
21
20
19
18
17
16
D I V
1 2 3 4 5 6 7 8 9 10
N

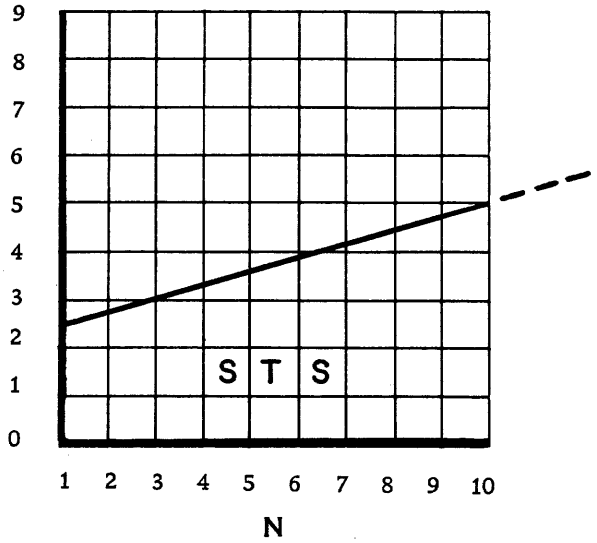












ZAC:	1.296 ms
TZE, TNZ:	1.896 ms
TPL, TMI:	.096 ms
TOV, TNO:	.120 ms

CLEAR AND ADD LOGICAL FIELD

Purpose

To form a 36 bit hash field checksum.

Calling Sequence

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		CAF, 4	
	α + 1				N	
	α + 2				A, t, R	
	α + 3					RETURN

Method

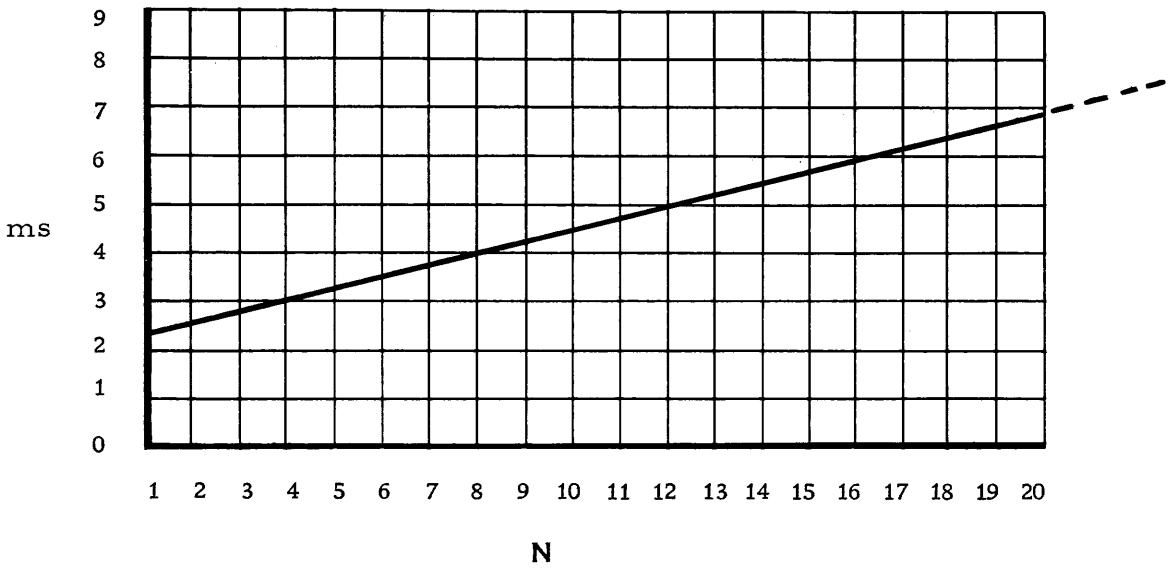
A 36-bit checksum is formed by clearing the accumulator and applying the ACL instruction to successive packed BCD words of the field. If N is not a multiple of 6, the remaining characters are shifted right and zeros are inserted at the left, prior to the last ACL.

Usage

The result is left as a logical word in the accumulator.

CAF may be used to conveniently extract a field of not more than six characters and insert it directly into the accumulator. This is more efficient than XIN followed by CAL.

Timing



INSERT LEADING ZEROS

Purpose

To replace leading blanks of a field with zeros.

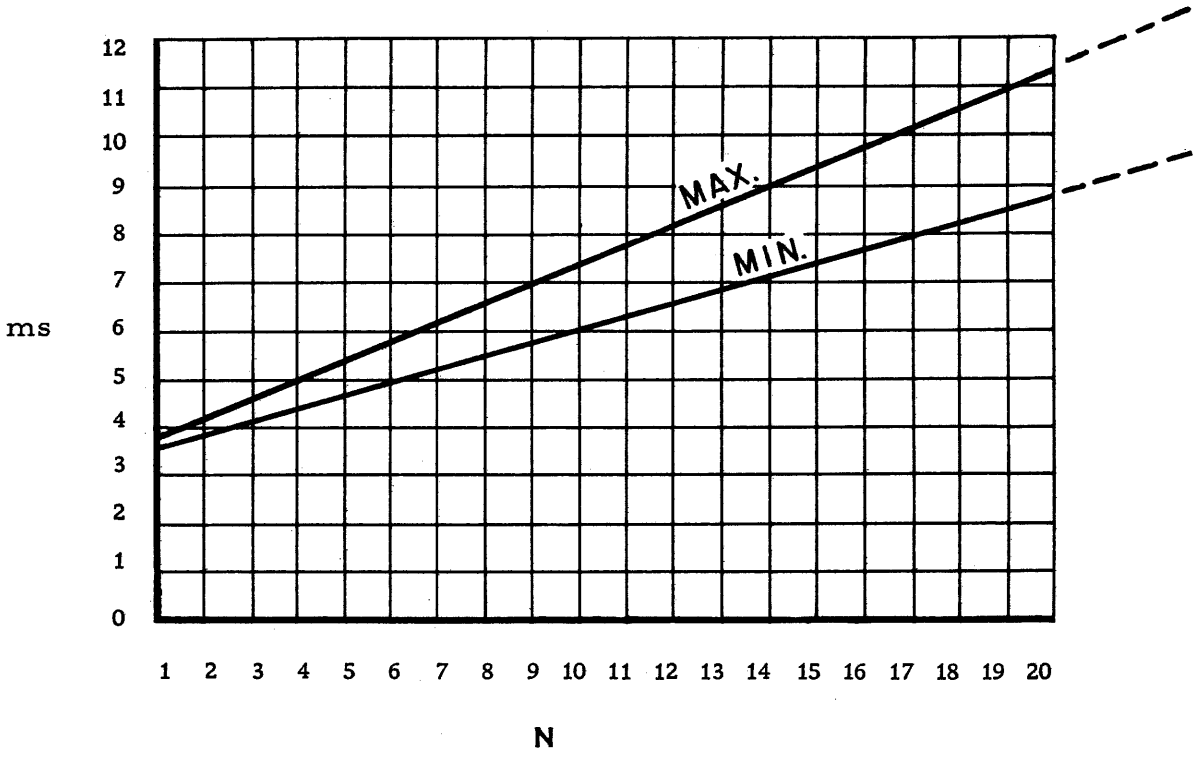
Calling Sequence

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		ILZ, 4	
	α + 1				N	N≤84
	α + 2				A, t, R	
	α + 3					RETURN

Method

Insertion of zeros progresses from left to right and ceases when either a non-blank character is encountered or the end of the field is reached.

Timing



MODIFY FOR PRINTING

Purpose

To prepare a numerical field for printing by adding any of the following: dollar signs (which may be floated), decimal points, commas, leading blanks, asterisks, and zeros. The desired output format is conveniently described by means of a BCD mask, and either - (minus) or CR (credit) may be used to sign negative results. If the units digit of the field is signed positively, the sign is simply removed.

This routine may also be used to modify the contents of the pseudo-accumulator used in the BCD arithmetic subroutines.

Calling Sequences

1. To modify a numerical field:

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	α	T S X	MOD, 4	
	α + 1		N	INPUT FIELD; N≦42
	α + 2		A, t, R	
	α + 3		M, f, m	MASK; m≦42
	α + 4		B, t, S	MODIFIED FIELD
	α + 5			ERROR RETURN
	α + 6			NORMAL RETURN

2. To modify N low order digits of pseudo-accumulator:

H	LOCATION	OP	ADDRESS, TAG, DECREMENT	COMMENTS
	α	T S X	MAC, 4	
	α + 1		N	N≦24
	α + 2		M, f, m	MASK; m≦42
	α + 3		B, t, S	MODIFIED FIELD
	α + 4			RETURN

where

M = Location of first word of mask
f = Format parameter
m = Number of characters in mask (also equal to number of characters in output field).

Usage and Restrictions

The mask must have at least as many characters as the input field and will usually have more ($m \geq N$). If the input field is non-numerical, control is returned to ($\alpha + 5$).

Example 1

Input	=	6237491	(N=7)
Mask	=	$XX, XXX.XX	(m=10)
Output	=	$62, 374.91	

This mask may be easily coded using a BCD card; e.g.,

H	LOCATION		OP			ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12		72
	M. .		B C D		2$XX,XXX.XX		

Note that two words (M, M+1) are required to store the mask which must begin with the leftmost character of location M.

Let $\sum X$ be the number of X's appearing in the mask. The inequality

$$N \leq \sum X \leq m \leq 42$$

must be satisfied. If AC input is used, the further restriction $N \leq 24$ is necessary.

If - (minus) or CR appears immediately to the right of the mask, the output will be signed accordingly when negative.

Example 2

Mask = $XX, XXX -

Input	=	47523	Input	=	$\bar{32586}$
Output	=	$47, 523b	Output	=	$32, 586 -

Mask = $X, XXX.XX CR

Input	=	238495	Input	=	$\bar{756894}$
Output	=	$2, 384.95bb	Output	=	$7, 568.94CR

The format parameter f may have the following values:

f	Format
0	Leading blanks
1	Floating dollar sign
2	Leading asterisks
3	Leading zeros

Example 3 illustrates the use of these parameters.

Example 3

MASK = $XXX,XXX.XX

INPUTS	F=0	F=1	F=2	F=3
36942708	$369,427.08	$369,427.08	$369,427.08	$369,427.08
00942708	$ 9,427.08	$9,427.08	$**9,427.08	$009,427.08
00002708	$ 27.08	$27.08	$*****27.08	$000,027.08
00000008	$ .08	$.08	$*******.08	$000,000.08
00000000	$ .00	$.00	$*******.00	$000,000.00

Note

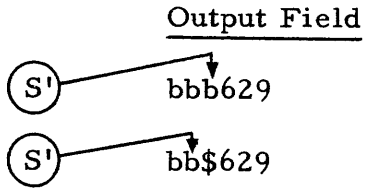
1. Suppression of commas or zeros never proceeds to the right of a decimal point.
2. A $ will not appear in the output unless it appears in the mask.
3. When the mask does not contain a $, the output for f = 0 and f = 1 is identical.

Example 4

Special care may be necessary when wholly zero fields are modified as shown by the following (somewhat peculiar) output; note in particular f = 0, 1:

	Mask = $XX, XXX-		Mask = $XX, XXX. -	
Input / f	00000	00000-	00000	00000-
0	$	$ -	$.	$. -
1	$	$-	$.	$. -
2	$******	$******-	$******.	$******. -
3	$00, 000	$00, 000-	$00, 000.	$00, 000. -

When control is sent to the normal return, a number S', defined in the following diagram, is left in the decrement field of the accumulator with the remainder of the accumulator clear:



These two situations are representative of instances where S' has meaning and possible value. It can be seen that S' is the character position of the rightmost blank in the output field. Two uses for S' immediately present themselves, and there are undoubtedly others:

1) To affix a floating sign at the left of a field; e.g.,

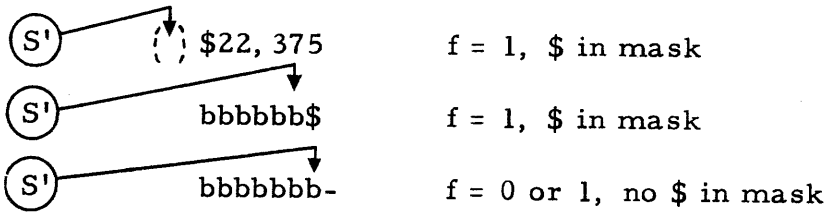
Output	Desired Output
3,427-	-3,427
427-	-427

2) To close the gap which arises between adjacent fields when the one at the right has fewer than its maximum number of significant digits, e.g.,

Output	Desired Output
SHARES SOLD 375, 416	SHARES SOLD 375,416
SHARES SOLD 416	SHARES SOLD 416

This type of situation will usually occur in isolated headings, not in columnar listings.

When the output field has no blanks at the left or is completely blank (except for . , - or CR), S' is defined as follows:



In all other instances, a number S' is calculated but it is difficult to assign any useful meaning to it.

As an aid in further processing, the sign of the accumulator is set to the sign of the input field on a normal return.

Execution of MOD or MAC in no way affects the mask. Thus, a single mask will frequently suffice for the modification of several fields.

CHECK PACKED BCD

Purpose

To check a field for illegal BCD characters.

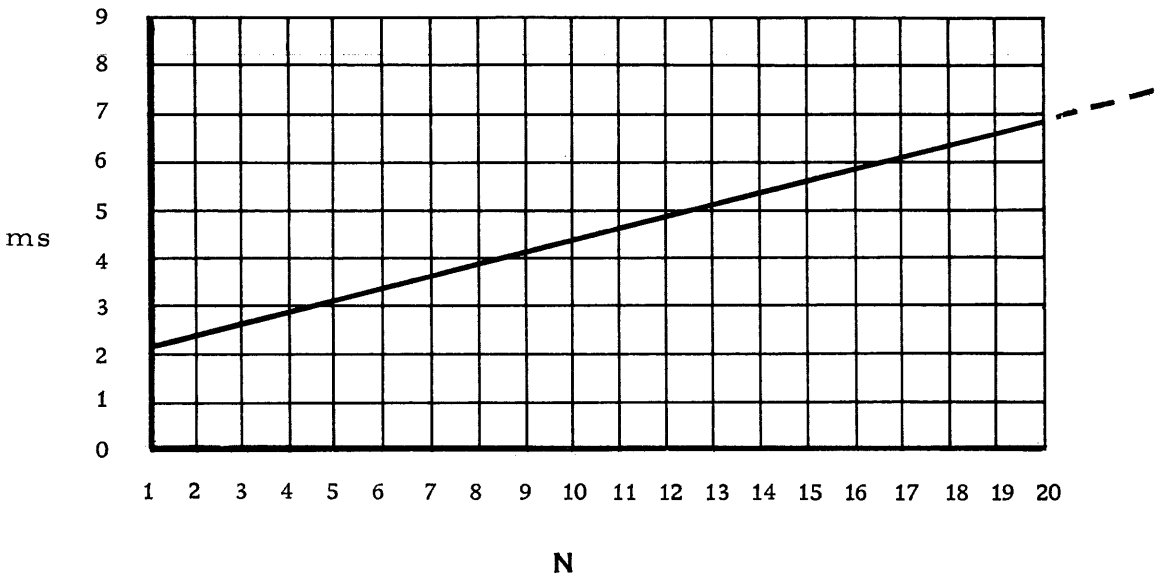
Calling Sequence

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 – 6	7	8 – 10	11	12 – 72	
	α		T S X		CHK, 4	
	α + 1				N	
	α + 2				A, t, R	
	α + 3					ILLEGAL RETURN
	α + 4					LEGAL RETURN

Method

A character for character check is carried out, which exits to (α + 3) if any of the fifteen illegal BCD characters given in the appendix are detected.

Timing



PART II: MEMORY ALLOCATION AND LOADER

INTRODUCTION

The purpose of this section is to specify the space required for each subroutine and to describe the manner of calling these subroutines into memory at the time a program is run.

PACKAGE COMPONENTS

For purpose of loading, the Data Processing Package is split into fourteen components, each containing one or more subroutines as shown in the table on page 34. Note that the Universal Routine does not have a component number. It is automatically brought into memory whenever any components are called in.

LOADER

The package components are stored on a library tape in a special relocatable form, one record per component. In order to call into core storage any desired group of components at the time a program is run, the routines A. and B. below must be <u>assembled</u> along with the main program. At the time the program is run, the library tape must be mounted on the tape unit with the Address Selection Switch set to 1.

A. <u>Loader Call Program - written by user</u>

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 — 6	7	8 — 10	11	12	72
	α		T S X		DPPL, 4	
	$\alpha + 1$					ERROR RETURN
	$\alpha + 2$				n_1, 0, n_2	
	$\alpha + 3$				n_3, 0, n_4	
	$\alpha + 4$				n_5, 0, ---	
	.				--------	
	.				--------	
	.				--------	
	$\alpha + K$				n_z	LAST n_i
	$\alpha + K + 1$					NORMAL RETURN

$n_1, n_2, \ldots, n_z$ = Component numbers of those components the user does <u>not</u> wish to call in. The n_i must be in ascending order except for n_z, the last n_i, which must be zero. n_z is not treated as are the preceding n_i but serves as a terminating marker.

COMPONENT IDENTIFICATION TABLE

Component No.	Routine	Words Required
-	Universal Routine (Contains BCD to Binary and Binary to BCD routines)	440
1	Read Card	163
2	Punch Print	97
3	Read BCD Tape Write BCD Tape	47
4	Read Binary Tape Write Binary Tape	88
5	Move	16
6	Extract and Insert	12
7	Alphanumerical Comparison	61
8	Blank Packed Block	10
9	BCD Arithmetic	364
10	Clear and Add Logical Field	32
11	Insert Leading Zeros	18
12	Modify for Printing	129
13	Check Packed BCD	26
	TOTAL:	1503

Generally, the DPPL call program will be executed only once. If memory is at a premium, a small saving can be effected by placing the call program in some erasable area.

Since DPPL is read over by DPP1, a second attempt to TSX to DPPL will generally produce nothing useful.

Error Return = Location to which control is immediately transferred in the event that

1) Three attempts at reading in a component record result in checksum failure.

2) Either the n_i's are not in ascending order or an $n_i > 13$.

3) The block of memory reserved for the components is of insufficient size.

On an error return, the accumulator is cleared, except for the decrement field, which will contain an indication corresponding to the error type; i.e.,

Error Type	Decrement (Octal)
1	00001
2	00002
3	00003

Normal Return = Location to which control is sent when component loading is completed.

Example 1

It is desired to load all components except Read-Write BCD Tape (#3), Move (#5), and Insert Leading Zeros (#11). If control is sent to the "Error Return" location, it is desired to stop with $(77777)_8$ in the address of the stop command.

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		DPPL, 4	
	α + 1		H T R		-1	
	α + 2				3, 0, 5	
	α + 3				11	
	α + 4				NEXT INSTRUCTION IN MAIN PROGRAM	

Note that the decrement of (α + 3), left blank on the coding sheet and therefore taken as zero, fulfills the condition that the last n_i be zero.

Example 2

Same as Example 1 except that only #3 and #5 are to be omitted.

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		DPPL, 4	
	α + 1		H T R		-1	
	α + 2				3, 0, 5	
	α + 3		P Z E			
	α + 4				NEXT INSTRUCTION IN MAIN PROGRAM	

Note that (α + 3) fulfills the condition that the last n_i be zero.

Example 3

Same as Example 1 except that all components are to be loaded.

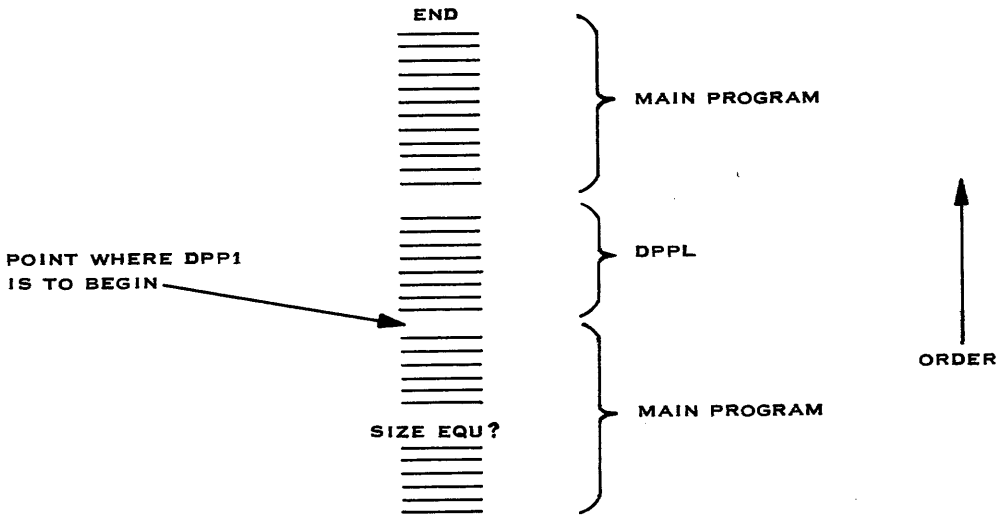
H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	α		T S X		DPPL, 4	
	α + 1		H T R		-1	
	α + 2		P Z E			
	α + 3				NEXT INSTRUCTION IN MAIN PROGRAM	

B. DPPL - Data Processing Package Loader

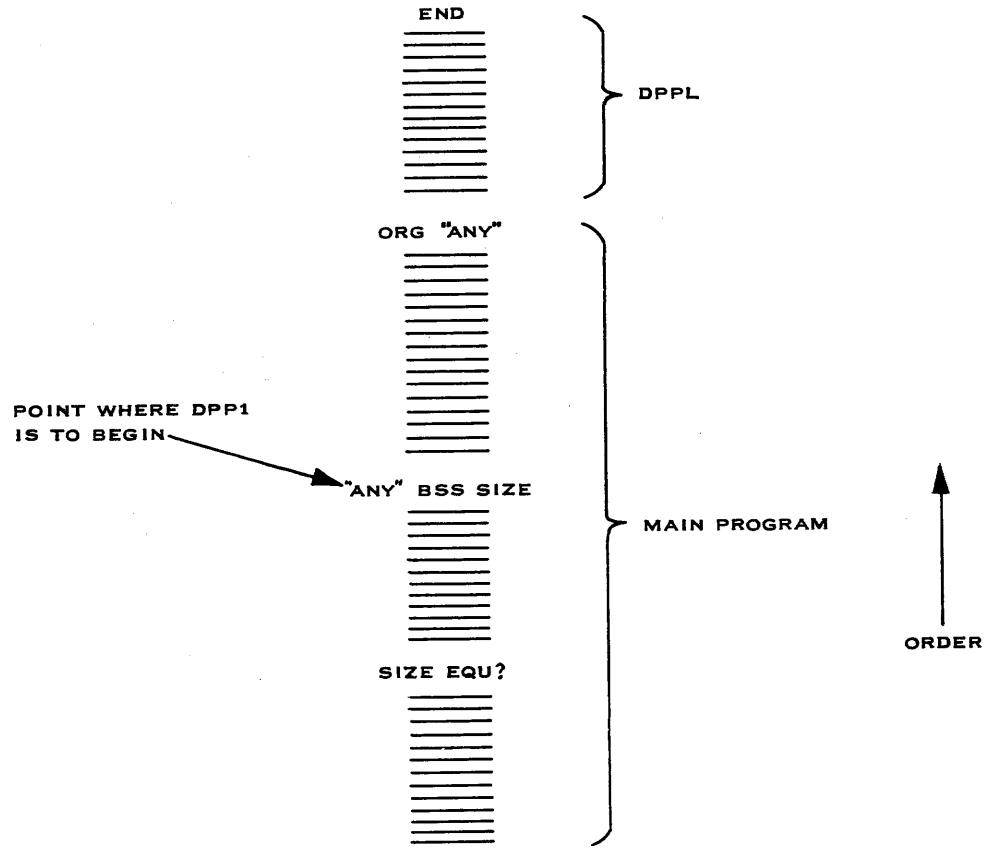
DPPL is essentially a selective relocatable loader which must be assembled such that it begins in the first word of the block allocated for the package components. During the loading process, it is read over by the Universal Routine. Thus DPPL requires no space beyond that already allocated for the components.

At any point preceding DPPL in the assembly deck, the user must place an EQU card which equates the symbol SIZE to the total number of words required for the components selected (computed from the table on page 34). The definition of SIZE permits DPPL to automatically block reserve the appropriate number of words needed for the components and to compare this figure against a computed value for checking purposes.

A typical assembly deck will thus appear as follows:



An alternative method of arranging the assembly deck is



If any attempt is made to use components of DPP1, e.g., MOD, without first executing DPPL to call them in, a stop of the form

H	LOCATION		OP		ADDRESS, TAG, DECREMENT	COMMENTS
1	2 6	7	8 10	11	12	72
	MOD		HTR		MOD	

will be encountered.

Card Deck Available

Symbolic (SAP code) deck, labelled DPPL 0000-0169

Note

The address part of DPPL + 13 (card # DPPL0051) must be set equal to the number of files to be skipped on the library tape containing DPP1.

PART III: WRITE LIBRARY TAPE ROUTINE

Purpose

To skip n files on tape T and write the Data Processing Package as the (n + 1)st file.

Binary Control Card

9L address: n ($n \geq 0$)
9R address: T ($1 \leq T \leq 10$)

Operating Notes

1) Ready tape T with library tape.
2) Load the following deck:

WDP 1	000-012
Control Card	
WDP 1	013-104

3) Error Stops (Octal)

02051	-	card checksum failure - start over.
02154	-}	relocate complement address or decrement
02163	-}	in DPP1 - should never happen.
02234	-	card checksum failure - start over.
02320	-	three tape checksum failures in a row - press START to try three more times. (WDP1 checksum tests each DPP1 record it has written.)

Note: Tape T is rewound prior to processing.

Card Deck Designation:

Symbolic (SAP code) deck, labelled	WDP1 0000-0259
Absolute Binary deck, labelled	WDP1 0000-0105

PART IV: PROGRAM LISTING

DPP1 DATA PROCESSING PACKAGE

```
                 00000           ORG 0
                 00000           BSS 0                      UNIVERSAL COMPONENT
                 00124      U    EQU 84
                 00000      ()   EQU 0

                                      UNIVERSAL CONSTANTS

00000  0 00000 0 00001      1A          1
00001  0 00000 0 00010      8A          8
00002  0 00000 0 00011      9A          9
00003  0 00000 0 00012      10A         10
00004  0 00000 0 00016      14A         14
00005  0 00000 0 00100      64A         64
00006 +000000000040         040A   OCT  40
00007 +000000000051         051A   OCT  51
00010 +000000000053         053A   OCT  53
00011 +000000000054         054A   OCT  54
00012 +000000000060         060A   OCT  60
00013 +000000000067         067A   OCT  67
00014 +000000000073         073A   OCT  73
00015 +000000000077         077A   OCT  77
00016  0 00001 0 00000      1D          0,0,1
00017  0 00002 0 00000      2D          0,0,2
00020  0 00014 0 00000      12D         0,0,12
00021 +000077000000         CXSO   OCT  77000000
00022  0 00000 1 00000      TAG1        0,1
00023  0 00000 2 00000      2T          0,2
00024  0 00000 7 00000      TAG7        0,7
00025  0 77777 0 77777      CT          -1,0,-1
00026  0 00000 0 77777      CTD         -1
00027  0 00000 0 00447      LAC         AC
00030  0 00000 0 00477      LAC24       AC+24
00031  0 00000 0 00124      UA          U                SIZE OF UNPACKED BLOCK
00032  0 00000 0 00052      HUA         U/2
00033  0 00124 0 00000      UDEC        0,0,U
00034  0 00052 0 00000      HUD         0,0,U/2
00035  0 00000 0 00500      UDB         UD
00036  0 00000 0 00477      UDM1        UD-1
00037  0 00000 0 00552      UDPHU       UD+U/2

                                      SHIFT TABLE

00040  0 00000 0 00000      ZERO        0
00041  0 00000 0 00006      6A          6
00042  0 00000 0 00014      12A         12
00043  0 00000 0 00022                  18
00044  0 00000 0 00030                  24
00045  0 00000 0 00036      STAB        30

                 00040      0000.  SYN ZERO
                 00000      0001.  SYN 1A
                 00041      0006.  SYN 6A
                 00001      0008.  SYN 8A
```

```
00002   0009. SYN 9A
00003   0010. SYN 10A
00042   0012. SYN 12A
00044   0024. SYN STAB-1
00035   LUD   SYN UDB
00012   50B   SYN 060A

00046 +000000000000          OCT
00047 +000000000000          OCT
00050 +000000000000          OCT
00051 -000011000000          OCT 400011000000
00052 -000010000000          OCT 400010000000
00053 +000000000000          OCT
00054 -000046000000          OCT 400046000000
00055 -000045000000          OCT 400045000000
00056 -000044000000          OCT 400044000000
00057 -000043000000          OCT 400043000000
00060 -000042000000          OCT 400042000000
00061 -000041000000          OCT 400041000000
00062 -000040000000          OCT 400040000000
00063 -000037000000          OCT 400037000000
00064 -000007000000          OCT 400007000000
00065 -000000606060          OCT 400000606060
00066 +000000000000          OCT
00067 +000000000000          OCT
00070 +000000000000          OCT
00071 -000005000000          OCT 400005000000
00072 -000004000000          OCT 400004000000
00073 -240025523200          OCT 640025523200
00074 -240036513111          OCT 640036513111
00075 -240035503010          OCT 640035503010
00076 -240034472707          OCT 640034472707
00077 -240033462606          OCT 640033462606
00100 -240032452505          OCT 640032452505
00101 -240031442404          OCT 640031442404
00102 -240030432303          OCT 640030432303
00103 -240027422202          OCT 640027422202
00104 -240026412101          OCT 640026412101
00105 -000006000000          OCT 400006000000
00106 +000000000000          OCT
00107 +000000000000          OCT
00110 +000000000000          OCT
00111 -000002000000          OCT 400002000000
00112 -000001000000          OCT 400001000000
00113 -200013523200          OCT 600013523200
00114 -200024513111          OCT 600024513111
00115 -200023503010          OCT 600023503010
00116 -200022472707          OCT 600022472707
00117 -200021462606          OCT 600021462606
00120 -200020452505          OCT 600020452505
00121 -200017442404          OCT 600017442404
00122 -200016432303          OCT 600016432303
00123 -200015422202          OCT 600015422202
00124 -200014412101          OCT 600014412101
00125 -000003000000          OCT 400003000000
00126 +000000000000          OCT

77    ILLEGAL
76    ILLEGAL
75    ILLEGAL
74    (
73    ,
72    ILLEGAL
71    Z
70    Y
67    X
66    W
65    V
64    U
63    T
62    S
61    /
60    BLANK
57    ILLEGAL
56    ILLEGAL
55    ILLEGAL
54    *
53    $
52    -0
51    R    -9
50    Q    -8
47    P    -7
46    O    -6
45    N    -5
44    M    -4
43    L    -3
42    K    -2
41    J    -1
40    -
37    ILLEGAL
36    ILLEGAL
35    ILLEGAL
34    )
33    .
32    +0
31    I    +9
30    H    +8
27    G    +7
26    F    +6
25    E    +5
24    D    +4
23    C    +3
22    B    +2
21    A    +1
20    +
17    ILLEGAL
```

```
DPP10056
DPP10057
DPP10058
DPP10059
DPP10060
DPP10061
DPP10062
DPP10063
DPP10064
DPP10065
DPP10066
DPP10067
DPP10068
DPP10069
DPP10070
DPP10071
DPP10072
DPP10073
DPP10074
DPP10075
DPP10076
DPP10077
DPP10078
DPP10079
DPP10080
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DPP10082
DPP10083
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DPP10100
DPP10101
DPP10102
DPP10103
DPP10104
DPP10105
DPP10106
DPP10107
DPP10108
DPP10109
DPP10110
DPP10111
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00127 +000000000000          OCT                          16   ILLEGAL
00130 +000000000000          OCT                          15   ILLEGAL
00131 +000000000000          OCT                          14   ILLEGAL(-)
00132 -000012000000          OCT 400012000000             13   =
00133 +000000000000          OCT                          12   ILLEGAL
00134 -300060513111          OCT 700060513111             11   9
00135 -300057503010          OCT 700057503010             10   8
00136 -300056472707          OCT 700056472707             07   7
00137 -300055462606          OCT 700055462606             06   6
00140 -300054452505          OCT 700054452505             05   5
00141 -300053442404          OCT 700053442404             04   4
00142 -300052432303          OCT 700052432303             03   3
00143 -300051422202          OCT 700051422202             02   2
00144 -300050412101          OCT 700050412101             01   1
00145 -300047523200    BCD   OCT 700047523200             00    0

                             UNIVERSAL SUB-SUBROUTINES

                             RESTORE AND RETURN ROUTINE

00146 -0 53400 1 00421 END   LXD XA,1                     RESTORE
00147 -0 53400 2 00422       LXD XB,2                     AND
00150  0 02000 4 00000       TRA 0,4                      RETURN


                             INDEX ROUTINE

00151  0 60200 0 00435 INDEX SLW IND1                     SAVE INPUT
00152 -0 32000 0 00024       ANA TAG7
00153  0 10000 0 00162       TZE IND2                     IS TAG=0
00154  0 40200 0 00022       SUB TAG1
00155 -0 10000 0 00160       TNZ IND3                     IS TAG=1
00156  0 50200 0 00421       CLS XA                       TAG=1
00157  0 02000 0 00161       TRA IND4
00160  0 50200 0 00422 IND3  CLS XB                       TAG=2
00161  0 77100 0 00022 IND4  ARS 18
00162  0 40000 0 00435 IND2  ADD IND1
00163 -0 32000 0 00025       ANA CT                       CLEAR TAG
00164  0 02000 2 00001       TRA 1,2

                             LOCATE FIELD START

00165 -0 63400 2 00436 LFS   SXD LFSB,2                   SAVE IR-2
00166  0 07400 2 00151       TSX INDEX,2                  INDEX ORIGIN
00167 -0 73400 2 00000       PDX 0,2
00170  3 00000 2 00174D      TXH LFS1,2,0                 IS DEC=0
00171  0 53400 1 00041       LXA 6A,1                     SET IR-1=6
00172 -0 53400 2 00436       LXD LFSB,2
00173  0 02000 2 00001       TRA 1,2
00174  0 62100 0 00431 LFS1  STA LFSA                     DEC. NOT ZERO
00175  0 40200 0 00016       SUB 1D                       (DEC-1)
00176  0 76500 0 00065       LRS 53
00177  0 22000 0 00041       DVH 6A                       (DEC-1)/6=Q+REM
00200  0 40200 0 00041       SUB 6A
00201  0 73400 1 00000       PAX 0,1                      SET IR-1=(6-REM)
00202 -0 60000 0 00437       STQ LFSQ                     SAVE Q
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00203 -0 50000 0 00431          CAL LFSA                                DPP10168
00204  0 36100 0 00437          ACL LFSQ                                DPP10169
00205 -0 53400 2 00436          LXD LFSB,2                              DPP10170
00206  0 02000 2 00001          TRA 1,2                                 DPP10171
                                                                        DPP10172
                                     SET UP BLOCK ADDRESS               DPP10173
                                                                        DPP10174
00207 -0 63400 2 00432   SBA    SXD SBAB,2                              DPP10175
00210  0 07400 2 00151          TSX INDEX,2             INDEX ORIGIN    DPP10176
00211  0 62100 0 00432          STA SBAB                                DPP10177
00212  0 77100 0 00022          ARS 18                                  DPP10178
00213  0 73400 1 00000          PAX 0,1                 SET IR-1=W      DPP10179
00214  0 36100 0 00432          ACL SBAB                (A+W)           DPP10180
00215 -0 53400 2 00432          LXD SBAB,2                              DPP10181
00216  0 02000 2 00001          TRA 1,2                                 DPP10182
                                                                        DPP10183
                                     EXTRACT FIELD TO UD                DPP10184
                                                                        DPP10185
00217  0 53400 1 00000   XTR1   LXA 1A,1                 SET IR-1=1      DPP10186
00220 -0 63400 2 00440   XTR    SXD XTRB,2              SAVE IR-2,4     DPP10187
00221 -0 63400 4 00441          SXD XTRX,4                              DPP10188
00222 -0 63400 1 00433          SXD XTRN,1              SAVE N          DPP10189
00223  0 07400 2 00165          TSX LFS,2               LOCATE FIELD START DPP10190
00224 -0 63400 1 00443          SXD XTRR,1              SAVE (6-REM)    DPP10191
00225  0 76000 0 00006          COM                                     DPP10192
00226  0 60200 0 00442          SLW XTRC                SAVE 1COM(A+Q)  DPP10193
00227  0 73400 2 00000          PAX 0,2                 SET IR-2=1COM(A+Q) DPP10194
00230 -0 50000 0 00433          CAL XTRN                                DPP10195
00231  0 77100 0 00022          ARS 18                                  DPP10196
00232  0 73400 4 00000          PAX 0,4                 SET IR-4=N      DPP10197
00233  0 36100 0 00035          ACL UDB                 (UD+N)          DPP10198
00234  0 62100 0 00243          STA XTRU                                DPP10199
00235 -0 50000 1 00046          CAL STAB+1,1            SET UP INITIAL SHIFT DPP10200
00236  0 62100 0 00240          STA XTR2                                DPP10201
00237  0 56000 2 77777          LDQ -1,2                GET 1ST PACKED WORD DPP10202
00240 -0 77300 0 00000   XTR2   RQL ()                  AND SPIN TO 1ST CHAR. DPP10203
00241  0 76000 0 00000   XTR4   CLM                                     DPP10204
00242 -0 76300 0 00006          LGL 6                   UNPACK AND STORE DPP10205
00243  0 60200 4 00000   XTRU   SLW (),4                 IN UD BLOCK     DPP10206
00244 -2 00001 4 00251          TNX XTR3,4,1            TEST FOR N CHAR. DPP10207
00245  2 00001 1 00241          TIX XTR4,1,1            TEST FOR 6 CHAR. DPP10208
00246  0 53400 1 00041          LXA 6A,1                SET IR-1=6      DPP10209
00247  0 56000 2 00000          LDQ 0,2                 GET NEXT PACKED WORD DPP10210
00250  1 77777 2 00241          TXI XTR4,2,-1           STEP PACKED ADDR. DPP10211
00251 -0 53400 1 00433   XTR3   LXD XTRN,1              SET IR-1=N      DPP10212
00252 -0 50000 0 00243          CAL XTRU                SET ACC(ADR)=(UD+N) DPP10213
00253 -0 53400 2 00440          LXD XTRB,2              RESTORE         DPP10214
00254 -0 53400 4 00441          LXD XTRX,4                  AND         DPP10215
00255  0 02000 2 00001          TRA 1,2                 RETURN          DPP10216
                                                                        DPP10217
                                     INSERT FIELD FROM UD               DPP10218
                                                                        DPP10219
00256  0 53400 1 00000   INS1   LXA 1A,1                 SET IR-1=1      DPP10220
00257 -0 63400 2 00444   INS    SXD INSB,2              SAVE IR-2,4     DPP10221
00260 -0 63400 4 00445          SXD INSC,4                              DPP10222
00261 -0 63400 1 00434          SXD INSN,1              SAVE N          DPP10223
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00262   0 07400 2 00165          TSX LFS,2                LOCATE FIELD START                DPP10224
00263   0 76000 0 00006          COM                                                        DPP10225
00264   0 73400 2 00000          PAX 0,2                  SET IR-2=1COM(A+Q)                DPP10226
00265  -0 50000 0 00434          CAL INSN                                                   DPP10227
00266   0 77100 0 00022  INS6    ARS 18                                                     DPP10228
00267   0 73400 4 00000          PAX 0,4                  SET IR-4=N                        DPP10229
00270   0 40000 0 00035          ADD UDB                  (UD+N)                            DPP10230
00271   0 62100 0 00300          STA INSU                                                   DPP10231
00272  -0 50000 1 00046          CAL STAB+1,1             SET UP INITIAL SHIFT              DPP10232
00273   0 62100 0 00275          STA INS2                                                   DPP10233
00274   0 56000 2 77777          LDQ -1,2                 GET FIRST PACKED WORD             DPP10234
00275  -0 76300 0 00000  INS2    LGL ()                   INITIAL SPIN                      DPP10235
00276   0 76700 0 00006  INS4    ALS 6                                                      DPP10236
00277  -0 77300 0 00006          RQL 6                                                      DPP10237
00300   0 36100 4 00000  INSU    ACL (),4                 INSERT                            DPP10238
00301  -2 00001 4 00310          TNX INS3,4,1             TEST FOR N CHAR.                  DPP10239
00302   2 00001 1 00276          TIX INS4,1,1             TEST FOR 6 CHAR.                  DPP10240
00303   0 60200 2 77777          SLW -1,2                 STORE PACKED WORD                 DPP10241
00304   0 53400 1 00041          LXA 6A,1                 SET IR-1=6                        DPP10242
00305   0 56000 2 00000          LDQ 0,2                  GET NEXT PACKED WORD              DPP10243
00306   1 77777 2 00276          TXI INS4,2,-1            STEP P.W. ADDR.                   DPP10244
00307  -0 76300 0 00006  INS5    LGL 6                    SPIN LAST                         DPP10245
00310   2 00001 1 00307  INS3    TIX INS5,1,1             PACKED WORD                       DPP10246
00311   0 60200 2 77777          SLW -1,2                                                   DPP10247
00312  -0 53400 2 00444          LXD INSB,2               RESTORE                           DPP10248
00313  -0 53400 4 00445          LXD INSC,4               AND                               DPP10249
00314   0 02000 2 00001          TRA 1,2                  RETURN                            DPP10250
00315  -0 63400 2 00444  INSX    SXD INSB,2                    SAVE I. R.                   DPP10251
00316  -0 63400 4 00445          SXD INSC,4                                                 DPP10252
00317  -0 53400 1 00443          LXD XTRR,1                    SET IR-1=(6-REM)             DPP10253
00320   0 53400 2 00442          LXA XTRC,2               SET IR-2=1COM(A+Q)                DPP10254
00321  -0 50000 0 00433          CAL XTRN                 SET N                             DPP10255
00322   0 02000 0 00266          TRA INS6                                                   DPP10256
                                                                                           DPP10257
                                 DECIMAL TO BINARY CONVERSION                              DPP10258
                                                                                           DPP10259
00323  -0 63400 1 00421  DTB     SXD XA,1                 SAVE I.R.                         DPP10260
00324  -0 63400 2 00422          SXD XB,2                                                   DPP10261
00325   0 50000 4 00001          CLA 1,4                  GET N                             DPP10262
00326   0 73400 1 00000          PAX 0,1                  SET IR-1=N                        DPP10263
00327   0 14000 0 00330          TOV DB1                  TURN OFF OV. TRIGGER              DPP10264
00330   0 50000 4 00002  DB1     CLA 2,4                  EXTRACT FIELD                     DPP10265
00331   0 07400 2 00220          TSX XTR,2                TO BE CONVERTED                   DPP10266
00332   0 62100 0 00335          STA DB3                  SET (UD+N)                        DPP10267
00333   0 60000 0 00424          STZ T1                   CLEAR PARTIAL SUM                 DPP10268
00334   0 56000 0 00002          LDQ 9A                   SET MQ=9                          DPP10269
00335   0 50000 1 00000  DB3     CLA (),1                                                   DPP10270
00336   0 04000 0 00347          TLQ DB4                  TEST FOR PURE DIGIT               DPP10271
00337   0 40000 0 00424          ADD T1                                                     DPP10272
00340  -3 00001 1 00362          TXL DB5,1,1              TEST FOR UNITS DIGIT              DPP10273
00341   0 60100 0 00424          STO T1                   PROGRAMMED                        DPP10274
00342   0 76700 0 00003          ALS 3                    MULT.                             DPP10275
00343   0 40000 0 00424          ADD T1                   BY                                DPP10276
00344   0 40000 0 00424          ADD T1                   10                                DPP10277
00345   0 60100 0 00424          STO T1                                                     DPP10278
00346   2 00001 1 00335          TIX DB3,1,1                                                DPP10279
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00347   3 00001 1 00365   DB4   TXH DB6,1,1                TEST FOR UNITS DIGIT                DPP10280
00350   0 73400 2 00000         PAX 0,2                    IS UNITS POSITION                   DPP10281
00351   0 56000 2 00145         LDQ BCD,2                  A SIGNED DIGIT                      DPP10282
00352  -0 77300 0 00001         RQL 1                                                          DPP10283
00353   0 16200 0 00365         TQP DB6                                                        DPP10284
00354  -0 77300 0 00037         RQL 31                     PUT UNSIGNED UNITS                  DPP10285
00355   0 50000 0 00040         CLA ZERO                   DIGIT IN ACC                        DPP10286
00356  -0 76300 0 00004         LGL 4                                                          DPP10287
00357   0 40000 0 00424         ADD T1                                                         DPP10288
00360  -0 77300 0 00003         RQL 3                      SIGN AC                             DPP10289
00361   0 76300 0 00000         LLS 0                                                          DPP10290
00362   0 14000 0 00364   DB5   TOV DB7                    OVERFLOW TEST                       DPP10291
00363   1 77774 4 00146         TXI END,4,-4               NORMAL RETURN                       DPP10292
00364   0 50000 0 00016   DB7   CLA 1D                     SET DECREMENT TO 1                  DPP10293
00365   1 77775 4 00146   DB6   TXI END,4,-3               ERROR RETURN                        DPP10294
                                                                                              DPP10295
                                BINARY TO DECIMAL CONVERSION                                  DPP10296
                                                                                              DPP10297
00366  -0 63400 1 00421   BTD   SXD XA,1                   SAVE I.R.                           DPP10298
00367  -0 63400 2 00422         SXD XB,2                                                       DPP10299
00370   0 76500 0 00043         LRS 35                     SHIFT BINARY INTO MQ                DPP10300
00371   0 76000 0 00000         CLM                                                            DPP10301
00372   0 36100 4 00001         ACL 1,4                                                        DPP10302
00373   0 73400 1 00000         PAX 0,1                    SET IR-1=N                          DPP10303
00374  -0 63400 1 00424         SXD T1,1                   SAVE N                              DPP10304
00375   0 36100 0 00036         ACL UDM1                                                       DPP10305
00376   0 62100 0 00404         STA BD1                    SET (UD+N-1)=UNITS POSITION         DPP10306
00377   0 62100 0 00410         STA BD2                                                        DPP10307
00400   0 62100 0 00414         STA BD3                                                        DPP10308
00401   0 53400 2 00040         LXA ZERO,2                 SET IR-2=0                          DPP10309
00402   0 76000 0 00000   BD5   CLM                                                            DPP10310
00403   0 22000 0 00003         DVH 10A                    GENERATE BCD                        DPP10311
00404   0 60200 2 00000   BD1   SLW (),2                   STORE UNPACKED BCD                  DPP10312
00405  -2 00001 1 00407         TNX BD4,1,1                TEST FOR N CHAR.                    DPP10313
00406   1 00001 2 00402         TXI BD5,2,1                                                    DPP10314
00407   0 12000 0 00415   BD4   TPL BD6                    SKIP ON +                           DPP10315
00410   0 50000 0 00000   BD2   CLA ()                     -, GET UNITS DIGIT                  DPP10316
00411  -0 10000 0 00413         TNZ BD7                                                        DPP10317
00412   0 40000 0 00003         ADD 10A                                                        DPP10318
00413   0 40000 0 00006   BD7   ADD 040A                   SIGN UNITS DIGIT -                  DPP10319
00414   0 60100 0 00000   BD3   STO ()                                                       DPP10320
00415  -0 53400 1 00424   BD6   LXD T1,1                   INSERT BCD                          DPP10321
00416   0 50000 4 00002         CLA 2,4                                                        DPP10322
00417   0 07400 2 00257         TSX INS,2                                                      DPP10323
00420   1 77775 4 00146         TXI END,4,-3               RETURN                              DPP10324
                                                                                              DPP10325
                                UNIVERSAL ERASEABLE                                           DPP10326
                                                                                              DPP10327
00421   0 00000 0 00000   XA                                                                  DPP10328
00422   0 00000 0 00000   XB                                                                  DPP10329
00423   0 00000 0 00000   XC                                                                  DPP10330
00424   0 00000 0 00000   T1                                                                  DPP10331
00425   0 00000 0 00000   T2                                                                  DPP10332
00426   0 00000 0 00000   T3                                                                  DPP10333
00427   0 00000 0 00000   T4                                                                  DPP10334
00430   0 00000 0 00000   T5                                                                  DPP10335
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00431  0 00000 0 00000    LFSA                                                    DPP10336
00432  0 00000 0 00000    SBAB                                                    DPP10337
00433  0 00000 0 00000    XTRN                                                    DPP10338
00434  0 00000 0 00000    INSN                                                    DPP10339
                   00435  IND1   BSS 1                                           DPP10340
                   00436  LFSB   BSS 1                                           DPP10341
                   00437  LFSQ   BSS 1                                           DPP10342
                   00440  XTRB   BSS 1                                           DPP10343
                   00441  XTRX   BSS 1                                           DPP10344
                   00442  XTRC   BSS 1                                           DPP10345
                   00443  XTRR   BSS 1                                           DPP10346
                   00444  INSB   BSS 1                                           DPP10347
                   00445  INSC   BSS 1                                           DPP10348
                   00446  SAC    BSS 1                                           DPP10349
                   00447  AC     BSS 25                                          DPP10350
                   00500  UD     BSS U                                           DPP10351
                                                                                 DPP10352
                   00624          BSS 0                    READ CARD COMPONENT    DPP10353
                                      READ CARD TO PACKED BCD                    DPP10354
                                                                                 DPP10355
                   00600  LEFT   SYN UD+64                                       DPP10356
                   00602  CMN    SYN UD+66                                       DPP10357
                   00604  BOOL   SYN UD+68                                       DPP10358
                   00606  8AND   SYN UD+70                                       DPP10359
                   00610  ATE4   SYN UD+72                                       DPP10360
                   00612  COBL   SYN UD+74                                       DPP10361
                   00614  ZAND   SYN UD+76                                       DPP10362
00624  0 76200 0 00321    RCD    RCD                      SELECT READER          DPP10363
00625 -0 63400 1 00421           SXD XA,1                 SAVE I. R.             DPP10364
00626 -0 63400 2 00422           SXD XB,2                                        DPP10365
00627 -0 63400 4 00423           SXD XC,4                                        DPP10366
00630 -0 50000 4 00001           CAL 1,4                                         DPP10367
00631  0 07400 2 00151           TSX INDEX,2              INDEX ADDRESS FOR OUTPUT DPP10368
00632  0 40100 0 00042           ADM 12A                                         DPP10369
00633  0 62100 0 00665           STA ORINS                                       DPP10370
00634  0 62100 0 00636           STA RCD2                                        DPP10371
00635  0 53400 4 00042           LXA 12A,4                CLEAR OUTPUT BLOCK     DPP10372
00636  0 60000 4 00000    RCD2   STZ (),4                                        DPP10373
00637  2 00001 4 00636           TIX RCD2,4,1                                    DPP10374
00640  0 53400 4 00005           LXA 64A,4                SET UP 64 WORD MODEL IN UD BLOCK DPP10375
00641  0 53400 2 00001           LXA 8A,2                                        DPP10376
00642  0 53400 1 00001    RCD1   LXA 8A,1                                        DPP10377
00643 -0 50000 2 01050    CAL    CAL MODEL+8,2                                   DPP10378
00644  0 76700 0 00022           ALS 18                                          DPP10379
00645  0 36100 1 01050           ACL MODEL+8,1                                   DPP10380
00646  0 60200 4 00600           SLW UD+64,4                                     DPP10381
00647 -2 00001 4 01017           TNX EOF,4,1                                     DPP10382
00650  2 00001 1 00643           TIX CAL,1,1                                     DPP10383
00651  2 00001 2 00642           TIX RCD1,2,1                                    DPP10384
00652  0 70000 0 00600    LOOP   CPY LEFT                 COPY ONE ROW OF THE CARD DPP10385
00653  0 70000 0 00601    RCD3   CPY LEFT+1                                      DPP10386
00654  0 53400 2 00041    SUBLP  LXA 6A,2                 TAKE ROW 6 BITS AT A TIME DPP10387
00655  0 56000 0 00600           LDQ LEFT                 AND (OR) THE APPROPRIATE DIGITS DPP10388
00656 -0 63400 2 00667           SXD TEST,2               INTO THE OUTPUT BLOCK  DPP10389
00657  1 00006 2 00660           TXI CLEER,2,6                                   DPP10390
00660 -0 75400 0 00000T   CLEER  PXD 0,0                                        DPP10391
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00661 -0 76300 0 00006          LGL 6                                                   DPP10392
00662  0 73400 1 00000          PAX 0,1                                                 DPP10393
00663 -0 50000 1 00577          CAL UD+63,1                                             DPP10394
00664 -0 32000 4 01066          ANA NUMB+14,4                                           DPP10395
00665 -0 60200 2 00000    ORINS ORS (),2                                                DPP10396
00666 -2 00001 2 00673          TNX TRATA,2,1                                           DPP10397
00667  3 00000 2 00660D   TEST   TXH CLEER,2,()                                        DPP10398
00670  0 56000 0 00601          LDQ LEFT+1          PROCESS RIGHT HALF OF ROW           DPP10399
00671 -0 63400 0 00667T         SXD TEST,0                                              DPP10400
00672  0 02000 0 00660          TRA CLEER                                               DPP10401
00673  1 00001 2 00674    TRATA TXI RCD4,2,1        SET IR-2=2                          DPP10402
00674 -3 00003 4 00752    RCD4  TXL LAST,4,3        IS THIS THE 12 ROW                  DPP10403
00675 -3 00015 4 00705          TXL 8ROW,4,13       IS THIS THE  9 ROW                  DPP10404
00676  0 60000 2 00606    9ROW  STZ BOOL+2,2        INITIALIZE ERASEABLE WORDS          DPP10405
00677  0 60000 2 00604          STZ CMN+2,2                                             DPP10406
00700  0 60000 2 00610          STZ 8AND+2,2                                            DPP10407
00701  0 07400 1 01024          TSX OA,1                                                DPP10408
00702  0 07400 1 01032          TSX OA8,1                                               DPP10409
00703  2 00001 2 00676          TIX 9ROW,2,1                                            DPP10410
00704  1 77777 4 00652          TXI LOOP,4,-1                                           DPP10411
00705 -3 00014 4 00712    8ROW  TXL 7ROW,4,12                                           DPP10412
00706  0 07400 1 01032    RCD6  TSX OA8,1                                               DPP10413
00707  0 60200 2 00612          SLW ATE4+2,2                                            DPP10414
00710  2 00001 2 00706          TIX RCD6,2,1                                            DPP10415
00711  1 77777 4 00652          TXI LOOP,4,-1                                           DPP10416
00712 -3 00011 4 00717    7ROW  TXL 4ROW,4,9                                            DPP10417
00713  0 07400 1 01032    RCD7  TSX OA8,1                                               DPP10418
00714  0 07400 1 01024    RCD9  TSX OA,1                                                DPP10419
00715  2 00001 2 00712          TIX 7ROW,2,1                                            DPP10420
00716  1 77777 4 00652    RCD12 TXI LOOP,4,-1                                           DPP10421
00717 -3 00010 4 00724    4ROW  TXL 3ROW,4,8                                            DPP10422
00720  0 07400 1 01024    RCD8  TSX OA,1                                                DPP10423
00721  0 32000 2 00612          ANS ATE4+2,2                                            DPP10424
00722  2 00001 2 00720          TIX RCD8,2,1                                            DPP10425
00723  1 77777 4 00652          TXI LOOP,4,-1                                           DPP10426
00724  3 00007 4 00714    3ROW  TXH RCD9,4,7                                            DPP10427
00725  3 00006 4 00713          TXH RCD7,4,6                                            DPP10428
00726 -3 00005 4 00745    1ROW  TXL ZROW,4,5                                            DPP10429
00727  0 07400 1 01024    RCD11 TSX OA,1                                                DPP10430
00730  0 07400 1 01032          TSX OA8,1                                               DPP10431
00731  2 00001 2 00727          TIX RCD11,2,1                                           DPP10432
00732  1 00001 2 00733          TXI RCD10,2,1       SET IR-2=2                          DPP10433
00733 -0 50000 2 00610    RCD10 CAL 8AND+2,2                                            DPP10434
00734  0 70000 2 00610          CPY 8AND+2,2        COPY ZERO ROW INTO 8AND             DPP10435
00735 -0 50100 2 00604          ORA CMN+2,2         FORM (OR) SUM OF ALL NZ DIGITS      DPP10436
00736 -0 60000 2 00614          STQ COBL+2,2                                            DPP10437
00737 -0 60200 2 00614          ORS COBL+2,2        FORM (OR) SUM OF ALL DIGITS INCL ZERO DPP10438
00740 -0 32000 2 00610          ANA 8AND+2,2                                            DPP10439
00741  0 60200 2 00616          SLW ZAND+2,2        ZAND GETS ALL ZERO ZONES            DPP10440
00742  0 60200 2 00602          SLW LEFT+2,2        GO TO PUT IN ZONE=3                 DPP10441
00743  2 00001 2 00733          TIX RCD10,2,1                                           DPP10442
00744  1 77777 4 00654          TXI SUBLP,4,-1                                          DPP10443
00745  3 00004 4 00716    ZROW  TXH RCD12,4,4                                           DPP10444
00746 -0 50000 2 00602    XROW  CAL LEFT+2,2                                            DPP10445
00747  0 60200 2 00604          SLW CMN+2,2         CMN GETS ALL 11 PUNCHES             DPP10446
00750  2 00001 2 00746          TIX XROW,2,1                                            DPP10447
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00751   1 77777 4 00652          TXI LOOP,4,-1                                    DPP10448
00752  -3 00002 4 00765   LAST   TXL BLAN,4,2                                    DPP10449
00753  -0 50000 2 00602   RCD13  CAL LEFT+2,2     CHECK FOR BOTH 11 AND 12 PUNCHES DPP10450
00754  -0 32000 2 00604          ANA CMN+2,2      IN THE SAME COLUMN               DPP10451
00755  -0 60200 2 00606          ORS BOOL+2,2                                     DPP10452
00756  -0 50000 2 00602          CAL LEFT+2,2     CMN GETS ALL 11 OR 12 PUNCHES    DPP10453
00757  -0 50100 2 00604          ORA CMN+2,2                                      DPP10454
00760   0 60200 2 00604          SLW CMN+2,2                                      DPP10455
00761  -0 32000 2 00610          ANA 8AND+2,2     GET ALL PLUS OR MINUS ZEROS      DPP10456
00762   0 60200 2 00602          SLW LEFT+2,2     AND GO TO PUT IN DIGIT OF 12 OCTAL DPP10457
00763   2 00001 2 00753          TIX RCD13,2,1                                    DPP10458
00764   1 77777 4 00654          TXI SUBLP,4,-1                                   DPP10459
00765  -3 00001 4 00777   BLAN   TXL BOO,4,1                                     DPP10460
00766  -0 50000 2 00604   RCD14  CAL CMN+2,2      FIND ALL COLUMNS WHICH ARE       DPP10461
00767  -0 50100 2 00614          ORA COBL+2,2     COMPLETELY BLANK                 DPP10462
00770   0 76000 0 00006          COM                                              DPP10463
00771   0 60200 2 00602          SLW LEFT+2,2                                     DPP10464
00772   2 00001 2 00766          TIX RCD14,2,1                                    DPP10465
00773  -0 50100 0 00600          ORA LEFT         UNLESS THERE ARE NO BLANK COLUMNS, DPP10466
00774   0 10000 0 00776          TZE RCD15        GO TO PUT  IN ZONE=3            DPP10467
00775   1 77777 4 00654          TXI SUBLP,4,-1                                   DPP10468
00776   1 77777 4 00777   RCD15  TXI BOO,4,-1                                    DPP10469
00777  -0 50000 2 00616   BOO    CAL ZAND+2,2     CHECK FOR 8-4 PUNCHES WITH NO ZONE DPP10470
01000  -0 50100 2 00604          ORA CMN+2,2      THESE ARE TREATED AS ILLEGAL     DPP10471
01001   0 76000 0 00006          COM                                              DPP10472
01002  -0 32000 2 00612          ANA ATE4+2,2                                     DPP10473
01003  -0 50100 2 00606          ORA BOOL+2,2                                     DPP10474
01004   0 60200 2 00602          SLW LEFT+2,2                                     DPP10475
01005  -0 50000 2 00616          CAL ZAND+2,2     CHECK FOR ZERO ZONE AS WELL AS   DPP10476
01006  -0 32000 2 00604          ANA CMN+2,2      11 OR 12 ZONE IN THE SAME COLUMN DPP10477
01007  -0 60200 2 00602          ORS LEFT+2,2                                     DPP10478
01010   2 00001 2 00777          TIX BOO,2,1                                      DPP10479
01011  -0 50000 0 00600          CAL LEFT                                         DPP10480
01012  -0 50100 0 00601          ORA LEFT+1                                       DPP10481
01013  -0 53400 4 00423          LXD XC,4                                         DPP10482
01014   0 10000 0 01016          TZE RCD16                                        DPP10483
01015   1 77776 4 00146          TXI END,4,-2     ERROR RETURN                    DPP10484
01016   1 77774 4 00146   RCD16  TXI END,4,-4     NORMAL RETURN                   DPP10485
01017   0 53400 4 00004   EOF    LXA 14A,4        GIVE COPY TO SENSE END OF FILE  DPP10486
01020   0 70000 0 00600          CPY LEFT                                         DPP10487
01021   0 02000 0 00653          TRA RCD3                                         DPP10488
01022  -0 53400 4 00423          LXD XC,4         END OF FILE RETURN              DPP10489
01023   1 77775 4 00146          TXI END,4,-3                                     DPP10490
01024  -0 50000 2 00602   OA     CAL LEFT+2,2     (AND) ROW TO CMN AND (OR)       DPP10491
01025  -0 32000 2 00604          ANA CMN+2,2      RESULT TO BOOL                  DPP10492
01026  -0 60200 2 00606          ORS BOOL+2,2                                     DPP10493
01027  -0 50000 2 00602          CAL LEFT+2,2     (OR) ROW TO CMN                 DPP10494
01030  -0 60200 2 00604          ORS CMN+2,2                                      DPP10495
01031   0 02000 1 00001          TRA 1,1                                          DPP10496
01032  -0 50000 2 00602   OA8    CAL LEFT+2,2     (AND) ROW TO 8AND AND (OR)      DPP10497
01033  -0 32000 2 00610          ANA 8AND+2,2     RESULT TO BOOL                  DPP10498
01034  -0 60200 2 00606          ORS BOOL+2,2                                     DPP10499
01035  -0 50000 2 00602          CAL LEFT+2,2     (OR) ROW TO 8AND                DPP10500
01036  -0 60200 2 00610          ORS 8AND+2,2                                     DPP10501
01037   0 02000 1 00001          TRA 1,1                                          DPP10502
01040 +000000777777       MODEL  OCT 777777                                      DPP10503
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01041 +000000777700              OCT 777700
01042 +000000770077              OCT 770077
01043 +000000770000              OCT 770000
01044 +000000007777              OCT 7777
01045 +000000007700              OCT 7700
01046 +000000000077              OCT 77
01047 +000000000000              OCT 0
01050  111111111111      NUMB    BCD 1999999
01051  101010101010              BCD 1888888
01052  070707070707              BCD 1777777
01053  060606060606              BCD 1666666
01054  050505050505              BCD 1555555
01055  040404040404              BCD 1444444
01056  030303030303              BCD 1333333
01057  020202020202              BCD 1222222
01060  010101010101              BCD 1111111
01061  606060606060              BCD 1
01062  404040404040              BCD 1------
01063  202020202020              BCD 1++++++
01064 +121212121212              OCT 121212121212
01065  606060606060              BCD 1
01066 -377777777777              OCT 777777777777

                     01067       BSS 0                  PUNCH PRINT COMPONENT

                                     PUNCH BCD

01067  0 76600 0 00341   WPU     WPU
01070 -0 63400 1 00421             SXD XA,1               SELECT PUNCH
01071 -0 63400 2 00422             SXD XB,2               SAVE I.R.
01072 -0 63400 4 00423             SXD XC,4
01073  0 50000 4 00001             CLA 1,4                GET CALL SEQ.
01074  0 07400 2 00151             TSX INDEX,2            INDEX
01075  0 60200 0 01077             SLW PCH3
01076  0 07400 4 01133             TSX DHC,4              GENERATE IMAGE
01077  0 00000 0 01077   PCH3      HTR PCH3               AND COPY
01100 -0 53400 4 00423             LXD XC,4               RETURN
01101  1 77776 4 00146             TXI END,4,-2

                                     PRINT BCD

01102  0 76600 0 00361   WPR     WPR
01103 -0 63400 1 00421             SXD XA,1               SELECT PRINTER
01104 -0 63400 2 00422             SXD XB,2               SAVE I.R.
01105 -0 63400 4 00423             SXD XC,4
01106 -0 50000 4 00001             CAL 1,4                GET CALL SEQ.
01107 -0 73400 4 00000             PDX 0,4                SET IR-1=W
01110  0 07400 2 00151             TSX INDEX,2            INDEX
01111  0 60200 0 01114             SLW PRT2               SAVE A,0,W
01112  3 00014 4 01117             TXH PRT3,4,12          IS W G.T. 12
01113  0 07400 4 01133             TSX DHC,4              GENERATE IMAGE
01114  0 00000 0 01114   PRT2      HTR PRT2               AND COPY
01115 -0 53400 4 00423   PRT7      LXD XC,4               RETURN
01116  1 77776 4 00146             TXI END,4,-2
01117  0 62100 0 01121   PRT3      STA PRT4               PRINT A,0,12
01120  0 07400 4 01133             TSX DHC,4
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01121   0 00014 0 00000   PRT4   HTR ()*0*12                                  DPP10560
01122   0 76600 0 00361          WPR                                          DPP10561
01123   0 76000 0 00371          SPR 9          SELECT PRINTER*               DPP10562
01124  -0 50000 0 01114          CAL PRT2       KILL SPACING FOR R*H *        DPP10563
01125   0 36100 0 00042          ACL 12A        GET (A+12)*0*(W-12)           DPP10564
01126   0 40200 0 00020          SUB 12D                                      DPP10565
01127   0 60200 0 01131   PRT5   SLW PRT6                                      DPP10566
01130   0 07400 4 01133          TSX DHC*4      PRINT RIGHT HALF              DPP10567
01131   0 00000 0 01131   PRT6   HTR PRT6       WITHOUT SPACING               DPP10568
01132   0 02000 0 01115          TRA PRT7                                     DPP10569
                                                                            DPP10570
                                 PUNCH-PRINT COPY SUBROUTINE                DPP10571
                                 DECIMAL TO HOLLERITH CONVERSION AND COPIES  DPP10572
                                                                            DPP10573
                  00524   DH4    SYN UD+20                                   DPP10574
                  00525   DH6    SYN UD+21                                   DPP10575
                  00526   DH13   SYN UD+22                                   DPP10576
                  00527   DH17   SYN UD+23                                   DPP10577
                                                                            DPP10578
01133  -0 63400 4 00524   DHC    SXD DH4*4      SAVE IR-4                     DPP10579
01134   0 50000 4 00001          CLA 1*4        OBTAIN CALL SEQ               DPP10580
01135   0 40000 0 01201          ADD DH5        N+1                           DPP10581
01136   0 62200 0 00525          STD DH6        SAVE N+1                      DPP10582
01137   0 77100 0 00022          ARS 18                                       DPP10583
01140   0 40000 4 00001          ADD 1*4        A + N +1                      DPP10584
01141   0 62100 0 01152          STA DH7        SAVE                          DPP10585
01142   0 53400 1 01156          LXA DH8*1      SET IR-1=64=OCT100            DPP10586
01143   0 53400 2 01161   DH9    LXA DH10*2     SET IR-2=17=3CT21             DPP10587
01144   0 60000 3 00621   DH11   STZ UD+81*3     SET IMAGE BLOCK               DPP10588
01145   2 00001 2 01144          TIX DH11*2*1   TO ZERO                       DPP10589
01146  -0 50000 0 01226          CAL DH12       SET IMAGE BIT                 DPP10590
01147   0 60200 0 00526          SLW DH13                                     DPP10591
01150   0 53400 2 01203          LXA DH14*2     SET IR-2=6                    DPP10592
01151  -0 53400 4 00525   DH15   LXD DH6*4      SET IR-4=N+1                  DPP10593
01152   0 56000 4 00000   DH7    LDQ 0*4        OBTAIN PACKED BCD WORD        DPP10594
01153  -2 00001 4 01175          TNX DH16*4*1                                 DPP10595
01154  -0 63400 4 00525          SXD DH6*4      SAVE IR-2*4                   DPP10596
01155  -0 63400 2 00527          SXD DH17*2                                   DPP10597
01156  -0 75400 0 00100T  DH8    PXD 64         CLEAR AC                      DPP10598
01157  -0 76300 0 00002   DH18   LGL 2          GET ZONE BITS                 DPP10599
01160   0 73400 2 00000          PAX 0*2        SET IR-2=ZONE BITS            DPP10600
01161  -0 75400 0 00021T  DH10   PXD 17         CLEAR AC                      DPP10601
01162  -0 76300 0 00004          LGL 4          GET DIGIT BITS                DPP10602
01163   0 73400 4 00000          PAX 0*4        SET IR-4=DIGIT BITS           DPP10603
01164  -0 50000 0 00526          CAL DH13                                     DPP10604
01165  -0 60200 3 00620          ORS UD+80*3    OR ZONE BIT TO IMAGE          DPP10605
01166  -0 60200 5 00614          ORS UD+76*5    OR DIGIT BIT TO IMAGE         DPP10606
01167   0 77100 0 00001          ARS 1          SHIFT IMAGE BIT               DPP10607
01170   0 60200 0 00526          SLW DH13                                     DPP10608
01171  -0 32000 0 01227          ANA DH19       TEST FOR 6 CHAR               DPP10609
01172  -0 10000 0 01156          TNZ DH8                                      DPP10610
01173  -0 53400 2 00527          LXD DH17*2                                   DPP10611
01174   2 00001 2 01151          TIX DH15*2*1   TEST FOR 36 CHAR              DPP10612
01175   0 53400 2 01157   DH16   LXA DH18*2     SET IR-2=2                    DPP10613
01176  -0 50000 3 00602   DH20   CAL UD+66*3     FILL IN 8-4 AND               DPP10614
01177  -0 60200 1 00604          ORS UD+68*1    8-3 BITS                      DPP10615
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01200 -0 60200 3 00612          ORS UD+74,3                                          DPP10616
01201  2 00001 2 01176   DH5    TIX DH20,2,1                                         DPP10617
01202 -0 50000 1 00614          CAL UD+76,1          KILL ZERO ZONE BITS             DPP10618
01203  0 76000 0 00006   DH14   COM                  ON BLANK CHAR                   DPP10619
01204  0 32000 1 00615          ANS UD+77,1                                          DPP10620
01205 -0 50000 1 00614          CAL UD+76,1          ELIMINATE ZERO DIGIT BITS       DPP10621
01206 -0 32000 1 00620          ANA UD+80,1          + AND - CHAR                    DPP10622
01207 -0 50100 1 00615          ORA UD+77,1          TRANSFER ZERO ZONE              DPP10623
01210  0 60200 1 00614          SLW UD+76,1          BITS TO ZERO DIGIT R6           DPP10624
01211 -0 50000 1 00616          CAL UD+78,1          MOVE X Y ZONE BITS              DPP10625
01212  0 60200 1 00615          SLW UD+77,1          INTO COPY POSITION              DPP10626
01213 -0 50000 1 00617          CAL UD+79,1                                          DPP10627
01214  0 60200 1 00616          SLW UD+78,1                                          DPP10628
01215 -0 50000 1 00602          CAL UD+66,1          OBTAIN ZERO BITS                DPP10629
01216 -0 60200 1 00614          ORS UD+76,1          ON SIGNED ZEROS                 DPP10630
01217  2 00040 1 01143          TIX DH9,1,32                                         DPP10631
01220  0 53400 1 00042          LXA 12A,1                                            DPP10632
01221  0 70000 1 00517   DH21   CPY UD+15,1          COPY                            DPP10633
01222  0 70000 1 00557          CPY UD+47,1          LOOP                            DPP10634
01223  2 00001 1 01221          TIX DH21,1,1                                         DPP10635
01224 -0 53400 4 00524          LXD DH4,4            RESTORE IR-4                    DPP10636
01225  0 02000 4 00002          TRA 2,4              RETURN                          DPP10637
01226 -0 00000 0 00000   DH12   MZE                                                 DPP10638
01227 -373737373737      DH19   OCT -373737373737                                    DPP10639
                                                                                     DPP10640
                 01230           BSS 0                READ WRITE BCD TAPE COMPONENT   DPP10641
                                                                                     DPP10642
                                 READ BCD TAPE                                       DPP10643
                                                                                     DPP10644
01230 -0 63400 1 00421   RTD    SXD XA,1             SAVE INDEX REGS.                DPP10645
01231 -0 63400 2 00422          SXD XB,2                                             DPP10646
01232 -0 50000 4 00001          CAL 1,4              OBTAIN CALL SEQ.                DPP10647
01233  0 07400 2 00151          TSX INDEX,2          INDEX ORIGIN                    DPP10648
01234  0 76000 0 00006          COM                                                  DPP10649
01235  0 73400 1 00000          PAX 0,1              SET IR-1=COM(ORIGIN)            DPP10650
01236  0 76000 0 00006          COM                                                  DPP10651
01237  0 77100 0 00022          ARS 18                                               DPP10652
01240 -0 50100 0 01306          ORA 0200A            BUILD TAPE ADDR                 DPP10653
01241  0 62100 0 01242          STA RDT1                                             DPP10654
01242  0 76200 0 00200   RDT1   RTD ()               SELECT TAPE                     DPP10655
01243 -0 76000 0 00012   RDT3   RTT                  TURN OFF RTT                    DPP10656
01244  0 76100 0 00000          NOP                                                  DPP10657
01245  0 53400 2 00040          LXA ZERO,2           CLEAR IR-2                      DPP10658
01246  0 70000 1 77777          CPY -1,1             FIRST COPY                      DPP10659
01247  1 00001 2 01253          TXI RDT4,2,1         STEP WORD COUNT                 DPP10660
01250  1 77775 4 00146          TXI END,4,-3         EOF RETURN                      DPP10661
01251  0 76000 0 00000   RDT7   CLM                  FALSE EOR SKIP                  DPP10662
01252  1 77776 4 00146          TXI END,4,-2         FALSE SKIP RETURN               DPP10663
01253  0 70000 1 00000   RDT4   CPY 0,1              SUBSEQUENT COPIES               DPP10664
01254  1 77777 1 01264          TXI RDT6,1,-1        STEP ADDR                       DPP10665
01255  0 02000 0 01251          TRA RDT7             FALSE EOF SKIP                  DPP10666
01256 -0 75400 2 00000          PXD 0,2              EOR, PLACE WORD COUNT IN AC     DPP10667
01257  0 76600 0 00333          IOD                  I.O. DELAY                      DPP10668
01260 -0 77300 0 00374          RQL 252              RTT DELAY                       DPP10669
01261 -0 76000 0 00012          RTT                                                  DPP10670
01262  1 77776 4 00146          TXI END,4,-2         ON, TAPE CHECK RETURN           DPP10671
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01263   1 77774 4 00146          TXI END,4,-4                OFF, NORMAL RETURN                DPP10672
01264   1 00001 2 01253   RDT6   TXI RDT4,2,1                STEP WORD COUNT                   DPP10673
                                                                                               DPP10674
                                  WRITE BCD TAPE                                               DPP10675
                                                                                               DPP10676
01265  -0 63400 1 00421   WTD    SXD XA,1                    SAVE I.R.                         DPP10677
01266  -0 63400 2 00422          SXD XB,2                                                      DPP10678
01267  -0 50000 4 00001          CAL 1,4                     OBTAIN W                          DPP10679
01270   0 73400 1 00000          PAX 0,1                     SET IR-1=W                        DPP10680
01271  -0 50000 4 00002          CAL 2,4                     OBTAIN AND INDEX ORIGIN           DPP10681
01272   0 07400 2 00151          TSX INDEX,2                                                   DPP10682
01273   0 62100 0 01301          STA WDT1                    SET FIRST ADDR.                   DPP10683
01274   0 77100 0 00022          ARS 18                                                        DPP10684
01275  -0 50100 0 01306          ORA 0200A                                                     DPP10685
01276   0 62100 0 01277          STA WDT2                                                      DPP10686
01277   0 76600 0 00200   WDT2   WTD ()                      SELECT TAPE                       DPP10687
01300  -0 73400 2 00000          PDX 0,2                     CLEAR IR-2                        DPP10688
01301   0 70000 2 00000   WDT1   CPY (),2                    COPY                              DPP10689
01302  -2 00001 1 01304          TNX WDT3,1,1                W                                 DPP10690
01303   1 77777 2 01301          TXI WDT1,2,-1               WORDS                             DPP10691
01304   0 76600 0 00333   WDT3   IOD                         DELAY USE OF MQ                   DPP10692
01305   1 77775 4 00146          TXI END,4,-3                RETURN                            DPP10693
01306 +000000000200       0200A OCT 200                                                       DPP10694
                                                                                               DPP10695
                  01307           BSS 0                     READ WRITE BINARY TAPE COMPONENT  DPP10696
                                                                                               DPP10697
                                  READ BINARY TAPE                                             DPP10698
                                                                                               DPP10699
01307  -0 63400 2 00422   RTB    SXD XB,2                    SAVE IR-2                         DPP10700
01310   0 07400 2 01421          TSX RWBTS,2                                                   DPP10701
01311   0 62100 0 01312          STA RTB1                                                      DPP10702
01312   0 76200 0 00220   RTB1   RTB ()                      SELECT TAPE                       DPP10703
01313   0 60000 0 00424          STZ T1                      CLEAR CHECK SUM                   DPP10704
01314   0 53400 2 01436          LXA 1S,2                    SET WORD COUNT=-1                 DPP10705
01315  -0 50000 4 77777          CAL -1,4                    GET FIRST C.W.                    DPP10706
01316  -0 73400 1 00000          PDX 0,1                     SET IR-1=W                        DPP10707
01317   0 77100 0 00022          ARS 18                                                        DPP10708
01320   0 36100 4 77777          ACL -1,4                    (A+W)                             DPP10709
01321   0 62100 0 01324          STA RTB3                                                      DPP10710
01322   0 62100 0 01341          STA RTB4                                                      DPP10711
01323  -0 50000 0 00424          CAL T1                                                        DPP10712
01324  -0 70000 1 00000   RTB3   CAD (),1                    FIRST COPY                        DPP10713
01325   1 00001 2 01353          TXI RTB6,2,1                STEP WORD COUNT                   DPP10714
01326   0 02000 0 01332          TRA RTB5                    EOF                               DPP10715
01327   0 76000 0 00000   RTB21  CLM                         FALSE EOR SKIP                    DPP10716
01330  -0 53400 4 00423          LXD XC,4                                                      DPP10717
01331   1 77776 4 00146          TXI END,4,-2                FALSE SKIP RETURN                 DPP10718
01332  -0 53400 4 00423   RTB5   LXD XC,4                    EOF RETURN                        DPP10719
01333   1 77775 4 00146          TXI END,4,-3                                                  DPP10720
01334  -0 73400 1 00000   RTB12  PDX 0,1                     SET IR-1=W                        DPP10721
01335   0 77100 0 00022          ARS 18                                                        DPP10722
01336   0 36100 4 77777          ACL -1,4                    (A+W)                             DPP10723
01337   0 62100 0 01341          STA RTB4                                                      DPP10724
01340  -0 50000 0 00424          CAL T1                                                        DPP10725
01341  -0 70000 1 00000   RTB4   CAD (),1                                                     DPP10726
01342   1 00001 2 01353          TXI RTB6,2,1                STEP WORD COUNT                   DPP10727
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01343   0 02000 0 01327          TRA RTB21                  FALSE EOF SKIP                DPP10728
01344   0 76000 0 00006   RTB15  COM                        EOR                           DPP10729
01345   0 76700 0 00001          ALS 1                                                    DPP10730
01346  -0 53400 4 00423          LXD XC,4                   RESTORE IR-4                  DPP10731
01347   0 10000 0 01351          TZE RTB9                   CHECK SUM TEST                DPP10732
01350   1 00002 4 01351          TXI RTB9,4,2               ERROR RETURN                  DPP10733
01351  -0 75400 2 00000   RTB9   PXD 0,2                    SET WORD COUNT                DPP10734
01352   1 77774 4 00146          TXI END,4,-4                                             DPP10735
01353   2 00001 1 01341   RTB6   TIX RTB4,1,1               TEST FOR W WORDS              DPP10736
01354   0 60200 0 00424          SLW T1                                                   DPP10737
01355   0 50000 4 00000          CLA 0,4                    IS THIS LAST                  DPP10738
01356  -0 12000 0 01360          TMI RTB11                  CONTROL WORD                  DPP10739
01357   1 77777 4 01334          TXI RTB12,4,-1             STEP C.W. TABLE               DPP10740
01360  -0 50000 0 00424   RTB11  CAL T1                                                   DPP10741
01361  -0 70000 0 00425          CAD T2                     FIRST DUMMY COPY              DPP10742
01362   0 02000 0 01365          TRA RTB13                                                DPP10743
01363   0 02000 0 01327          TRA RTB21                  FALSE EOF SKIP                DPP10744
01364   0 02000 0 01344          TRA RTB15                  EOR                           DPP10745
01365  -0 70000 0 00425   RTB13  CAD T2                     SUBSEQUENT DUMMY COPIES       DPP10746
01366   0 02000 0 01365          TRA RTB13                                                DPP10747
01367   0 02000 0 01327          TRA RTB21                  FALSE EOF SKIP                DPP10748
01370   1 00001 2 01344          TXI RTB15,2,1              ADJUST WORD COUNT             DPP10749
                                                                                         DPP10750
                                  WRITE BINARY TAPE                                      DPP10751
01371  -0 63400 2 00422   WTB    SXD XB,2                   SAVE IR-2                     DPP10752
01372   0 07400 2 01421          TSX RWBTS,2                SET UP                        DPP10753
01373   0 62100 0 01374          STA WBT1                                                 DPP10754
01374   0 76600 0 00220   WBT1   WTB ()                     SELECT TAPE                   DPP10755
01375   0 60000 0 00424          STZ T1                     CLEAR CHECK SUM               DPP10756
01376  -0 50000 4 77777   WBT5   CAL -1,4                   GET CONTROL WORD              DPP10757
01377   0 62100 0 01403          STA WBT2                   SET A                         DPP10758
01400  -0 73400 1 00000          PDX 0,1                    SET IR-1=W                    DPP10759
01401  -0 50000 0 00424          CAL T1                     GET CHECK SUM                 DPP10760
01402   0 53400 2 00040          LXA ZERO,2                 SET IR-2=0                    DPP10761
01403  -0 70000 2 00000   WBT2   CAD (),2                   COPY                          DPP10762
01404  -2 00001 1 01406          TNX WBT3,1,1               TEST FOR W WORDS              DPP10763
01405   1 77777 2 01403          TXI WBT2,2,-1              STEP COPY ADDR.               DPP10764
01406   0 60200 0 00424   WBT3   SLW T1                     SAVE CHECK SUM                DPP10765
01407   0 50000 4 00000          CLA 0,4                    TEST SIGN FOR                 DPP10766
01410  -0 12000 0 01412          TMI WBTB                   LAST CONTROL WORD             DPP10767
01411   1 77777 4 01376          TXI WBT5,4,-1              STEP C.T. ADDR.               DPP10768
01412  -0 50000 0 00424   WBTB   CAL T1                     COPY                          DPP10769
01413   0 76000 0 00006          COM                        COMPLIMENTED                  DPP10770
01414   0 60200 0 00425          SLW T2                     CHECK                         DPP10771
01415   0 70000 0 00425          CPY T2                     SUM                           DPP10772
01416  -0 53400 4 00423          LXD XC,4                   RESTORE                       DPP10773
01417   0 76600 0 00333          IOD                        DELAY USE OF MQ               DPP10774
01420   1 77776 4 00146          TXI END,4,-2               RETURN                        DPP10775
                                  READ-WRITE BINARY TAPE   SUBROUTINE                    DPP10776
                                                                                         DPP10777
01421  -0 63400 1 00421   RWBTS  SXD XA,1                   SAVE IR                       DPP10778
01422  -0 63400 2 00425          SXD T2,2                                                 DPP10779
01423  -0 63400 4 00423          SXD XC,4                                                 DPP10780
01424   0 50000 4 00001          CLA 1,4                    GET CALL SEQ.                 DPP10781
01425   0 07400 2 00151          TSX INDEX,2                INDEX                         DPP10782
01426   0 76000 0 00006          COM                                                      DPP10783
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01427   0 73400 4 00000          PAX 0,4                    SET IR-4=COM(C)                DPP10784
01430   0 76000 0 00006          COM                                                       DPP10785
01431   0 77100 0 00022          ARS 18                     BUILD TAPE ADDR.               DPP10786
01432  -0 50100 0 01435          ORA 144A                                                  DPP10787
01433  -0 53400 2 00425          LXD T2,2                   EXIT                           DPP10788
01434   0 02000 2 00001          TRA 1,2                                                   DPP10789
                                                                                          DPP10790
01435   0 00000 0 00220   144A       144                                                  DPP10791
01436   0 77777 7 77777   1S     HTR -1,7,-1                                               DPP10792
                                                                                          DPP10793
                  01437          BSS 0                      MOVE COMPONENT                 DPP10794
                                     MOVE                                                 DPP10795
                                                                                          DPP10796
01437  -0 63400 1 00421   MOV    SXD XA,1                   SAVE I.R.                      DPP10797
01440  -0 63400 2 00422          SXD XB,2                                                  DPP10798
01441  -0 50000 4 00002          CAL 2,4                    GET A                          DPP10799
01442   0 07400 2 00151          TSX INDEX,2                INDEX A                        DPP10800
01443   0 36100 4 00001          ACL 1,4                    A+W                            DPP10801
01444   0 62100 0 01453          STA MOV1                                                  DPP10802
01445  -0 50000 4 00003          CAL 3,4                    GET B                          DPP10803
01446   0 07400 2 00151          TSX INDEX,2                INDEX B                        DPP10804
01447   0 36100 4 00001          ACL 1,4                    B+W                            DPP10805
01450   0 62100 0 01454          STA MOV2                                                  DPP10806
01451  -0 50000 4 00001          CAL 1,4                    GET W                          DPP10807
01452   0 73400 2 00000          PAX 0,2                                                   DPP10808
01453   0 56000 2 00000   MOV1   LDQ (),2                   MOVE                           DPP10809
01454  -0 60000 2 00000   MOV2   STQ (),2                   LOOP                           DPP10810
01455   2 00001 2 01453          TIX MOV1,2,1                                              DPP10811
01456   1 77774 4 00147          TXI END+1,4,-4             RETURN                         DPP10812
                                                                                          DPP10813
                  01457          BSS 0                      EXTRACT AND INSERT COMPONENT   DPP10814
                                     EXTRACT AND INSERT                                   DPP10815
                                                                                          DPP10816
01457  -0 63400 1 00421   XIN    SXD XA,1                   SAVE I.R.                      DPP10817
01460  -0 63400 2 00422          SXD XB,2                                                  DPP10818
01461   0 50000 4 00001   XIN2   CLA 1,4                                                   DPP10819
01462   0 73400 1 00000          PAX 0,1                    SET IR-1=N                     DPP10820
01463   0 50000 4 00002          CLA 2,4                    EXTRACT                        DPP10821
01464   0 07400 2 00220          TSX XTR,2                                                 DPP10822
01465   0 50000 4 00003          CLA 3,4                    INSERT                         DPP10823
01466   0 07400 2 00257          TSX INS,2                                                 DPP10824
01467   0 50000 4 00003          CLA 3,4                                                   DPP10825
01470  -0 12000 0 01472          TMI XIN1                   TEST FOR LAST EXTRACT-INSERT   DPP10826
01471   1 77775 4 01461          TXI XIN2,4,-3              GET NEXT EXTRACT-INSERT        DPP10827
01472   1 77774 4 00146   XIN1   TXI END,4,-4               RETURN                         DPP10828
                                                                                          DPP10829
                  01473          BSS 0                      ALPHANUMERIC COMPARISON COMPONENT DPP10830
                                     BCD COMPARISON                                       DPP10831
                                                                                          DPP10832
01473  -0 63400 1 00421   COM    SXD XA,1                   SAVE IR                        DPP10833
01474  -0 63400 2 00422          SXD XB,2                                                  DPP10834
01475   0 50000 4 00001          CLA 1,4                    GET N                          DPP10835
01476   0 73400 1 00000          PAX 0,1                    SET IR-1=N                     DPP10836
01477  -0 50000 4 00003          CAL 3,4                    IF S=0, REPLACE                DPP10837
01500  -0 73400 2 00000          PDX 0,2                    S BY 1                         DPP10838
01501   3 00000 2 01503D         TXH COM1,2                                                DPP10839
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01502   0 36100 0 00016          ACL 1D                                    DPP10840
01503   0 60200 0 00425    COM1  SLW T2                                    DPP10841
01504  -0 50000 4 00002          CAL 2,4      SAME FOR R                   DPP10842
01505  -0 73400 2 00000          PDX 0,2                                   DPP10843
01506   3 00000 2 01510D         TXH COM2,2                                DPP10844
01507   0 36100 0 00016          ACL 1D                                    DPP10845
01510   0 60200 0 00424    COM2  SLW T1                                    DPP10846
01511  -0 63400 1 00426          SXD T3,1     SAVE N                       DPP10847
01512  -3 00052 1 01514          TXL COM3,1,U/2 IF N IS G.T. U/2,          DPP10848
01513   0 53400 1 00032          LXA HUA,1    SET N=U/2                    DPP10849
01514  -0 63400 1 00427    COM3  SXD T4,1     SAVE N                       DPP10850
01515   0 07400 2 00220          TSX XTR,2    EXTRACT FIELD 1              DPP10851
01516   0 62100 0 01523          STA COM4     SET (UD+N)                   DPP10852
01517   0 40000 0 00032          ADD HUA                                   DPP10853
01520   0 62100 0 01524          STA COM5     SET (UD+U/2+N)               DPP10854
01521   0 62100 0 01533          STA COM6                                  DPP10855
01522   0 62100 0 01547          STA COM7                                  DPP10856
01523   0 56000 1 00000    COM4  LDQ (),1     MOVE FIELD 1 TO              DPP10857
01524  -0 60000 1 00000    COM5  STQ (),1     UPPER HALF OF UD             DPP10858
01525   2 00001 1 01523          TIX COM4,1,1                              DPP10859
01526  -0 53400 1 00427          LXD T4,1     EXTRACT FIELD 2              DPP10860
01527  -0 50000 0 00425          CAL T2                                    DPP10861
01530   0 07400 2 00220          TSX XTR,2                                 DPP10862
01531   0 62100 0 01534          STA COM8     SET (UD+N)                   DPP10863
01532   0 62100 0 01555          STA COM9                                  DPP10864
01533   0 50000 1 00000    COM6  CLA (),1     COMPARE BCD                  DPP10865
01534   0 40200 1 00000    COM8  SUB (),1                                  DPP10866
01535  -0 10000 0 01547          TNZ COM7                                  DPP10867
01536   2 00001 1 01533          TIX COM6,1,1                              DPP10868
01537  -0 53400 1 00426          LXD T3,1     PARTIAL FIELDS EQUAL         DPP10869
01540  -3 00052 1 01565          TXL COM11,1,U/2 IF N IS G.T. U/2,         DPP10870
01541  -0 50000 0 00425          CAL T2       WE ARE NOT FINISHED          DPP10871
01542   0 36100 0 00034          ACL HUD      FORM (B,T,S+U/2)             DPP10872
01543   0 60200 0 00425          SLW T2                                    DPP10873
01544  -0 50000 0 00424          CAL T1       FORM (A,T,R+U/2)             DPP10874
01545   0 36100 0 00034          ACL HUD                                   DPP10875
01546   1 77726 1 01510          TXI COM2,1,-U/2 REDUCE N B U/2            DPP10876
01547   0 50000 1 00000    COM7  CLA (),1     FIELDS UNEQUAL,              DPP10877
01550   0 73400 2 00000          PAX 0,2      COMPARE ORDER                DPP10878
01551  -0 50000 2 00145          CAL BCD,2    NUMBERS                      DPP10879
01552   0 10000 0 01567          TZE COM12    IS CHAR. LEGAL               DPP10880
01553  -0 32000 0 00021          ANA CXSO                                  DPP10881
01554   0 60200 0 00430          SLW T5                                    DPP10882
01555   0 50000 1 00000    COM9  CLA (),1                                  DPP10883
01556   0 73400 2 00000          PAX 0,2                                   DPP10884
01557  -0 50000 2 00145          CAL BCD,2                                 DPP10885
01560   0 10000 0 01567          TZE COM12    IS CHAR. LEGAL               DPP10886
01561  -0 32000 0 00021          ANA CXSO                                  DPP10887
01562   0 40200 0 00430          SUB T5       2-1                          DPP10888
01563   0 12000 0 01566          TPL COM13                                 DPP10889
01564   1 77773 4 00146          TXI END,4,-5 1 G. T. 2                    DPP10890
01565   1 77772 4 00146    COM11 TXI END,4,-6 EQUAL RETURN                 DPP10891
01566   1 77771 4 00146    COM13 TXI END,4,-7 1 L. T. 2                    DPP10892
01567   1 77774 4 00146    COM12 TXI END,4,-4 ERROR RETURN                 DPP10893
                                                                          DPP10894
                                                                          DPP10895
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                    01570          BSS 0                          BLANK PACKED BLOCK COMPONENT      DPP10896
                                       BLANK PACKED BLOCK                                           DPP10897
                                                                                                    DPP10898
01570 -0 63400 1 00421   BPB       SXD XA,1                       SAVE I.R.                         DPP10899
01571 -0 63400 2 00422             SXD XB,2                                                         DPP10900
01572  0 50000 4 00001             CLA 1,4                        INDEX AND SET                     DPP10901
01573  0 07400 2 00207             TSX SBA,2                      IR-1=W                            DPP10902
01574  0 62100 0 01576             STA BPB1                       SET (A+W)                         DPP10903
01575 -0 50000 0 01601             CAL BLKS                                                         DPP10904
01576  0 60200 1 00000   BPB1      SLW (),1                       STORE BLANKS                      DPP10905
01577  2 00001 1 01576             TIX BPB1,1,1                                                     DPP10906
01600  1 77776 4 00146             TXI END,4,-2                   RETURN                            DPP10907
01601  606060606060      BLKS      BCD 1                                                            DPP10908
                                                                                                    DPP10909
                    01602          BSS 0                          ARITHMETIC COMPONENT              DPP10910
                                                                                                    DPP10911
                                                                                                    DPP10912
                                       ZAC ROUTINE SETS THE PSEUDO-AC                               DPP10913
                                       TO PLUS ZERO                                                 DPP10914
                                                                                                    DPP10915
01602 -0 63400 1 00421   ZAC       SXD XA,1                                                         DPP10916
01603  0 53400 1 00044             LXA 0024.,1                                                      DPP10917
01604  0 60000 1 00477   ACZA      STZ AC+24,1                    CLEAR PSEUDO AC                   DPP10918
01605  2 00001 1 01604             TIX ACZA,1,1                                                     DPP10919
01606  0 60000 0 00446             STZ SAC                        SET SIGN OF PSEUDO AC TO PLUS     DPP10920
01607 -0 53400 1 00421             LXD XA,1                                                         DPP10921
01610  0 02000 4 00001             TRA 1,4                                                          DPP10922
                                                                                                    DPP10923
                                                                                                    DPP10924
                                       CLA ROUTINE PLACES THE NUMBER IN                             DPP10925
                                       THE CALLING SEQUENCE INTO THE                                DPP10926
                                       PSEUDO-AC.  CLS CHANGES ITS SIGN                             DPP10927
                                                                                                    DPP10928
01611  0 60000 0 00424   CLA       STZ T1                                                           DPP10929
01612  0 02000 0 01615             TRA CLAF                                                         DPP10930
01613  0 56000 0 00002   CLS       LDQ 9A                                                           DPP10931
01614 -0 60000 0 00424             STQ T1                                                           DPP10932
01615 -0 63400 1 00421   CLAF      SXD XA,1                       SAVE I. R.                        DPP10933
01616 -0 63400 2 00422             SXD XB,2                                                         DPP10934
01617  0 07400 2 02262             TSX SET,2                      EXTRACT FIELD TO UD AND SNO       DPP10935
01620  0 62100 0 01623             STA CLAA                                                         DPP10936
01621 -0 63400 1 01626             SXD CLAB,1                                                       DPP10937
01622  0 53400 2 00000             LXA 0001.,2                                                      DPP10938
01623  0 50000 2 00000   CLAA      CLA *,2                        MOVE FIELD FROM UD TO PSEUDO AC   DPP10939
01624  0 60100 2 00477             STO AC+24,2                                                      DPP10940
01625  1 00001 2 01626             TXI CLAB,2,1                                                     DPP10941
01626 -3 00000 2 01623D  CLAB      TXL CLAA,2,*                                                     DPP10942
01627  3 00030 2 01632   CLAC      TXH CLAD,2,24                                                    DPP10943
01630  0 60000 2 00477             STZ AC+24,2                    FILL OUT REST OF PSEUDO AC WITH ZEROS DPP10944
01631  1 00001 2 01627             TXI CLAC,2,1                                                     DPP10945
01632  0 53400 2 00424   CLAD      LXA T1,2                                                         DPP10946
01633  0 50000 0 02353             CLA SNO                        TRANSFER SIGN FROM SNO TO SAC     DPP10947
01634 -3 00000 2 01636D            TXL CLAE,2,0                   FLIP SIGN IF WANT CLS             DPP10948
01635  0 40200 0 00000             SUB 0001.                                                        DPP10949
01636  0 60200 0 00446   CLAE      SLW SAC                                                          DPP10950
01637  1 77774 4 00146             TXI END,4,-4                   NORMAL RETURN                     DPP10951
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                                                                                DPP10952
                                                                                DPP10953
                        ADD ROUTINE ADDS THE NUMBER IN THE                      DPP10954
                        CALLING SEQUENCE TO THE NUMBER IN                       DPP10955
                        THE PSEUDO-AC                                           DPP10956
                                                                                DPP10957
                                                                                DPP10958
01640 -0 63400 1 00421  ADD   SXD XA,1                                          DPP10959
01641 -0 63400 2 00422        SXD XB,2                                          DPP10960
01642  0 07400 2 02262        TSX SET,2      EXTRACT FIELD TO UD AND SNO        DPP10961
01643  0 62100 0 01656        STA ADDC                                          DPP10962
01644  0 62100 0 01717        STA SUBC                                          DPP10963
01645 -0 63400 1 01670        SXD ADDB,1                                        DPP10964
01646 -0 63400 1 01727        SXD SUBB,1                                        DPP10965
01647  0 50000 0 00446        CLA SAC                                           DPP10966
01650  0 40200 0 02353        SUB SNO                                           DPP10967
01651 -0 10000 0 01713        TNZ SUBG                                          DPP10968
01652  0 60000 0 02354  ADDG  STZ CARRY    OPERATION IS ADDITION               DPP10969
01653  0 60000 0 00424        STZ T1                                            DPP10970
01654  0 56000 0 00000        LDQ 0001.     DO NOT CHANGE SIGN OF PSEUDO AC     DPP10971
01655  0 53400 2 00000        LXA 0001.,2                                       DPP10972
01656  0 50000 2 00000  ADDC  CLA *,2                                          DPP10973
01657  0 40000 0 02354        ADD CARRY                                         DPP10974
01660  0 40000 2 00477  ADDE  ADD AC+24,2                                      DPP10975
01661  0 60100 2 00477        STO AC+24,2                                       DPP10976
01662  0 60000 0 02354        STZ CARRY                                         DPP10977
01663  0 40200 0 00003        SUB 0010.                                         DPP10978
01664 -0 12000 0 01667        TMI ADDA                                          DPP10979
01665 -0 60000 0 02354        STQ CARRY      A CARRY OCCURRED                   DPP10980
01666  0 60100 2 00477        STO AC+24,2                                       DPP10981
01667  1 00001 2 01670  ADDA  TXI ADDB,2,1                                     DPP10982
01670 -3 00000 2 01656D ADDB  TXL ADDC,2,*                                     DPP10983
01671  0 50000 0 02354        CLA CARRY                                         DPP10984
01672  0 10000 0 01675        TZE ADDF                                          DPP10985
01673 -3 00030 2 01660        TXL ADDE,2,24                                     DPP10986
01674  0 60100 0 02355        STO OFLOW                                         DPP10987
01675  0 53400 2 00424  ADDF  LXA T1,2       TEST WHETHER ENTERED               DPP10988
01676 -3 00000 2 01700D       TXL ADDH,2,0    FROM SHIFT ROUND ROUTINE          DPP10989
01677  1 77776 4 00146        TXI END,4,-2                                      DPP10990
01700  1 77774 4 00146  ADDH  TXI END,4,-4                                     DPP10991
                                                                                DPP10992
                        SUB ROUTINE SUBTRACTS THE NUMBER                        DPP10993
                        IN THE CALLING SEQUENCE FROM THE                        DPP10994
                        NUMBER IN THE PSEUDO-AC                                 DPP10995
                                                                                DPP10996
                                                                                DPP10997
01701 -0 63400 1 00421  SUB   SXD XA,1                                          DPP10998
01702 -0 63400 2 00422        SXD XB,2                                          DPP10999
01703  0 07400 2 02262        TSX SET,2      EXTRACT FIELD TO UD AND SNO        DPP11000
01704  0 62100 0 01656        STA ADDC                                          DPP11001
01705  0 62100 0 01717        STA SUBC                                          DPP11002
01706 -0 63400 1 01670        SXD ADDB,1                                        DPP11003
01707 -0 63400 1 01727        SXD SUBB,1                                        DPP11004
01710  0 50000 0 00446        CLA SAC                                           DPP11005
01711  0 40200 0 02353        SUB SNO                                           DPP11006
01712 -0 10000 0 01652        TNZ ADDG                                          DPP11007
01713  0 60000 0 02354  SUBG  STZ CARRY    OPERATION IS SUBTRACTION
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01714   0 56000 0 00000          LDQ 0001.                                    DPP11008
01715   0 53400 3 00000          LXA 0001.,3                                  DPP11009
01716   0 50000 2 00477   SUBN   CLA AC+24,2                                  DPP11010
01717   0 40200 2 00000   SUBC   SUB *,2                                      DPP11011
01720   0 40200 0 02354   SUBE   SUB CARRY                                    DPP11012
01721   0 60000 0 02354          STZ CARRY                                    DPP11013
01722   0 12000 0 01725          TPL SUBA                                     DPP11014
01723   0 40000 0 00003          ADD 0010.                                    DPP11015
01724  -0 60000 0 02354          STQ CARRY      A BORROW IS NECESSARY         DPP11016
01725   0 60100 2 00477   SUBA   STO AC+24,2                                  DPP11017
01726   1 00001 2 01727          TXI SUBB,2,1                                 DPP11018
01727  -3 00000 2 01716D  SUBB   TXL SUBN,2,*                                 DPP11019
01730   0 50000 0 02354          CLA CARRY                                    DPP11020
01731   0 10000 0 01753          TZE SUBJ                                     DPP11021
01732   0 50000 2 00477          CLA AC+24,2                                  DPP11022
01733  -3 00030 2 01720          TXL SUBE,2,24                                DPP11023
01734   0 50000 0 02354   SUBD   CLA CARRY                                    DPP11024
01735   0 10000 0 01753          TZE SUBJ                                     DPP11025
01736   0 50000 0 00446          CLA SAC        HAVE BEEN SUBTRACTING A BIG NUMBER DPP11026
01737   0 40200 0 00000          SUB 0001.      FROM A SMALLER ONE            DPP11027
01740   0 60200 0 00446          SLW SAC        CHANGE SIGN OF PSEUDO AC      DPP11028
01741   0 50200 1 00477   SUBI   CLS AC+24,1    AND GET TENS COMPLEMENT       DPP11029
01742  -0 10000 0 01744          TNZ SUBH       OF NUMBER IN THE PSEUDO AC    DPP11030
01743   1 00001 1 01741          TXI SUBI,1,1                                 DPP11031
01744   0 40000 0 00003   SUBH   ADD 0010.      FIRST NON ZERO DIGIT FROM RIGHT DPP11032
01745   0 02000 0 01750          TRA SUBK       IS COMPLEMENTED FROM TEN      DPP11033
01746   0 50200 1 00477   SUBM   CLS AC+24,1                                  DPP11034
01747   0 40000 0 00002          ADD 0009.                                    DPP11035
01750   0 60200 1 00477   SUBK   SLW AC+24,1    ALL FOLLOWING DIGITS ARE COMPLEMENTED DPP11036
01751   1 00001 1 01752          TXI SUBL,1,1   FROM NINE                     DPP11037
01752  -3 00030 1 01746   SUBL   TXL SUBM,1,24                                DPP11038
01753   1 77774 4 00146   SUBJ   TXI END,4,-4    NORMAL RETURN               DPP11039
                                                                             DPP11040
                                                                             DPP11041
                    MPY ROUTINE MULTIPLIES THE NUMBER                        DPP11042
                    IN THE PSEUDO-AC BY THE NUMBER IN                        DPP11043
                    THE CALLING SEQUENCE. THE MULTIPLIER                     DPP11044
                    MUST BE IN ABSOLUTE VALUE LESS THAN                      DPP11045
                    2 TO THE 35TH POWER.                                     DPP11046
                                                                             DPP11047
01754  -0 50000 4 00001   MPY    CAL 1,4                                      DPP11048
01755   0 56000 4 00002          LDQ 2,4                                      DPP11049
01756  -0 63400 4 01760          SXD MPYXC,4                                  DPP11050
01757   0 07400 4 02327          TSX MDS,4      CONVERT MULTIPLIER AND PUT IN T3 DPP11051
01760  -3 00000 0 02025T  MPYXC  TXL MPYER,0,*  SIGN OF PRODUCT IN SAC        DPP11052
01761   0 53400 2 00001          LXA 0008.,2                                  DPP11053
01762   0 60000 0 02354          STZ CARRY                                    DPP11054
01763   0 53400 1 02351          LXA 0007.,1                                  DPP11055
01764   0 60000 0 00424   MPYG   STZ T1                                       DPP11056
01765  -0 75400 0 00000T         PXD                                          DPP11057
01766   0 76700 0 00003   MPYC   ALS 3          CONVERT 8 DIGITS OF THE PSEUDO AC DPP11058
01767   0 40000 0 00424          ADD T1         TO BINARY , STARTING WITH LOW ORDER DPP11059
01770   0 40000 0 00424          ADD T1                                       DPP11060
01771   0 40000 3 00506          ADD AC+31,3                                  DPP11061
01772   0 60100 0 00424          STO T1                                       DPP11062
01773  -3 00000 1 01775D         TXL MPYI,1,0                                 DPP11063
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01774   1 77777 1 01766          TXI MPYC,1,-1                                  DPP11064
01775   0 56000 0 00424   MPYI   LDQ T1                                         DPP11065
01776   0 20000 0 00426          MPY T3          MULTIPLY                       DPP11066
01777   0 60100 0 00424          STO T1                                         DPP11067
02000  -0 60000 0 00425          STQ T2                                         DPP11068
02001   0 50000 0 00425          CLA T2                                         DPP11069
02002   0 40000 0 02354          ADD CARRY       ADD PREVIOUS HIGH ORDER PRODUCT DPP11070
02003   0 76500 0 00043          LRS 35          TO LOW ORDER                   DPP11071
02004   0 40000 0 00424          ADD T1                                         DPP11072
02005   0 22100 0 02350          DVP 10E8        SEPARATE RESULT INTO HIGH AND LOW DPP11073
02006  -0 60000 0 02354          STQ CARRY       ORDER PARTS                    DPP11074
02007   0 76500 0 00043          LRS 35          CONVERT LOW ORDER PART TO DECIMAL DPP11075
02010  -0 75400 0 00000T  MPYE   PXD             AND STORE IN PSEUDO AC         DPP11076
02011   0 22100 0 00003          DVP 0010.                                      DPP11077
02012   0 60100 3 00506          STO AC+31,3                                    DPP11078
02013   3 00006 1 02015          TXH MPYD,1,6                                   DPP11079
02014   1 00001 1 02010          TXI MPYE,1,1                                   DPP11080
02015   1 00010 2 02016   MPYD   TXI MPYF,2,8     MOVE TO THE NEXT HIGHER 8 DIGITS DPP11081
02016  -3 00030 2 01764   MPYF   TXL MPYG,2,24                                  DPP11082
02017   0 50000 0 02354          CLA CARRY                                      DPP11083
02020   0 10000 0 02023          TZE MPYH                                       DPP11084
02021   0 50000 0 00000          CLA 0001.       OVERFLOW OCCURRED IF LAST HIGH DPP11085
02022   0 60100 0 02355          STO OFLOW       ORDER PART IS NOT ZERO         DPP11086
02023  -0 53400 4 01760   MPYH   LXD MPYXC,4                                    DPP11087
02024   1 77774 4 00146          TXI END,4,-4    NORMAL RETURN                  DPP11088
02025  -0 53400 4 01760   MPYER  LXD MPYXC,4                                    DPP11089
02026   1 77775 4 00146          TXI END,4,-3    ERROR RETURN                   DPP11090
                                                                                DPP11091
                                                                                DPP11092
                    DIV ROUTINE DIVIDES THE NUMBER                              DPP11093
                    IN THE PSEUDO-AC BY THE NUMBER                              DPP11094
                    IN THE CALLING SEQUENCE.THE DIVISOR                         DPP11095
                    MUST BE IN THE ABSOLUTE VALUE LESS THAN                     DPP11096
                    2 TO THE 35TH POWER.  THE                                   DPP11097
                    REMAINDER IS LOST.                                          DPP11098
                                                                                DPP11099
                                                                                DPP11100
02027  -0 50000 4 00001   DIV    CAL 1,4                                        DPP11101
02030   0 56000 4 00002          LDQ 2,4                                        DPP11102
02031  -0 63400 4 02033          SXD DIVXC,4                                    DPP11103
02032   0 07400 4 02327          TSX MDS,4       CONVERT DIVISOR AND PUT IN T3  DPP11104
02033  -3 00000 0 02076T  DIVXC  TXL DIVER,0,*   SIGN OF QUOTIENT IN SAC        DPP11105
02034   0 50000 0 00426          CLA T3                                         DPP11106
02035   0 10000 0 02075          TZE DIVJ        ERROR EXIT ON ZERO DIVISOR     DPP11107
02036   0 53400 2 00044          LXA 0024.,2                                    DPP11108
02037   0 60000 0 02354          STZ CARRY                                      DPP11109
02040   0 53400 1 02351          LXA 0007.,1                                    DPP11110
02041   0 60000 0 00424   DIVG   STZ T1                                         DPP11111
02042  -0 75400 0 00000T         PXD                                            DPP11112
02043   0 76700 0 00003   DIVC   ALS 3           CONVERT 8 DIGITS OF THE PSEUDO AC DPP11113
02044   0 40000 0 00424          ADD T1          TO BINARY, STARTING WITH HIGH ORDER DPP11114
02045   0 40000 0 00424          ADD T1                                         DPP11115
02046   0 40000 3 00506          ADD AC+31,3                                    DPP11116
02047   0 60100 0 00424          STO T1                                         DPP11117
02050  -3 00000 1 02052D         TXL DIVH,1,0                                   DPP11118
02051   1 77777 1 02043          TXI DIVC,1,-1                                  DPP11119
02052   0 56000 0 02354   DIVH   LDQ CARRY        MULTIPLY REMAINDER FROM PREVIOUS
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02053   0 20000 0 02350          MPY 10E8                  DIVISION BY  10 TO THE 8TH          DPP11120
02054   0 60100 0 00425          STO T2                                                       DPP11121
02055  -0 75400 0 00000T         PXD                                                          DPP11122
02056   0 76300 0 00043          LLS 35                                                       DPP11123
02057   0 40000 0 00424          ADD T1                                                       DPP11124
02060   0 76500 0 00043          LRS 35                                                       DPP11125
02061   0 40000 0 00425          ADD T2                    ADD SCALED REMAINDER TO DIVIDEND   DPP11126
02062   0 22100 0 00426          DVP T3                    DIVIDE                             DPP11127
02063   0 60100 0 02354          STO CARRY                                                    DPP11128
02064  -0 75400 0 00000T  DIVE   PXD                                                          DPP11129
02065   0 22100 0 00003          DVP 0010.                 CONVERT QUOTIENT TO DECIMAL        DPP11130
02066   0 60100 3 00506          STO AC+31,3               AND STOR IN PSEUDO AC              DPP11131
02067   3 00006 1 02071          TXH DIVD,1,6                                                 DPP11132
02070   1 00001 1 02064          TXI DIVE,1,1                                                 DPP11133
02071   1 77770 2 02072  DIVD   TXI DIVF,2,-8             MOVE TO NEXT LOWER  8 DIGITS       DPP11134
02072   3 00000 2 02041D DIVF   TXH DIVG,2,0                                                 DPP11135
02073  -0 53400 4 02033          LXD DIVXC,4                                                  DPP11136
02074   1 77774 4 00146          TXI END,4,-4              NORMAL RETURN                      DPP11137
02075   0 50000 0 00017  DIVJ   CLA 2D                                                       DPP11138
02076  -0 53400 4 02033  DIVER  LXD DIVXC,4                                                  DPP11139
02077   1 77775 4 00146          TXI END,4,-3              ERROR RETURN                       DPP11140
                                                                                             DPP11141
                                    STO ROUTINE STORES THE LOW-ORDER N                       DPP11142
                                    DIGITS OF THE PSEUDO-AC INTO THE                         DPP11143
                                    LOCATION IN THE CALLING SEQUENCE.                        DPP11144
                                    STS ROUTINE STORES SIMILARLY, REPLACING                  DPP11145
                                    LEADING ZEROS WITH BLANKS.  STS MINUS                    DPP11146
                                    ZERO GIVES ALL BLANKS.                                   DPP11147
                                                                                             DPP11148
02100   0 60000 0 00424  STO    STZ T1                                                       DPP11149
02101   0 02000 0 02104          TRA STOK                                                     DPP11150
02102   0 56000 0 00002  STS    LDQ 9A                                                       DPP11151
02103  -0 60000 0 00424          STQ T1                                                       DPP11152
02104  -0 63400 1 00421  STOK   SXD XA,1                 SAVE I. R.                         DPP11153
02105  -0 63400 2 00422          SXD XB,2                                                     DPP11154
02106   0 50000 4 00001          CLA 1,4                                                      DPP11155
02107   0 73400 1 00000          PAX 0,1                                                      DPP11156
02110   0 36100 0 00035          ACL LUD                                                      DPP11157
02111   0 62100 0 02121          STA STOA                                                     DPP11158
02112   0 62100 0 02125          STA STOB                                                     DPP11159
02113   0 62100 0 02137          STA STOC                                                     DPP11160
02114   0 53400 2 00424          LXA T1,2                                                     DPP11161
02115   0 50000 1 00477  STOD   CLA AC+24,1               MOVE FIELD FROM PSEUDO AC TO UD    DPP11162
02116  -0 10000 0 02125          TNZ STOB                  JUMP OUT ON FIRST NON ZERO DIGIT   DPP11163
02117  -3 00000 2 02121D         TXL STOA,2,0              FROM THE LEFT                      DPP11164
02120   0 50000 0 00012          CLA 50B                   PUT IN LEADING BLANKS IF REQUESTED DPP11165
02121   0 60100 1 00000  STOA   STO *,1                                                      DPP11166
02122   2 00001 1 02115          TIX STOD,1,1                                                 DPP11167
02123   0 02000 0 02127          TRA STOJ                  PSEUDO AC ZERO                     DPP11168
02124   0 50000 1 00477  STOE   CLA AC+24,1               STORE REST OF DIGITS UNCONDITIONALLY DPP11169
02125   0 60100 1 00000  STOB   STO *,1                                                      DPP11170
02126   2 00001 1 02124          TIX STOE,1,1                                                 DPP11171
02127   0 73400 2 00000  STOJ   PAX 0,2                   GET LOW ORDER DIGIT AND SIGN IT WITH DPP11172
02130   0 56000 2 00145          LDQ BCD,2                 THE SIGN OF THE PSEUDO AC          DPP11173
02131   0 50000 0 00446          CLA SAC                                                      DPP11174
02132   0 76000 0 00001          LBT                                                          DPP11175
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02133   0 76300 0 00014          LLS 12                    0   PLUS                    DPP11176
02134   0 76300 0 00021          LLS 17                    1   MINUS                   DPP11177
02135  -0 75400 0 00000T         PXD                                                   DPP11178
02136   0 76300 0 00006          LLS 6                                                 DPP11179
02137   0 60200 1 00000    STOC  SLW *,1                                               DPP11180
02140  -0 50000 4 00001          CAL 1,4                                               DPP11181
02141   0 73400 1 00000          PAX 0,1                                               DPP11182
02142  -0 50000 4 00002          CAL 2,4                                               DPP11183
02143   0 07400 2 00257          TSX INS,2                 INSERT FIELD FROM UD        DPP11184
02144   1 77775 4 00146          TXI END,4,-3              RETURN                      DPP11185
                                                                                       DPP11186
                                                                                       DPP11187
                                 ARS ROUTINE SHIFTS THE PSEUDO-AC                      DPP11188
                                 RIGHT N PLACES, DROPPING THE N                        DPP11189
                                 LOW-ORDER DIGITS AND PLACING ZEROS                    DPP11190
                                 IN THE N HIGH-ORDER DIGITS. SRD                       DPP11191
                                 ROUTINE ROUNDS AFTER THE SHIFT                        DPP11192
                                                                                       DPP11193
02145   0 60000 0 00424    ARS   STZ T1                                                DPP11194
02146   0 02000 0 02151          TRA ARSF                                              DPP11195
02147   0 56000 0 00002    SRD   LDQ 9A                                                DPP11196
02150  -0 60000 0 00424          STQ T1                                                DPP11197
02151  -0 63400 1 00421    ARSF  SXD XA,1                  SAVE I. R.                  DPP11198
02152  -0 63400 2 00422          SXD XB,2                                              DPP11199
02153  -0 50000 4 00001          CAL 1,4                                               DPP11200
02154   0 10000 0 02205          TZE ARSE                  QUICK EXIT IF N=0           DPP11201
02155   0 53400 1 00000          LXA 0001.,1                                           DPP11202
02156   0 73400 2 00000          PAX 0,2                                               DPP11203
02157   3 00030 2 02171          TXH ARSA,2,24             SKIP DIGIT SHIFT IF N GREATER DPP11204
02160   0 40200 0 02352          SUB 0025.                 THAN 24                     DPP11205
02161   0 73400 2 00000          PAX 0,2                                               DPP11206
02162  -0 63400 2 02165          SXD ARSB,2                                            DPP11207
02163   0 36100 0 00027          ACL LAC                                               DPP11208
02164   0 62100 0 02166          STA ARSC                                              DPP11209
02165   3 00000 1 02171D   ARSB  TXH ARSA,1,*              SHIFT THE 25 -N HIGH ORDER DIGITS DPP11210
02166   0 50000 1 00000    ARSC  CLA *,1                   TO THE RIGHT                DPP11211
02167   0 60100 1 00500          STO AC+25,1                                           DPP11212
02170   1 00001 1 02165          TXI ARSB,1,1                                          DPP11213
02171   0 60000 1 00500    ARSA  STZ AC+25,1               FILL IN ZEROS ON THE LEFT   DPP11214
02172   1 00001 1 02173          TXI ARSD,1,1                                          DPP11215
02173  -3 00031 1 02171    ARSD  TXL ARSA,1,25                                         DPP11216
02174   0 53400 2 00424          LXA T1,2                                              DPP11217
02175  -3 00000 2 02205D         TXL ARSE,2,0              EXIT NOW IF WANT ARS        DPP11218
02176   0 53400 2 00477          LXA AC+24,2                                           DPP11219
02177  -3 00004 2 02205          TXL ARSE,2,4              EXIT IF NO ROUNDING IS NECESSARY DPP11220
02200   0 50000 0 00000          CLA 0001.                                             DPP11221
02201   0 73400 2 00000          PAX 0,2                                               DPP11222
02202  -0 63400 2 01670          SXD ADDB,2                GO TO ADD ROUTINE TO ROUND  DPP11223
02203   0 56000 0 00000          LDQ 0001.                                             DPP11224
02204   0 02000 0 01660          TRA ADDE                                              DPP11225
02205   1 77776 4 00146    ARSE  TXI END,4,-2              RETURN                      DPP11226
                                                                                       DPP11227
                                                                                       DPP11228
                                 ALS ROUTINE SHIFTS THE PSEUDO-AC                      DPP11229
                                 LEFT N PLACES. N HIGH ORDER PLACES                    DPP11230
                                 ARE LOST AND ZEROS ARE PLACED IN                      DPP11231
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                                   THE N LOW-ORDER PLACES. THE OVERFLOW                                  DPP11232
                                   TRIGGER REMAINS UNTOUCHED                                             DPP11233
                                                                                                         DPP11234
02206 -0 63400 1 00421   ALS     SXD XA,1                                                               DPP11235
02207  0 50000 4 00001           CLA 1,4                                                                DPP11236
02210  0 73400 1 00000           PAX 0,1                                                                DPP11237
02211 -3 00000 1 02224D          TXL ALSD,1,0              QUICK EXIT IF N=0                            DPP11238
02212 -0 63400 1 02216           SXD ALSA,1                                                             DPP11239
02213  0 36100 0 00030           ACL LAC24                                                              DPP11240
02214  0 62100 0 02217           STA ALSB                                                               DPP11241
02215  0 53400 1 00044           LXA 0024,,1                                                            DPP11242
02216 -3 00000 1 02222D  ALSA    TXL ALSC,1,*                                                           DPP11243
02217  0 50000 1 00000   ALSB    CLA *,1                   SHIFT THE 24-N LOW ORDER DIGITS              DPP11244
02220  0 60100 1 00477           STO AC+24,1               TO THE LEFT                                  DPP11245
02221  1 77777 1 02216           TXI ALSA,1,-1                                                          DPP11246
02222  0 60000 1 00477   ALSC    STZ AC+24,1               FILL IN ZEROS TO THE RIGHT                   DPP11247
02223  2 00001 1 02222           TIX ALSC,1,1                                                           DPP11248
02224 -0 53400 1 00421   ALSD    LXD XA,1                                                               DPP11249
02225  0 02000 4 00002           TRA 2,4                                                                DPP11250
                                                                                                         DPP11251
                                                                                                         DPP11252
                                   TZE ROUTINE RETURNS CONTROL TO                                        DPP11253
                                   ALPHA +1 IF PSEUDO-AC IS ZERO AND                                     DPP11254
                                   TO ALPHA+2 IF IT IS NON-ZERO                                          DPP11255
                                                                                                         DPP11256
02226 -0 63400 2 00422   TZE     SXD XB,2                                                               DPP11257
02227  0 53400 2 00044           LXA 0024,,2                                                            DPP11258
02230  0 50000 2 00477   TZEB    CLA AC+24,2                                                            DPP11259
02231 -0 10000 0 02234           TNZ TZEA                                                               DPP11260
02232  2 00001 2 02230           TIX TZEB,2,1                                                           DPP11261
02233  1 77777 4 00147           TXI END+1,4,-1            PSEUDO AC ZERO                               DPP11262
02234  1 77776 4 00147   TZEA    TXI END+1,4,-2            NON ZERO                                     DPP11263
                                                                                                         DPP11264
                                                                                                         DPP11265
                                   TNZ ROUTINE RETURNS CONTROL TO                                        DPP11266
                                   ALPHA+1 IF PSEUDO-AC IS NON-ZERO                                      DPP11267
                                   AND TO ALPHA+2 IF IT IS ZERO                                          DPP11268
                                                                                                         DPP11269
02235 -0 63400 2 00422   TNZ     SXD XB,2                                                               DPP11270
02236  0 53400 2 00044           LXA 0024,,2                                                            DPP11271
02237  0 50000 2 00477   TNZB    CLA AC+24,2                                                            DPP11272
02240 -0 10000 0 02243           TNZ TNZA                                                               DPP11273
02241  2 00001 2 02237           TIX TNZB,2,1                                                           DPP11274
02242  1 77776 4 00147           TXI END+1,4,-2            PSEUDO AC NON ZERO                           DPP11275
02243  1 77777 4 00147   TNZA    TXI END+1,4,-1            ZERO                                         DPP11276
                                                                                                         DPP11277
                                                                                                         DPP11278
                                   TPL ROUTINE RETURNS CONTROL TO                                        DPP11279
                                   ALPHA+1 IF PSEUDO-AC IS POSITIVE                                      DPP11280
                                   AND TO ALPHA+2 IF IT IS NEGATIVE                                      DPP11281
                                                                                                         DPP11282
02244  0 50000 0 00446   TPL     CLA SAC                                                                DPP11283
02245  0 10000 4 00001           TZE 1,4                                                                DPP11284
02246  0 02000 4 00002           TRA 2,4                                                                DPP11285
                                                                                                         DPP11286
                                                                                                         DPP11287
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                                        TMI ROUTINE RETURNS CONTROL TO                                  DPP11288
                                        ALPHA+1 IF PSEUDO-AC IS NEGATIVE                                DPP11289
                                        AND TO ALPHA+1 IF IT IS POSITIVE                                DPP11290
                                                                                                        DPP11291
02247  0 50000 0 00446   TMI    CLA SAC                                                                 DPP11292
02250 -0 10000 4 00001          TNZ 1,4                                                                 DPP11293
02251  0 02000 4 00002          TRA 2,4                                                                 DPP11294
                                                                                                        DPP11295
                                                                                                        DPP11296
                                        TOV ROUTINE RETURNS CONTROL TO                                  DPP11297
                                        ALPHA+1 IF OVERFLOW HAS OCCURRED                                DPP11298
                                        AND TO ALPHA+2 IF NOT. THE OVERFLOW                             DPP11299
                                        TRIGGER IS RESET                                                DPP11300
                                                                                                        DPP11301
02252  0 50000 0 02355   TOV    CLA OFLOW                                                               DPP11302
02253  0 10000 4 00002          TZE 2,4                                                                 DPP11303
02254  0 60000 0 02355          STZ OFLOW                                                               DPP11304
02255  0 02000 4 00001          TRA 1,4                                                                 DPP11305
                                                                                                        DPP11306
                                                                                                        DPP11307
                                        TNO ROUTINE RETURNS CONTROL TO                                  DPP11308
                                        ALPHA+1 IF NO OVERFLOW HAS OCCURRED                             DPP11309
                                        AND TO ALPHA+2 IF IT HAS. THE OVERFLOW                          DPP11310
                                        TRIGGER IS RESET                                                DPP11311
                                                                                                        DPP11312
02256  0 50000 0 02355   TNO    CLA OFLOW                                                               DPP11313
02257  0 10000 4 00001          TZE 1,4                                                                 DPP11314
02260  0 60000 0 02355          STZ OFLOW                                                               DPP11315
02261  0 02000 4 00002          TRA 2,4                                                                 DPP11316
                                                                                                        DPP11317
                                                                                                        DPP11318
                                        SET ROUTINE PLACES THE NUMBER IN                                DPP11319
                                        THE CALLING SEQUENCE INTO UD+N-1                                DPP11320
                                        THRU UD, CHECKS EACH CHARACTER,                                 DPP11321
                                        AND PLACES ITS SIGN INTO SNO                                    DPP11322
                                        SET LEAVES N IN IR-1.                                           DPP11323
                                        SET IS USED BY CLA, CLS, ADD, SUB.                              DPP11324
                                                                                                        DPP11325
                                                                                                        DPP11326
02262 -0 63400 2 02326   SET    SXD SETX2,2                                                             DPP11327
02263 -0 50000 4 00001          CAL 1,4                                                                 DPP11328
02264  0 73400 1 00000          PAX 0,1                                                                 DPP11329
02265 -0 50000 4 00002          CAL 2,4                                                                 DPP11330
02266  0 07400 2 00220          TSX XTR,2              EXTRACT FIELD TO UD                              DPP11331
02267  0 62100 0 02277          STA SETA                                                                DPP11332
02270  0 62100 0 02305          STA SETB                                                                DPP11333
02271  0 40200 0 00000          SUB 0001.                                                               DPP11334
02272  0 62100 0 02304          STA SETC                                                                DPP11335
02273  0 62100 0 02320          STA SETD                                                                DPP11336
02274 -0 75400 1 00000          PXD 0,1                                                                 DPP11337
02275 -0 73400 2 00000          PDX 0,2                                                                 DPP11338
02276  0 50000 0 00003          CLA 0010.                                                               DPP11339
02277  0 34000 2 00000   SETA   CAS *,2                  CHECK CHARACTERS                                DPP11340
02300  2 00001 2 02277          TIX SETA,2,1                                                            DPP11341
02301  3 00001 2 02325          TXH SETF,2,1           ERROR EXIT IF NON NUMERIC CHARACTER              DPP11342
02302  3 00001 2 02325          TXH SETF,2,1           IN OTHER THAN UNITS POSITION                     DPP11343
02303  0 56000 0 00000          LDQ 0001.
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02304 -0 50000 0 00000   SETC  CAL *                                                    DPP11344
02305  0 73400 2 00000   SETB  PAX *,2                                                  DPP11345
02306 -0 50000 2 00145         CAL BCD,2                                               DPP11346
02307  0 76700 0 00001         ALS 1                                                   DPP11347
02310 -0 76000 0 00001         PBT                                                     DPP11348
02311  0 02000 0 02324         TRA SETER                0   ERROR EXIT IF UNITS DIGIT IS NOT DPP11349
02312  0 76700 0 00002         ALS 2                    1   A PURE OR SIGNED DIGIT      DPP11350
02313 -0 76000 0 00001         PBT                                                     DPP11351
02314  0 56000 0 00040         LDQ 0000.                0   PUT SIGN OF FIELD IN SNO    DPP11352
02315 -0 60000 0 02353         STQ SNO                  1                           DPP11353
02316  0 76500 0 00011         LRS 9                                                   DPP11354
02317 -0 77300 0 00007         RQL 7                                                   DPP11355
02320 -0 60000 0 00000   SETD  STQ                      PUT PURE DIGIT IN UNITS POSITION DPP11356
02321 -0 50000 0 02305         CAL SETB                                                DPP11357
02322 -0 53400 2 02326         LXD SETX2,2                                             DPP11358
02323  0 02000 2 00001         TRA 1,2                  NORMAL RETURN               DPP11359
02324  0 76000 0 00000   SETER CLM                                                     DPP11360
02325  1 77775 4 00146   SETF  TXI END,4,-3            ERROR RETURN                DPP11361
02326  0 00000 0 02326   SETX2 HTR SETX2                                             DPP11362
                                                                                     DPP11363
                                                                                     DPP11364
                              MDS ROUTINE PLACES THE MULTIPLIER                      DPP11365
                         -    OR DIVISOR INTO T3 AS A BINARY                         DPP11366
                         -    NUMBER AND PLACES THE SIGN OF THE                      DPP11367
                         -    RESULT INTO SAC                                        DPP11368
                              MDS IS USED BY MPY, DIV.                               DPP11369
                                                                                     DPP11370
02327  0 60200 0 02333   MDS   SLW MDSA                                              DPP11371
02330 -0 60000 0 02334         STQ MDSB                                              DPP11372
02331 -0 63400 4 02335         SXD MDSXC,4                                           DPP11373
02332  0 07400 4 00323         TSX DTB,4                CONVERT FIELD TO A BINARY NUMBER DPP11374
02333  0 00000 0 00000   MDSA  HTR *                                                 DPP11375
02334  0 00000 0 00000   MDSB  HTR *                                                 DPP11376
02335 -3 00000 0 02346T  MDSXC TXL MDSER,0,*           ERROR RETURN FROM DTB       DPP11377
02336  0 60200 0 00426         SLW T3                                                DPP11378
02337  0 76500 0 00000         LRS 0                                                 DPP11379
02340 -0 75400 0 00000T        PXD                                                   DPP11380
02341 -0 76300 0 00001         LGL 1                                                 DPP11381
02342  0 40200 0 00446         SUB SAC                                               DPP11382
02343  0 60200 0 00446         SLW SAC                  PUT SIGN OF RESULT INTO SAC DPP11383
02344 -0 53400 4 02335         LXD MDSXC,4                                           DPP11384
02345  0 02000 4 00002         TRA 2,4                                               DPP11385
02346 -0 53400 4 02335   MDSER LXD MDSXC,4                                           DPP11386
02347  0 02000 4 00001         TRA 1,4                                               DPP11387
                                                                                     DPP11388
02350 +000575360400      10E8  DEC 100000000                                        DPP11389
02351  0 00000 0 00007   0007. 7                                                     DPP11390
02352  0 00000 0 00031   0025. 25                                                    DPP11391
                  02353  SNO   BSS 1                                                DPP11392
                  02354  CARRY BSS 1                                                DPP11393
                  02355  OFLOW BSS 1                                                DPP11394
                                                                                     DPP11395
                                                                                     DPP11396
                  02356         BSS 0                  HASH CHECKSUM COMPONENT     DPP11397
                                                                                     DPP11398
                              CLEAR AND ADD LOGICAL FIELD                            DPP11399
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02356 -0 63400 1 00421   CAF    SXD XA,1          SAVE I.R.                          DPP11400
02357 -0 63400 2 00422          SXD XB,2                                             DPP11401
02360 -0 50000 4 00001          CAL 1,4           GET N                              DPP11402
02361  0 73400 1 00000          PAX 0,1           SET IR-1=N                         DPP11403
02362  0 60000 0 00424          STZ T1            CLEAR SUM                          DPP11404
02363 -0 50000 4 00002          CAL 2,4           GET (A,T,R)                        DPP11405
02364 -0 73400 2 00000          PDX 0,2           IF R=0, SUBSTITUTE                 DPP11406
02365  3 00000 2 02367D         TXH CAF1,2        R=1                                DPP11407
02366  0 36100 0 00016          ACL 1D                                               DPP11408
02367  0 60200 0 00425   CAF1   SLW T2          SAVE (A,T,R)                       DPP11409
02370 -0 63400 1 00426          SXD T3,1          SAVE N                             DPP11410
02371 -3 00124 1 02373          TXL CAF2,1,U      IF N IS G.T.U,                     DPP11411
02372  0 53400 1 00031          LXA UA,1          SET N=U                            DPP11412
02373  0 07400 2 00220   CAF2   TSX XTR,2         EXTRACT                            DPP11413
02374  0 62100 0 02400          STA CAF3          SET (UD+N)                         DPP11414
02375  0 53400 2 00041   CAF6   LXA 6A,2         SET IR-2=6                         DPP11415
02376 -0 75400 0 00000T         PXD               CLEAR AC                           DPP11416
02377  0 76700 0 00006   CAF5   ALS 6             FORM 6 CHAR. WORDS                 DPP11417
02400  0 36100 1 00000   CAF3   ACL (),1                                            DPP11418
02401 -2 00001 1 02406          TNX CAF4,1,1      TEST FOR N CHAR.                   DPP11419
02402  2 00001 2 02377          TIX CAF5,2,1      TEST FOR 6 CHAR.                   DPP11420
02403  0 36100 0 00424          ACL T1            ADD PREVIOUS SUM                   DPP11421
02404  0 60200 0 00424          SLW T1            AND SAVE                           DPP11422
02405  0 02000 0 02375          TRA CAF6                                             DPP11423
02406  0 36100 0 00424   CAF4   ACL T1            ADD PREVIOUS SUM                   DPP11424
02407 -0 53400 1 00426          LXD T3,1          IF N IS G.T. U,                    DPP11425
02410 -3 00124 1 02415          TXL CAF7,1,U      WE ARE NOT FINISHED                DPP11426
02411  0 60200 0 00424          SLW T1                                               DPP11427
02412 -0 50000 0 00425          CAL T2            FORM (A,T,R+U)                     DPP11428
02413  0 36100 0 00033          ACL UDEC                                             DPP11429
02414  1 77654 1 02367          TXI CAF1,1,-U     REDUCE N BY U                      DPP11430
02415  1 77775 4 00146   CAF7   TXI END,4,-3      RETURN                             DPP11431
                                                                                    DPP11432
                 02416          BSS 0             INSERT LEADING ZEROS COMPONENT     DPP11433
                                INSERT LEADING ZEROS                                DPP11434
                                                                                    DPP11435
                                                                                    DPP11436
02416 -0 63400 1 00421   ILZ    SXD XA,1          SAVE I.R.                          DPP11437
02417 -0 63400 2 00422          SXD XB,2                                             DPP11438
02420  0 50000 4 00001          CLA 1,4           GET N                              DPP11439
02421  0 73400 1 00000          PAX 0,1           SET IR-1=N                         DPP11440
02422 -0 50000 4 00002          CAL 2,4           EXTRACT INPUT                      DPP11441
02423  0 07400 2 00220          TSX XTR,2                                            DPP11442
02424  0 62100 0 02427          STA IZ1           SET (UD+N)                         DPP11443
02425  0 62100 0 02435          STA IZ2                                              DPP11444
02426  0 56000 0 00040          LDQ ZERO                                             DPP11445
02427 -0 50000 1 00000   IZ1    CAL (),1                                             DPP11446
02430  0 34000 0 00012          CAS 060A          COMPARE WITH BLANK                 DPP11447
02431  0 02000 0 02433          TRA IZ3           NOT BLANK                          DPP11448
02432  0 02000 0 02435          TRA IZ2           BLANK-INSERT ZERO                  DPP11449
02433  0 07400 2 00315   IZ3    TSX INSX,2        NOT BLANK                          DPP11450
02434  1 77775 4 00146          TXI END,4,-3      RETURN                             DPP11451
02435 -0 60000 1 00000   IZ2    STQ (),1                                             DPP11452
02436  2 00001 1 02427          TIX IZ1,1,1                                          DPP11453
02437  0 02000 0 02433          TRA IZ3                                              DPP11454
                                                                                    DPP11455
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                    02440       BSS 0                          MODIFY OR STORE FOR PRINT COMPONENT
                                MOD ROUTINE MODIFIES A FIELD
                                FOR PRINTING.IT USES A MASK TO
                                INDICATE THE TYPE OF MODIFICATION.

02440   0 56000 0 00040   MOD   LDQ ZERO                        SET MOD FLAG (0.
02441   0 02000 0 02443         TRA MM
02442   0 56000 0 02447   MAC   LDQ MACF                       SET MAC FLAG (1)
02443  -0 60000 0 00424   MM    STQ T1
02444  -0 63400 1 00421         SXD XA,1                       SAVE IR
02445  -0 63400 2 00422         SXD XB,2
02446   0 60000 0 00427         STZ T4                         INITIALIZE SWITCH TO OFF
02447  -0 50000 4 00001   MACF  CAL 1,4                        GET N
02450   0 73400 1 00000         PAX 0,1                        SET IR-1=N
02451   0 76000 0 00006         COM
02452   0 60200 0 00425         SLW T2                         SAVE CO(N)
02453   0 16200 0 02465         TQP M1                         MOD OR MAC
02454   0 76000 0 00006         COM                            MAVE N
02455   0 36100 0 00037         ACL UDPHU                      LOW DIGITS
02456   0 62100 0 02460         STA M2                         OF AC
02457   0 50000 1 00477   M3    CLA AC+24,1                    TO UPPER UD
02460   0 60100 1 00000   M2    STO (),1
02461   2 00001 1 02457         TIX M3,1,1
02462   0 50000 0 00446         CLA SAC                        GET SIGN OF AC
02463   0 76500 0 00002         LRS 2
02464   1 00001 4 02505         TXI M4,4,1                     CORRECT IR-4
02465  -0 50000 4 00002   M1    CAL 2,4                        EXTRACT FIELD
02466   0 07400 2 00220         TSX XTR,2
02467   0 62100 0 02473         STA M5                         (UD+N)
02470   0 36100 0 00032         ACL HUA
02471   0 62100 0 02474         STA M6                         (UD+U/2+N)
02472   0 62100 0 02504         STA M27
02473   0 50000 1 00000   M5    CLA (),1                       MOVE FIELD TO
02474   0 60100 1 00000   M6    STO (),1                       UPPER UD
02475   2 00001 1 02473         TIX M5,1,1
02476   0 73400 2 00000         PAX 0,2                        IS UNITS POSITION
02477   0 56000 2 00145         LDQ BCD,2                      A PURE OR
02500  -0 77300 0 00001         RQL 1                          SIGNED DIGIT
02501   0 16200 0 02545         TQP M7
02502  -0 50000 2 00145         CAL BCD,2                      PURIFY UNITS DIGIT
02503  -0 32000 0 00015         ANA 077A
02504   0 60200 1 00000   M27   SLW (),1
02505  -0 77300 0 00002   M4    RQL 2
02506  -0 60000 0 00426         STQ T3                         SAVE INPUT SIGN
02507  -0 50000 4 00003         CAL 3,4                        EXTRACT MASK TO UD
02510  -0 73400 1 00000         PDX 0,1
02511  -0 32000 0 00026         ANA CTD
02512   0 07400 2 00220         TSX XTR,2
02513  -0 75400 1 00000         PXD 0,1
02514   0 76000 0 00006         COM
02515  -0 73400 1 00000         PDX 0,1                        SET IR-1=CO(M)
02516  -0 63400 1 02603         SXD M19,1
02517   0 53400 2 00425         LXA T2,2                       SET IR-2=CO(N)
02520   0 56000 0 00426         LDQ T3                         GET INPUT SIGN
02521  -0 50000 1 00476         CAL UD-2,1                     TEST M(1)
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02522   0 34000 0 00007          CAS 051A                                  DPP11512
02523   0 02000 0 02542          TRA M8          M(1)=X                    DPP11513
02524   0 02000 0 02531          TRA M9          M(1)=R                    DPP11514
02525   0 40200 0 00006          SUB 040A                                  DPP11515
02526  -0 10000 0 02540          TNZ M10                                   DPP11516
02527   0 16200 0 02536          TQP M11         M(1)=-,TEST INPUT SIGN    DPP11517
02530   0 02000 0 02540          TRA M10                                   DPP11518
02531   0 16200 0 02533   M9     TQP M12         M(1)=R, TEST INPUT SIGN   DPP11519
02532   1 00001 1 02540          TXI M10,1,1     STEP MASK POSITION        DPP11520
02533   0 56000 0 00012   M12    LDQ 060A        STORE BLANK IN MASK       DPP11521
02534  -0 60000 1 00476          STQ UD-2,1                                DPP11522
02535   1 00001 1 02537          TXI M13,1,1     STEP MASK POSITION        DPP11523
02536   0 56000 0 00012   M11    LDQ 060A                                  DPP11524
02537  -0 60000 1 00476   M13    STQ UD-2,1      STORE BLANK IN MASK       DPP11525
02540   3 77775 1 02570   M10    TXH M14,1,-3    TEST FOR END OF MASK      DPP11526
02541   1 00001 1 02553          TXI M15,1,1     STEP MASK POSITION        DPP11527
02542   3 77776 2 02551   M8     TXH M16,2,-2    IS FIELD FINISHED         DPP11528
02543  -0 50000 2 00550          CAL UD+U/2-2,2  TEST FOR PURE DIGIT       DPP11529
02544   0 34000 0 00002          CAS 9A                                    DPP11530
02545   1 77773 4 00146   M7     TXI END,4,-5    ILLEGAL                   DPP11531
02546   0 76100 0 00000          NOP                                       DPP11532
02547   0 60200 1 00476          SLW UD-2,1      PUT DIGIT IN MASK         DPP11533
02550   1 00001 2 02540          TXI M10,2,1     STEP FIELD POSITION       DPP11534
02551   0 60000 1 00476   M16    STZ UD-2,1      STORE ZERO IN MASK        DPP11535
02552   0 02000 0 02540          TRA M10                                   DPP11536
02553  -0 50000 1 00476   M15    CAL UD-2,1                                DPP11537
02554   0 40200 0 00013          SUB 067A                                  DPP11538
02555   0 10000 0 02542          TZE M8          IS MASK=X                 DPP11539
02556   0 40000 0 00042          ADD 12A                                   DPP11540
02557  -0 10000 0 02540          TNZ M10         IS MASK=$                 DPP11541
02560   1 77777 1 02561          TXI M30,1,-1    STEP MASK POS. TO THE RIGHT DPP11542
02561   0 56000 0 00012   M30    LDQ 060A        SET T=BLANK               DPP11543
02562  -0 50000 4 00003          CAL 3,4         GET FORM PARAMETER        DPP11544
02563  -0 32000 0 00024          ANA TAG7                                  DPP11545
02564   0 40200 0 00022          SUB TAG1                                  DPP11546
02565  -0 10000 0 02571          TNZ M34         TEST FOR FLOATING $       DPP11547
02566  -0 60000 1 00475          STQ UD-3,1      REPLACE $ BY BLANK        DPP11548
02567  -0 60000 0 00427          STQ T4          SET SWITCH ON             DPP11549
02570   0 56000 0 00012   M14    LDQ 060A        SET T=BLANK               DPP11550
02571  -0 50000 4 00003   M34    CAL 3,4         GET FORM PARAMETER        DPP11551
02572  -0 32000 0 00024          ANA TAG7                                  DPP11552
02573   0 34000 0 00023          CAS 2T                                    DPP11553
02574   0 02000 0 02617          TRA M23         F=3, LEADING ZEROS        DPP11554
02575   0 56000 0 00011          LDQ 054A        F=2, LEADING *, SET T=*   DPP11555
02576  -0 50000 1 00476   M21    CAL UD-2,1      F=0 OR 1, T=BLANK         DPP11556
02577   0 10000 0 02602          TZE M22         IS MASK POS.=0            DPP11557
02600   0 40200 0 00014          SUB 073A                                  DPP11558
02601  -0 10000 0 02605          TNZ M31         IS MASK POS.=,            DPP11559
02602  -0 60000 1 00476   M22    STQ UD-2,1      STORE T IN MASK           DPP11560
02603  -3 00000 1 02606D  M19    TXL M32,1,()    IS THIS RIGHT END OF MASK DPP11561
02604   1 77777 1 02576          TXI M21,1,-1    STEP MASK POS. TO THE RIGHT DPP11562
02605   1 00001 1 02606   M31    TXI M32,1,1     STEP MASK POS. TO THE LEFT DPP11563
02606  -0 50000 0 00427   M32    CAL T4          TEST SWITCH               DPP11564
02607   0 10000 0 02613          TZE M33         OFF                       DPP11565
02610   0 56000 0 00010          LDQ 053A        INSERT $                  DPP11566
02611  -0 60000 1 00476          STQ UD-2,1                                DPP11567
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02612  1 00001 1 02613          TXI M33,1,1                STEP MASK POS. TO THE LEFT          DPP11568
02613 -0 75400 1 00000   M33     PXD 0,1                                                        DPP11569
02614  0 76000 0 00006           COM                                                            DPP11570
02615 -0 32000 0 02637           ANA MASK1                  AVOID SIZE-OF-MACHINE TROUBLE       DPP11571
02616  0 60200 0 00425           SLW T2                     SAVE MASK POS.=K                    DPP11572
02617 -0 50000 4 00003   M23     CAL 3,4                    INSERT MODIFIED FIELD               DPP11573
02620 -0 73400 1 00000           PDX 0,1                                                        DPP11574
02621 -0 50000 4 00004           CAL 4,4                                                        DPP11575
02622  0 07400 2 00257           TSX INS,2                                                      DPP11576
02623 -0 50000 4 00004           CAL 4,4                                                        DPP11577
02624 -0 73400 1 00000           PDX 0,1                                                        DPP11578
02625 -3 00000 1 02627D          TXL M35,1,0                IF S=0, SET S=1                     DPP11579
02626  0 40200 0 00016           SUB 1D                                                         DPP11580
02627  0 36100 0 00425   M35     ACL T2                     FORM S+K-1 IN DECREMENT             DPP11581
02630 -0 32000 0 02640           ANA MASK2                  CLEAR REST OF AC                    DPP11582
02631  0 56000 0 00426           LDQ T3                     SET AC SIGN TO INPUT SIGN           DPP11583
02632  0 76300 0 00000           LLS 0                                                          DPP11584
02633  0 56000 0 00424           LDQ T1                                                         DPP11585
02634  0 16200 0 02636           TQP M26                    MOD OR MAC                          DPP11586
02635  1 77773 4 00146           TXI END,4,-5               (1) - MAC                           DPP11587
02636  1 77772 4 00146   M26     TXI END,4,-6               (0)- MOD                            DPP11588
02637 +007777000000      MASK1   OCT 007777000000                                              DPP11589
02640 +077777000000      MASK2   OCT 077777000000                                              DPP11590
                                                                                               DPP11591
                  02641          BSS 0                      CHECK PACKED BCD COMPONENT          DPP11592
                                 CHECK BCD FIELD                                               DPP11593
                                                                                               DPP11594
02641 -0 63400 1 00421   CHK     SXD XA,1                   SAVE IR                             DPP11595
02642 -0 63400 2 00422           SXD XB,2                                                       DPP11596
02643 -0 50000 4 00001           CAL 1,4                    GET N                               DPP11597
02644  0 73400 1 00000           PAX 0,1                    SET IR-1=N                          DPP11598
02645 -0 50000 4 00002           CAL 2,4                    GET (A,T,R)                         DPP11599
02646 -0 73400 2 00000           PDX 0,2                    IF R=0, SUBSTITUTE                  DPP11600
02647  3 00000 2 02651D          TXH CHD1,2                 R=1                                 DPP11601
02650  0 36100 0 00016           ACL 1D                                                         DPP11602
02651  0 60200 0 00424   CHD1    SLW T1                     SAVE (A,T,R)                        DPP11603
02652 -0 63400 1 00425           SXD T2,1                   SAVE N                              DPP11604
02653 -3 00124 1 02655           TXL CHD2,1,U               IF N IS G.T.U,                      DPP11605
02654  0 53400 1 00031           LXA UA,1                   SET N=U                             DPP11606
02655  0 07400 2 00220   CHD2    TSX XTR,2                  EXTRACT                             DPP11607
02656  0 62100 0 02657           STA CHD3                   SET (UD+N)                          DPP11608
02657  0 50000 1 00000   CHD3    CLA (),1                   CHECK                               DPP11609
02660  0 73400 2 00000           PAX 0,2                    EACH                                DPP11610
02661  0 50000 2 00145           CLA BCD,2                  CHARACTER                           DPP11611
02662  0 12000 0 02671           TPL CHD4                                                       DPP11612
02663  2 00001 1 02657           TIX CHD3,1,1                                                   DPP11613
02664 -0 53400 1 00425           LXD T2,1                   IF N IS G.T. U, WE                  DPP11614
02665 -3 00124 1 02672           TXL CHD5,1,U               ARE NOT DONE                        DPP11615
02666 -0 50000 0 00424           CAL T1                     FORM (A,T,R+U)                      DPP11616
02667  0 36100 0 00033           ACL UDEC                                                       DPP11617
02670  1 77654 1 02651           TXI CHD1,1,-U              REDUCE N BY U                       DPP11618
02671  1 77775 4 00146   CHD4    TXI END,4,-3               ILLEGAL RETURN                      DPP11619
02672  1 77774 4 00146   CHD5    TXI END,4,-4               LEGAL RETURN                        DPP11620
                  00000          END                                                            DPP11621
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      REM DATA PROCESSING PACKAGE LOADER                                DPPL0000
DTB   HTR DTB                        TRANSFER TABLE                     DPPL0001
BTD   HTR BTD                                                           DPPL0002
RCD   HTR RCD                                                           DPPL0003
WPU   HTR WPU                                                           DPPL0004
WPR   HTR WPR                                                           DPPL0005
RTD   HTR RTD                                                           DPPL0006
WTD   HTR WTD                                                           DPPL0007
RTB   HTR RTB                                                           DPPL0008
WTB   HTR WTB                                                           DPPL0009
MOV   HTR MOV                                                           DPPL0010
XIN   HTR XIN                                                           DPPL0011
COM   HTR COM                                                           DPPL0012
BPB   HTR BPB                                                           DPPL0013
ZAC   HTR ZAC                                                           DPPL0014
CLA   HTR CLA                                                           DPPL0015
CLS   HTR CLS                                                           DPPL0016
ADD   HTR ADD                                                           DPPL0017
SUB   HTR SUB                                                           DPPL0018
MPY   HTR MPY                                                           DPPL0019
DIV   HTR DIV                                                           DPPL0020
STO   HTR STO                                                           DPPL0021
STS   HTR STS                                                           DPPL0022
ARS   HTR ARS                                                           DPPL0023
SRD   HTR SRD                                                           DPPL0024
ALS   HTR ALS                                                           DPPL0025
TZE   HTR TZE                                                           DPPL0026
TNZ   HTR TNZ                                                           DPPL0027
TPL   HTR TPL                                                           DPPL0028
TMI   HTR TMI                                                           DPPL0029
TOV   HTR TOV                                                           DPPL0030
TNO   HTR TNO                                                           DPPL0031
CAF   HTR CAF                                                           DPPL0032
ILZ   HTR ILZ                                                           DPPL0033
MOD   HTR MOD                                                           DPPL0034
MAC   HTR MAC                                                           DPPL0035
CHK   HTR CHK                                                           DPPL0036
      BSS 271                                                           DPPL0037
DPPL  REW 1                                                             DPPL0038
      SXD DPPL+104,1             SAVE INDEX REGISTERS                   DPPL0039
      SXD DPPL+99,2                                                     DPPL0040
      SXD DPPL+107,4                                                    DPPL0041
      LXA DPPL+13,1              POSITION LIBRARY TAPE                  DPPL0042
      TXL DPPL+11,1,0                                                   DPPL0043
      RTB 1                                                             DPPL0044
      CPY DPPL+131                                                      DPPL0045
      TRA DPPL+6                 NORMAL                                 DPPL0046
      TXI DPPL+5,1,-1            END OF FILE                            DPPL0047
      TRA DPPL+6                 END OF RECORD                          DPPL0048
      RTB 1                                                             DPPL0049
      CAL 2,4                    GET FIRST DELETION FROM ADDRESS        DPPL0050
      PAX 1,1                                                           DPPL0051
      TXH DPPL+114,1,13          ERROR EXIT IF DELETION IS TOO HIGH     DPPL0052
      SXD DPPL+91,1                                                     DPPL0053
      SXD DPPL+36,4                                                     DPPL0054
      LXD DPPL+121,2                                                    DPPL0055
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LXD  DPPL+91,1          SHOULD WE DELETE THIS COMPONENT      DPPL0056
PXD  0,1                                                     DPPL0057
SUB  DPPL+124                                                DPPL0058
TNZ  DPPL+23            NO                                   DPPL0059
LXD  DPPL+64,2          YES                                  DPPL0060
LXD  DPPL+122,1         READ TAPE RECORD ROUTINE             DPPL0061
SXD  DPPL+77,1          INDEX 2 CONTROLS FUNCTION            DPPL0062
PXD  0,0                INDEX 2=0, DELETE COMPONENT          DPPL0063
CAD  DPPL+131           INDEX 2=1, UNIVERSAL COMPONENT       DPPL0064
SLW  DPPL+132           INDEX 2=2, REGULAR COMPONENT         DPPL0065
ACL  DPPL+127,2                                              DPPL0066
STA  DPPL+65            SET UP STORING ADDRESS               DPPL0067
TXL  DPPL+37,2,1        SKIP IF NOT A REGULAR COMP           DPPL0068
ACL  DPPL+128           TEST WHETHER LOADING THIS COMP       DPPL0069
STD  DPPL+78            WILL CAUSE US TO EXCEED SIZE         DPPL0070
PDX  0,1                                                     DPPL0071
TXL  DPPL+37,1,DTB+SIZE                                      DPPL0072
CLA  DPPL+122           SIZE IS TOO SMALL,                   DPPL0073
TXL  DPPL+115           GO TO ERROR EXIT                     DPPL0074
LXA  DPPL+131,4         W1 ADR HAS NO LOCS LOADED FOR COMP   DPPL0075
CAL  DPPL+132           W1 DEC HAS NO LOCS USED BY THIS COMP DPPL0076
CAD  DPPL+131           COPY W2                              DPPL0077
SLW  DPPL+132                                                DPPL0078
CAL  DPPL+131           W2 ADR HAS NO LAST SUB IN COMP       DPPL0079
ACL  DPPL+86            W2 DEC HAS NO. SUBS IN THIS COMP     DPPL0080
STA  DPPL+51                                                 DPPL0081
LXD  DPPL+131,1                                              DPPL0082
CAL  DPPL+132                                                DPPL0083
CAD  DPPL+131           COPY SUBROUTINE WORD                 DPPL0084
SLW  DPPL+132                                                DPPL0085
CAL  DPPL+131           SUBROUTINE WORD ADDRESS HAS ORIGIN   DPPL0086
ACL  DPPL+127,2         OF SUBROUTINE RELATIVE TO ORIGIN     DPPL0087
TXL  DPPL+52,2,0        OF COMPONENT                         DPPL0088
SLW  0,1                                                     DPPL0089
TIX  DPPL+45,1,1                                             DPPL0090
SXD  DPPL+76,2                                               DPPL0091
CAL  DPPL+132                                                DPPL0092
CAD  DPPL+131           COPY RELOCATOR WORD                  DPPL0093
LXA  DPPL+131,1         RW HAS REL BITS FOR ADR IN ADR       DPPL0094
LXD  DPPL+131,2         REL BITS FOR DEC IN DEC              DPPL0095
CAD  DPPL+131           COPY INSTRUCTION WORD                DPPL0096
SLW  DPPL+132                                                DPPL0097
CAL  DPPL+131           RELOCATE ADDRESS AND DECREMENT OF    DPPL0098
ACL  DPPL+127,1         INSTRUCTION WORD                     DPPL0099
ACL  DPPL+130,2                                              DPPL0100
LXD  DPPL+76,2                                               DPPL0101
TXL  DPPL+66,2,0                                             DPPL0102
SLW  0,4                                                     DPPL0103
TIX  DPPL+54,4,1                                             DPPL0104
CPY  DPPL+131           CHECK CHECKSUM                       DPPL0105
CLA  DPPL+132                                                DPPL0106
SUB  DPPL+131                                                DPPL0107
TZE  DPPL+79,2                                               DPPL0108
BST  1                                                       DPPL0109
RTB  1                                                       DPPL0110
LXD  DPPL+77,1                                               DPPL0111
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TIX DPPL+24,1,1                                                    DPPL0112
CLA DPPL+120                                                       DPPL0113
TXL DPPL+115                                                       DPPL0114
TXL DPPL+100                                                       DPPL0115
TXL DPPL+108                                                       DPPL0116
LXD DPPL+36,4          GET NEXT DELETION NO AND TEST IT            DPPL0117
IOD                                                                DPPL0118
LDQ DPPL+123                                                       DPPL0119
CLA 2,4                                                            DPPL0120
TQP DPPL+86                                                        DPPL0121
ARS 18                                                             DPPL0122
TXI DPPL+86,4,-1                                                   DPPL0123
PAX DTB,1                                                          DPPL0124
RQL 1                                                              DPPL0125
STQ DPPL+123                                                       DPPL0126
SXD DPPL+36,4                                                      DPPL0127
TXL DPPL+93,1,0                                                    DPPL0128
TXL DPPL+114,1,0                                                   DPPL0129
TXH DPPL+114,1,13                                                  DPPL0130
SXD DPPL+91,1                                                      DPPL0131
LXD DPPL+124,1                                                     DPPL0132
TXI DPPL+96,1,1                                                    DPPL0133
TXH DPPL+105,1,13      HAVE WE READ ALL COMPONENTS                 DPPL0134
SXD DPPL+124,1         NO, GO TO NEXT COMPONENT                    DPPL0135
RTB 1                                                              DPPL0136
TXL DPPL+17                                                        DPPL0137
CAL DPPL+78            INCREASE ORIGINS FOR REG COMPS              DPPL0138
STD DPPL+128           BY NO LOCS USED BY LAST COMP                DPPL0139
ARS 18                                                             DPPL0140
STA DPPL+125                                                       DPPL0141
TXL DPPL+94                                                        DPPL0142
RTB 1                  READ UNIVERSAL COMPONENT                    DPPL0143
LXD DPPL+120,2                                                     DPPL0144
TXL DPPL+23                                                        DPPL0145
LXD DPPL+36,4          NORMAL RETURN                               DPPL0146
IOD                                                                DPPL0147
LDQ DPPL+123                                                       DPPL0148
TQP DPPL+113                                                       DPPL0149
TXI DPPL+116,4,-2                                                  DPPL0150
TXI DPPL+116,4,-1                                                  DPPL0151
CLA DPPL+121                                                       DPPL0152
LXD DPPL+107,4         ERROR RETURN                                DPPL0153
LXD DPPL+104,1                                                     DPPL0154
LXD DPPL+99,2                                                      DPPL0155
REW 1                                                              DPPL0156
TRA 1,4                                                            DPPL0157
    0,0,1              CONSTANTS                                   DPPL0158
    0,0,2                                                          DPPL0159
    0,0,3                                                          DPPL0160
OCT 525252525252                                                   DPPL0161
    0,0,1                                                          DPPL0162
PZE DPPL+133                                                       DPPL0163
PZE CHK+1                                                          DPPL0164
PZE                                                                DPPL0165
PZE 0,0,DPPL+133                                                   DPPL0166
PZE 0,0,CHK+1                                                      DPPL0167
PZE                                                                DPPL0168
BSS DTB+SIZE-DPPL-131                                              DPPL0169
```

```
                    02000          ORG 1024                                                                  WDP10000
                                   PROGRAM TO WRITE DATA PROCESSING PACKAGE ON LIBRARY TAPE                   WDP10001
                    00000   ()     EQU 0                                                                     WDP10002
                    00007   LIB    EQU 7                                                                     WDP10003
02000   0 76200 0 00321    WDP1   RCD                        READ                                           WDP10004
02001   0 70000 0 04577           CPY LF                     NUMBER OF FILES                                WDP10005
02002   0 70000 0 04571           CPY E                      TAPE ADDRESS                                   WDP10006
02003  -0 50000 0 04571           CAL E                                                                     WDP10007
02004   0 36100 0 02337           ACL O220A                                                                 WDP10008
02005   0 62100 0 02015           STA P1                     STORE TAPE ADDRESSES                           WDP10009
02006   0 62100 0 02020           STA S22                                                                   WDP10010
02007   0 62100 0 02236           STA S16                                                                   WDP10011
02010   0 62100 0 02273           STA P2                                                                    WDP10012
02011   0 62100 0 02274           STA P3                                                                    WDP10013
02012   0 62100 0 02327           STA S2                                                                    WDP10014
02013   0 62100 0 02330           STA P4                                                                    WDP10015
02014   0 62100 0 02316           STA ERR                                                                   WDP10016
02015   0 77200 0 00207    P1     REW LIB                    POSITION LIBRARY TAPE                          WDP10017
02016   0 53400 1 04577           LXA LF,1                                                                  WDP10018
02017  -3 00000 1 02026D   P6     TXL P5,1,0                                                                WDP10019
02020   0 76200 0 00227    S22    RTB LIB                                                                   WDP10020
02021   0 70000 0 04571           CPY E                                                                     WDP10021
02022   0 02000 0 02020           TRA S22                    NORMAL                                         WDP10022
02023   0 02000 0 02025           TRA S23                    END OF FILE                                    WDP10023
02024   0 02000 0 02020           TRA S22                    END OF RECORD                                  WDP10024
02025   1 77777 1 02017    S23    TXI P6,1,-1                                                               WDP10025
02026  -0 53400 1 02332    P5     LXD ZERO,1                      READ CONTROL CARDS INTO TAB REGION        WDP10026
02027   0 76200 0 00321    S63    RCD                                                                       WDP10027
02030  -0 75400 0 00000T          PXD 0,0                                                                   WDP10028
02031  -0 70000 0 04555           CAD 9L                                                                    WDP10029
02032   0 10000 0 02052           TZE S62                    EXIT ON A BLANK CARD                           WDP10030
02033   0 63000 0 04576           STP TEST                                                                  WDP10031
02034   0 70000 0 04556           CPY 9R                                                                    WDP10032
02035  -0 70000 0 04571           CAD E                                                                     WDP10033
02036  -0 70000 0 04571           CAD E                                                                     WDP10034
02037  -0 53400 2 04555           LXD 9L,2                                                                  WDP10035
02040  -0 70000 1 02447    S61    CAD TAB-1,1                                                               WDP10036
02041   1 00001 1 02042           TXI S60,1,1                                                               WDP10037
02042   2 00001 2 02040    S60    TIX S61,2,1                                                               WDP10038
02043   0 60200 0 04561           SLW CKS                                                                   WDP10039
02044   0 50000 0 04576           CLA TEST                   DO NOT CHECK CHECKSUM                          WDP10040
02045   0 10000 0 02027           TZE S63                    IF 9L PREFIX IS ZERO                           WDP10041
02046   0 50000 0 04561           CLA CKS                                                                   WDP10042
02047   0 40200 0 04556           SUB 9R                                                                    WDP10043
02050   0 10000 0 02027           TZE S63                                                                   WDP10044
02051   0 00000 0 00000           HTR                        CHECKSUM STOP FOR CONTROL CARD                 WDP10045
02052   1 77776 1 02053    S62    TXI S62A,1,-2              S66 GETS NO. OF ENTRIES IN TAB  MINUS 2        WDP10046
02053  -0 63400 1 02076    S62A   SXD S66,1                                                                 WDP10047
02054   0 50000 0 02447           CLA TAB-1                  STORE ORIGIN OF FIRST COMPONENT                WDP10048
02055   0 62100 0 02473           STA CTAB1-1                                                               WDP10049
02056   0 60000 0 02602           STZ NSC                    SET NS, NSC TO ZERO                            WDP10050
02057   0 60000 0 02603           STZ NS                                                                    WDP10051
02060  -0 53400 7 02332           LXD ZERO,7                                                                WDP10052
02061   0 50000 4 02446    S67    CLA TAB-2,4                PICK UP TAB ENTRY                              WDP10053
02062  -0 12000 0 02100           TMI S64                    NEGATIVE ENTRY REPRESENTS A COMPONENT          WDP10054
02063   0 40200 2 02473           SUB CTAB1-1,2              GET ORIGIN OF SUBROUTINE RELATIVE              WDP10055
```

```
02064 -0 50100 0 02341          ORA TRA          TO COMPONENT                                WDP10056
02065  0 60200 1 02520          SLW STAB,1                                                   WDP10057
02066  0 50000 0 02603          CLA NS           STEP NO. OF SUBROUTINES                     WDP10058
02067  0 40000 0 02333          ADD 1A                                                       WDP10059
02070  0 60100 0 02603          STO NS                                                       WDP10060
02071  0 50000 0 02602          CLA NSC          STEP NO. OF SUBROUTINES IN THIS COMP        WDP10061
02072  0 40000 0 02334          ADD 1D                                                       WDP10062
02073  0 60100 0 02602          STO NSC                                                      WDP10063
02074  1 77777 1 02075          TXI S65,1,-1                                                 WDP10064
02075  1 00001 4 02076    S65   TXI S66,4,1                                                 WDP10065
02076 -3 00000 4 02061D   S66   TXL S67,4,()      HAVE FINISHED LAST ENTRY IN TAB             WDP10066
02077  1 77777 2 02113          TXI S68,2,-1     YES, GO TO READ PROGRAM CARDS               WDP10067
02100  0 62100 2 02472    S64   STA CTAB1-2,2    TAB ENTRY REPRESENTS A COMPONENT            WDP10068
02101  0 76000 0 00003          SSP                                                          WDP10069
02102  0 40200 2 02473          SUB CTAB1-1,2                                                WDP10070
02103  0 76700 0 00022          ALS 18                                                       WDP10071
02104  0 62200 2 02473          STD CTAB1-1,2    CTAB1 DEC GETS NO. LOCS. USED BY COMP       WDP10072
02105  0 50000 0 02602          CLA NSC          CTAB2 DEC GETS NO. SUBS IN THIS COMP        WDP10073
02106  0 62200 2 02517          STD CTAB2-1,2                                                WDP10074
02107  0 50000 0 02603          CLA NS           CTAB2 ADR GETS NO. LAST SUB IN THIS COMP    WDP10075
02110  0 62100 2 02517          STA CTAB2-1,2                                                WDP10076
02111  0 60000 0 02602          STZ NSC          RESET NSC                                   WDP10077
02112  1 00001 2 02075          TXI S65,2,1                                                  WDP10078
02113 -0 63400 2 02324    S68   SXD S76,2        S76 GETS NO. COMPS MINUS ONE                WDP10079
02114 -0 53400 2 02334          LXD 1D,2         SET COMPONENT NUMBER TO ONE                 WDP10080
02115 -0 63400 2 04575    S15   SXD COMPN,2      START NEW COMPONENT                         WDP10081
02116 -0 50000 2 02473          CAL CTAB1-1,2    SET UP DECS TO ORIGIN OF COMP - 1           WDP10082
02117  0 40200 0 02333          SUB 1A                                                       WDP10083
02120  0 76700 0 00022          ALS 18                                                       WDP10084
02121  0 62200 0 02171          STD S5                                                       WDP10085
02122  0 62200 0 02200          STD S6                                                       WDP10086
02123  0 60000 0 04562          STZ LOC          CLEAR LOC                                   WDP10087
02124  0 76200 0 00321    S1    RCD              READ PROGRAM CARDS                          WDP10088
02125 -0 75400 0 00000T         PXD 0,0                                                      WDP10089
02126 -0 70000 0 04555          CAD 9L                                                       WDP10090
02127  0 10000 0 02235          TZE S3                TEST FOR END OF COMPONENT              WDP10091
02130 -0 53400 4 04555          LXD 9L,4                                                     WDP10092
02131  0 70000 0 04556          CPY 9R                                                       WDP10093
02132 -0 70000 0 04557          CAD R1                                                       WDP10094
02133 -0 70000 0 04560          CAD R2                                                       WDP10095
02134  0 60200 0 04561          SLW CKS                                                      WDP10096
02135 -0 63400 4 04563    S4    SXD N,4                                                      WDP10097
02136 -0 50000 0 04561          CAL CKS                                                      WDP10098
02137 -0 70000 0 04564          CAD I            COPY TWO INSTRUCTIONS AT A TIME             WDP10099
02140 -0 70000 0 04572          CAD IR                                                       WDP10100
02141  0 60200 0 04561          SLW CKS                                                      WDP10101
02142 -0 53400 2 02334          LXD 1D,2                                                     WDP10102
02143 -0 63400 2 04573    DET   SXD TRACK,2       DETERMINE THE RELOCATABILITY                WDP10103
02144  0 56000 0 04560          LDQ R2           OF DECREMENTS, ADDRESSES                    WDP10104
02145 -0 50000 0 04557          CAL R1                                                       WDP10105
02146 -0 53400 3 02332          LXD ZERO,3                                                   WDP10106
02147 -0 76000 0 00001          PBT                                                          WDP10107
02150  1 00000 1 02155D         TXI A,1,0        0   DECREMENT ABSOLUTE                      WDP10108
02151 -0 76300 0 00001          LGL 1                 1                                      WDP10109
02152 -0 76000 0 00001          PBT                                                          WDP10110
02153  1 00001 1 02155          TXI A,1,1        0   DECREMENT RELOC. DIRECT                 WDP10111
```

```
02154  0 00000 0 00000          HTR                  1   DECREMENT RELOC. COMPL., STOP          WDP10112
02155 -0 76300 0 00001    A     LGL 1                                                           WDP10113
02156 -0 76000 0 00001          PBT                                                             WDP10114
02157  1 00000 2 02164D         TXI B,2,0            0   ADDRESS ABSOLUTE                       WDP10115
02160 -0 76300 0 00001          LGL 1                    1                                      WDP10116
02161 -0 76000 0 00001          PBT                                                             WDP10117
02162  1 00001 2 02164          TXI B,2,1            0   ADDRESS RELOC. DIRECT                  WDP10118
02163  0 00000 0 00000          HTR                  1   ADDRESS RELOC. COMPL., STOP            WDP10119
02164 -0 76300 0 00001    B     LGL 1                                                           WDP10120
02165  0 60200 0 04557          SLW R1                                                          WDP10121
02166 -0 60000 0 04560          STQ R2                                                          WDP10122
02167 -3 00000 1 02175D         TXL ST1,1,0              JUMP IF DEC IS ABSOLUTE                WDP10123
02170 -0 53400 4 04564          LXD I,4                                                         WDP10124
02171 -2 00000 4 02175D   S5    TNX ST1,4,()         JUMP IF DEC OF I IS LOW                    WDP10125
02172  1 77777 4 02173          TXI X1,4,-1                                                     WDP10126
02173 -0 63400 4 04564    X1    SXD I,4                                                         WDP10127
02174  1 00001 1 02175          TXI ST1,1,1                                                     WDP10128
02175 -0 63400 1 04565    ST1   SXD R,1                                                         WDP10129
02176 -3 00000 2 02206D         TXL ST2,2,0              JUMP IF ADR IS ABSOLUTE                WDP10130
02177  0 53400 4 04564          LXA I,4                                                         WDP10131
02200 -2 00000 4 02206D   S6    TNX ST2,4,()         JUMP IF ADR OF I IS LOW                    WDP10132
02201  1 77777 4 02202          TXI X2,4,-1                                                     WDP10133
02202 -0 75400 4 00000    X2    PXD 0,4                                                         WDP10134
02203  0 77100 0 00022          ARS 18                                                          WDP10135
02204  0 62100 0 04564          STA I                                                           WDP10136
02205  1 00001 2 02206          TXI ST2,2,1                                                     WDP10137
02206 -0 75400 2 00000    ST2   PXD 0,2                                                         WDP10138
02207  0 77100 0 00022          ARS 18                                                          WDP10139
02210  0 62100 0 04565          STA R                                                           WDP10140
02211 -0 53400 4 04562          LXD LOC,4                                                       WDP10141
02212  0 50000 0 04564          CLA I                I HAS THE MODIFIED INSTRUCTION             WDP10142
02213  0 60100 4 02605    S7    STO C+1,4                                                       WDP10143
02214  0 50000 0 04565          CLA R                R HAS THE RELOCATOR BITS FOR I             WDP10144
02215  0 60100 4 02604    S8    STO C,4                                                         WDP10145
02216  1 77776 4 02217          TXI S10,4,-2                                                    WDP10146
02217 -0 63400 4 04562    S10   SXD LOC,4                                                       WDP10147
02220 -0 53400 4 04563          LXD N,4                                                         WDP10148
02221 -2 00001 4 02231          TNX CHECK,4,1        FINISHED ALL WORDS ON CARD                 WDP10149
02222 -0 63400 4 04563          SXD N,4              NO                                         WDP10150
02223 -0 53400 2 04573          LXD TRACK,2                                                     WDP10151
02224  0 50000 0 04572          CLA IR                                                          WDP10152
02225  0 60100 0 04564          STO I                                                           WDP10153
02226  1 00001 2 02227          TXI S52,2,1                                                     WDP10154
02227 -3 00002 2 02143    S52   TXL DET,2,2          FINISHED RIGHT HALF WORD                   WDP10155
02230  0 02000 0 02135          TRA S4               YES, GO TO COPY TWO MORE WORDS             WDP10156
02231  0 50000 0 04556   CHECK CLA 9R               CHECK CHECHSUM                             WDP10157
02232  0 40200 0 04561          SUB CKS                                                         WDP10158
02233  0 10000 0 02124          TZE S1                                                          WDP10159
02234  0 00000 0 00000          HTR                  CHECKSUM STOP FOR PROGRAM CARD             WDP10160
02235 -0 53400 1 02336    S3    LXD 3D,1             WRITE OUT COMPONENT ON LIBRARY TAPE        WDP10161
02236  0 76600 0 00227    S16   WTB LIB                                                         WDP10162
02237 -0 53400 2 04575          LXD COMPN,2                                                     WDP10163
02240  0 50000 2 02473          CLA CTAB1-1,2                                                   WDP10164
02241  0 62200 0 04570          STD CW               CW DEC GETS NO. WORDS USED BY COMP         WDP10165
02242  0 50000 2 02517          CLA CTAB2-1,2                                                   WDP10166
02243  0 60100 0 04554          STO CW2                                                         WDP10167
```

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02244 -0 50000 0 04562          CAL LOC                                                    WDP10168
02245  0 62200 0 02270          STD S12                                                    WDP10169
02246  0 76000 0 00006          COM                                                        WDP10170
02247 -0 73400 4 00000          PDX 0,4          AVOID SIZE-OF-MACHINE TROUBLE             WDP10171
02250 -0 75400 4 00000          PXD 0,4          AND CLEAR REST OF AC                      WDP10172
02251  0 36100 0 02334          ACL 1D                                                     WDP10173
02252  0 77100 0 00023          ARS 19                                                     WDP10174
02253  0 62100 0 04570          STA CW           CW ADR GETS NO. WORDS LOADED FOR COMP     WDP10175
02254 -0 50000 0 04554          CAL CW2                                                    WDP10176
02255  0 36100 0 02340          ACL LSTAB                                                  WDP10177
02256  0 62100 0 02263          STA S21                                                    WDP10178
02257 -0 53400 2 04554          LXD CW2,2                                                  WDP10179
02260 -0 75400 0 00000T         PXD 0,0                                                    WDP10180
02261 -0 70000 0 04570          CAD CW                                                     WDP10181
02262 -0 70000 0 04554          CAD CW2                                                    WDP10182
02263 -0 70000 2 00000   S21    CAD (),2                                                   WDP10183
02264  2 00001 2 02263          TIX S21,2,1                                                WDP10184
02265 -0 53400 4 02332          LXD ZERO,4                                                 WDP10185
02266 -0 70000 4 02604   S13    CAD C,4                                                    WDP10186
02267  1 77777 4 02270          TXI S12,4,-1                                               WDP10187
02270  3 00000 4 02266D  S12    TXH S13,4,()                                               WDP10188
02271  0 60200 0 04566          SLW CS                                                     WDP10189
02272  0 70000 0 04566          CPY CS                                                     WDP10190
02273  0 76400 0 00207   P2     BST LIB          BACKSPACE, READ BACK, CHECK CHECKSUM      WDP10191
02274  0 76200 0 00227   P3     RTB LIB                                                    WDP10192
02275 -0 75400 0 00000T         PXD 0,0                                                    WDP10193
02276 -0 70000 0 04567   S14    CAD DUMP                                                   WDP10194
02277  0 02000 0 02276          TRA S14                                                    WDP10195
02300  0 02000 0 02316          TRA ERR          FALSE END OF FILE                         WDP10196
02301  0 60200 0 04574          SLW CSC          END OF RECORD                             WDP10197
02302 -0 50000 0 04567          CAL DUMP                                                   WDP10198
02303  0 36100 0 04567          ACL DUMP                                                   WDP10199
02304  0 60200 0 04567          SLW DUMP                                                   WDP10200
02305  0 50000 0 04567          CLA DUMP                                                   WDP10201
02306  0 40200 0 04574          SUB CSC                                                    WDP10202
02307 -0 10000 0 02316          TNZ ERR                                                    WDP10203
02310 -0 50000 0 04566          CAL CS                                                     WDP10204
02311  0 36100 0 04566          ACL CS                                                     WDP10205
02312  0 60200 0 04566          SLW CS                                                     WDP10206
02313  0 50000 0 04566          CLA CS                                                     WDP10207
02314  0 40200 0 04574          SUB CSC                                                    WDP10208
02315  0 10000 0 02321          TZE S75                                                    WDP10209
02316  0 76400 0 00207   ERR    BST LIB                                                    WDP10210
02317  2 00001 1 02236          TIX S16,1,1                                                WDP10211
02320  0 00000 0 02235          HTR S3           THREE TAPE ERRORS IN A ROW                WDP10212
02321 -0 53400 2 04575   S75    LXD COMPN,2                                                WDP10213
02322 -3 00000 2 02327D          TXL S2,2,0       EXIT AFTER UNIVERSAL COMPONENT            WDP10214
02323  1 00001 2 02324          TXI S76,2,1      STEP COMPONENT NUMBER AND                 WDP10215
02324 -3 00000 2 02115D  S76    TXL S15,2,()     TEST FOR LAST COMPONENT                   WDP10216
02325 -0 53400 2 02332          LXD ZERO,2       GO BACK TO WRITE THE UNIVERSAL COMP       WDP10217
02326  0 02000 0 02115          TRA S15                                                    WDP10218
02327  0 77000 0 00207   S2     WEF LIB                                                    WDP10219
02330  0 77200 0 00207   P4     REW LIB                                                    WDP10220
02331  0 00000 0 00000          HTR              FINAL STOP                                WDP10221
                                    CONSTANTS                                           WDP10222
02332  0 00000 0 00000   ZERO                                                            WDP10223
```

```
02333   0 00000 0 00001    1A          1                              WDP10224
02334   0 00001 0 00000    1D          0,0,1                          WDP10225
02335   0 00002 0 00000    2D          0,0,2                          WDP10226
02336   0 00003 0 00000    3D          0,0,3                          WDP10227
02337  +000000000220       0220A OCT   220                            WDP10228
02340   0 00000 0 02520    LSTAB       STAB                           WDP10229
02341   0 02000 0 00000    TRA   TRA                                  WDP10230
                                       ERASEABLE                      WDP10231
                   02450   TAB   BES   70                             WDP10232
                   02474   CTAB1 BES   20                             WDP10233
                   02520   CTAB2 BES   20                             WDP10234
                   02520   STAB  BSS   50                             WDP10235
                   02602   NSC   BSS   1                              WDP10236
                   02603   NS    BSS   1                              WDP10237
                   02604   C     BSS   1000                           WDP10238
                   04554   CW2   BSS   1                              WDP10239
                   04555   9L    BSS   1                              WDP10240
                   04556   9R    BSS   1                              WDP10241
                   04557   R1    BSS   1                              WDP10242
                   04560   R2    BSS   1                              WDP10243
                   04561   CKS   BSS   1                              WDP10244
                   04562   LOC   BSS   1                              WDP10245
                   04563   N     BSS   1                              WDP10246
                   04564   I     BSS   1                              WDP10247
                   04565   R     BSS   1                              WDP10248
                   04566   CS    BSS   1                              WDP10249
                   04567   DUMP  BSS   1                              WDP10250
                   04570   CW    BSS   1                              WDP10251
                   04571   E     BSS   1                              WDP10252
                   04572   IR    BSS   1                              WDP10253
                   04573   TRACK BSS   1                              WDP10254
                   04574   CSC   BSS   1                              WDP10255
                   04575   COMPN BSS   1                              WDP10256
                   04576   TEST  BSS   1                              WDP10257
                   04577   LF    BSS   1                              WDP10258
                   00000         END                                  WDP10259
```

APPENDIX

OCTAL - CORE STORAGE BCD

For Use With DPP1

Zone / Num.	No Zone		Y		X		0	
No Num.	60	Blank	20	+	40	-		
1	01	1	21	A(+1)	41	J(-1)	61	/
2	02	2	22	B(+2)	42	K(-2)	62	S
3	03	3	23	C(+3)	43	L(-3)	63	T
4	04	4	24	D(+4)	44	M(-4)	64	U
5	05	5	25	E(+5)	45	N(-5)	65	V
6	06	6	26	F(+6)	46	O(-6)	66	W
7	07	7	27	G(+7)	47	P(-7)	67	X
8	10	8	30	H(+8)	50	Q(-8)	70	Y
9	11	9	31	I(+9)	51	R(-9)	71	Z
0	00	0	32	+0	52	-0		
	12	Illegal					72 $\overset{+}{0}$	(Illegal)
8-3	13	=	33	.	53	$	73	,
8-4	14	@(Illegal)	34	)	54	*	74	(
	15	Illegal	35	Illegal	55	Illegal	75	Illegal
	16	Illegal	36	Illegal	56	Illegal	76	Illegal
	17	Illegal	37	Illegal	57	Illegal	77	Illegal

NOTE: The characters $\overset{+}{0}$ (32) and $\overset{-}{0}$ (52) cannot be printed. Moreover, removing the zone bits of $\overset{+}{0}$ or $\overset{-}{0}$ will not yield an unsigned zero.

READ CARD

α	TSX RCD, 4
$\alpha+1$	A, t
$\alpha+2$	Error Return
$\alpha+3$	EOF "
$\alpha+4$	Normal "

PUNCH

α	TSX WPU, 4
$\alpha+1$	A, t, W
$\alpha+2$	Return

PRINT

α	TSX WPR, 4
$\alpha+1$	A, t, W
$\alpha+2$	Return

This page is intended to be a convenient reference chart for the programmer.

READ TAPE DECIMAL

α	TSX RTD, 4
$\alpha+1$	A, t, T
$\alpha+2$	Error Return
$\alpha+3$	EOF "
$\alpha+4$	Normal "

WRITE TAPE DECIMAL

α	TSX WTD, 4
$\alpha+1$	W
$\alpha+2$	A, t, T
$\alpha+3$	Return

READ TAPE BINARY

α	TSX RTB, 4
$\alpha+1$	C, t, T
$\alpha+2$	Error Return
$\alpha+3$	EOF "
$\alpha+4$	Normal "

WRITE TAPE BINARY

α	TSX WTB, 4
$\alpha+1$	C, t, T
$\alpha+2$	Return

MOVE

α	TSX MOV, 4
$\alpha+1$	W
$\alpha+2$	A, t
$\alpha+3$	B, t
$\alpha+4$	Return

EXTRACT & INSERT

α	TSX XIN, 4
$\alpha+1$	N
$\alpha+2$	A, t, R
$\alpha+3$	B, t, S
⋮	⋮
$\alpha+3K$	MZE B, t, S
$\alpha+3K+1$	Return

ALPHANUMERICAL COMPARISON

α	TSX COM, 4
$\alpha+1$	N
$\alpha+2$	A, t, R (I)
$\alpha+3$	B, t, S (II)
$\alpha+4$	Illegal BCD Return
$\alpha+5$	I > II
$\alpha+6$	I = II
$\alpha+7$	I < II

BLANK PACKED BLOCK

α	TSX BPB, 4
$\alpha+1$	A, t, W
$\alpha+2$	Return

BCD TO BINARY

α	TSX DTB, 4
$\alpha+1$	N
$\alpha+2$	A, t, R
$\alpha+3$	Error Return
$\alpha+4$	Normal "

BINARY TO BCD

α	TSX BTD, 4
$\alpha+1$	N
$\alpha+2$	A, t, R
$\alpha+3$	Return

CLEAR & ADD LOGICAL FIELD

α	TSX CAF, 4
$\alpha+1$	N
$\alpha+2$	A, t, R
$\alpha+3$	Return

INSERT LEADING ZEROS

α	TSX ILZ, 4
$\alpha+1$	N
$\alpha+2$	A, t, R
$\alpha+3$	Return

CLA, CLS, ADD, SUB, MPY, DIV

α	TSX "OP", 4
$\alpha+1$	N
$\alpha+2$	A, t, R
$\alpha+3$	Error Return
$\alpha+4$	Normal "

STO, STS

α	TSX "OP", 4
$\alpha+1$	N
$\alpha+2$	A, t, R
$\alpha+3$	Return

ALS, ARS, SRD

α	TSX "OP", 4
$\alpha+1$	N
$\alpha+2$	Return

ZERO ACCUMULATOR

α	TSX ZAC, 4
$\alpha+1$	Return

TZE, TNZ, TPL, TMI, TOV, TNO

α	TSX "OP", 4
$\alpha+1$	MET
$\alpha+2$	NOT MET

MODIFY FIELD

α	TSX MOD, 4
$\alpha+1$	N
$\alpha+2$	A, t, R
$\alpha+3$	M, f, m
$\alpha+4$	B, t, S
$\alpha+5$	Error Return
$\alpha+6$	Normal "

MODIFY PSEUDO ACCUMULATOR

α	TSX MAC, 4
$\alpha+1$	N
$\alpha+2$	M, f, m
$\alpha+3$	B, t, S
$\alpha+4$	Return

CHECK BCD

α	TSX CHK, 4
$\alpha+1$	N
$\alpha+2$	A, t, R
$\alpha+3$	Illegal Return
$\alpha+4$	Legal "

CALL IN DPP1

α	TSX DPPL, 4
$\alpha+1$	Error Return
$\alpha+2$	n_1, 0, n_2
$\alpha+3$	n_3, 0, ---
⋮	⋮
$\alpha+K$	n_z
$\alpha+K+1$	Normal Return

SUMMARY OF CALLING SEQUENCES

IBM®
International Business Machines Corporation
590 Madison Avenue
New York 22, New York

32-0305 PRINTED IN U. S. A.