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PROGRAM DESCRIPTION

Page 1 of 8

Catalog No. 000011

- IDENTIFICATION: Basic Utility Package IV
- AUTHOR: A. W. England, SDS
- ACCEPTED: 23 November 1962
- COMPUTER CONFIGURATION: All 920 Systems and any 910 with typewriter.
- PURPOSE: To provide a simple utility system for the SDS 910 and 920 when a more elaborate system is not required or when memory space is limited.
- PROGRAMMED OPERATORS: None
- STORAGE: The program occupies 288 words.
- TIMING: All operations proceed at the rate of the I/O device being used. This is 15 character/sec on the typewriter, 300 characters/sec from paper tape in the photoreader and 60 characters/sec on paper tape from the punch.
- USE:
1. LOADING THE PROGRAM

The system tape is in a relocatable format with a relocating bootstrap at the beginning. To load this tape, insert it in the photoreader and enter the desired starting location in the A register. Then follow the normal fill procedure. The relocating bootstrap loads into the first 32 words of memory and then loads the system program starting at the address given in the A register. When the tape is loaded, control is transferred to the program and it will address the keyboard for operational control.
 2. OPERATION CONTROL CODES

All characters read by the system from the keyboard or paper tape are handled in the same manner. Digits are accumulated until a control code is read and then operated upon. There follows a description of the operations caused by the various control codes.

 - 2.1 Set Location * (asterisk), L (letter L)

The character * will be the standard set location symbol for the HELP system but the L character is allowed for compatibility with earlier systems. This character causes the previously entered five octal digits (14 bits) to be placed in

USE: (Cont.)

the location counter. The contents of the accumulate and hold words are set to zero and all flags are reset. This operation is used to set the location for loading, outputting or branching. The location setting is in the X register when the program is waiting for an input. It may be inspected by moving the compute switch to IDLE, typing a character (CR for instance) and looking in X. Move the switch to RUN before typing any further characters.

2.2 Enter Information . (period),) (right parenthesis), ▢ (lozenge)

On reading the enter symbol the program will form the word defined by the previously read characters and store it in memory in the location specified by the contents of the location counter. It then increments the location counter by 1 and clears the input accumulating words. A further description of the word formation will be found under the sections on indirect and relative addressing. The symbol right parentheses,), or lozenge, ▢, is the standard symbol for enter. Only one of these will be present on any given input preparation device and the code is the same.

2.3 Set Location to Register A, ' (apostrophe), @ (at)

The address of the temporary storage location for A is loaded into the location counter. This operation is the same as set location except that the location set is always the address of the A temporary storage word. When this code has been entered the operator can load information into the temporary A, B, and X locations in that order, by simply inputting words in the normal manner followed by the enter symbol. When either branch operation is performed to leave the system the contents of these three words are loaded into their respective registers before the branch is executed.

2.4 Step Location \$ (dollar sign)

The \$ causes the location counter to be incremented by one without storing anything in memory. It also clears and resets like the carriage return.

2.5 Start Compute at Location, J (letter J), # (hash mark), or = (equal sign)

The registers are loaded with the contents of the temporary A, B and X locations and the program executes a BRU to the location specified by the location counter. The # or = is the HELP symbol for start compute.

USE: (Cont.) 2.6 Enter Subroutine at Location, , (comma)

The contents of the temporary A, B, and X are loaded into the respective registers and a BRM is executed to the location specified by the contents of the location counter. This operation is used for entering subroutines and routines which end with a BRR. If control returns with a BRR to the system the instruction following the BRM will transfer control back to the keyboard input section.

2.7 Fill from Reader, F (letter F), : (colon)

This will cause the photoreader to be started and information will be loaded from paper tape. The format is as described for typewriter. The : (colon) is the HELP code for fill, the letter F is allowed for compatibility with earlier systems.

2.7.1 Verifying Mode, V (letter V)

This will cause the photoreader to be started and information read from paper tape as in the fill mode. However, the information from tape is not loaded but is compared with the contents of the specified memory locations. If it agrees, operation continues as usual. If it does not agree, the input stops. The A register contains the word as it was on tape, the B register contains the contents of the corresponding memory location and X contains the address of the memory location. When the halt is cleared the system will continue in the verify mode if BP 2 is set. If it is reset, control will be returned to the keyboard.

2.8 Return to Keyboard, / (slash mark)

The slash is used to indicate the end of information on paper tape and will cause an unconditional return to keyboard control. The reader is stopped.

2.9 Stop Code, # (group mark)

The Flexowriter stop code or the character # which have the same code, can be used to stop input and return control to the keyboard if BP 4 is set. If it is reset this code is ignored.

2.10 Indirect Addressing, I (letter I)

After the tag digit and the two octal digit instruction code has been read, an I may be used to set the indirect address bit in an instruction word. When this character is read the previous 9 bits are moved to the left of the word and bit 9 is set to a one. This word is placed in Hold and the accumulating word set to zero. Additional octal digits are stored in the accumulating word and when the enter symbol is read they are merged with the Hold word and the result stored in memory at the location specified. The indirect address bit will also be set if a five digit absolute address greater than 40000 octal is read.

USE: (Cont.) 2.11 Relative Addressing, + (plus) or & (ampersand)
and - (minus)

If after the tag digit, the two instruction code digits, and possibly the I code are read, a sign symbol is read, the previous digits and tags will be moved to the left and placed in Hold. The relative address tag, bit 0, will be set to one and the relative flag will be set. The accumulating word will be set to zero and each successive digit will be stored in this word until the enter symbol is encountered. The accumulated number is then added to the contents of the location counter if the sign was positive, + or &, or subtracted from the contents of the location counter if the sign was negative. This resultant address is merged with the contents of the Hold word and stored in memory at the address specified by the location counter. When giving a relative address it is not necessary to use leading zeros. The signed address field causes the resultant instruction word to be made negative regardless of whether or not the tag digit was 4 or greater. However, a tag digit of 4 or greater will not cause relative addressing on input but can be used to indicate that a word should be relativized on output.

2.12 Clear and Reset, Carriage Return, CR

The carriage return causes the accumulating and holding registers to be set to zero and all flags to be reset. The location counter is not affected.

2.13 Ignored Codes TB, SP, DL, BS

The codes for tabulate, space, backspace, and code delete are unconditionally ignored whenever read.

2.14 Output Operations

2.14.1 Output on the typewriter or punch is allowed in this utility system. In the HELP system output will be a separate module from the input routine. The output of this routine is in the same general format as that of the HELP system. Output is started by setting the location of the first word to be output using the set location operation. If output is to be stopped automatically, the ending address is then entered followed by a T for typewriter output or P for punch. The routine will then output from the first address through the ending address or until BP 1 is set. If no ending address is given, zero will be used and output will normally be terminated on BP 1 set.

USE: (Cont.) 2.14.2 The format is the same for either typewriter or punch and it can be set for either octal mode or instruction mode. The output begins with a carriage return followed by the five digit starting address and an *. Each word is output preceded by a tab and followed by a Π or) and a carriage return. Whenever a location ending with an octal zero is encountered it is output before the tab. When output is terminated, a / will be output after the last carriage return.

2.14.2.1 BP 2 reset indicates octal mode. In this mode each word is output as eight octal digits.

2.14.2.2 BP 2 set indicates instruction mode. In this mode each word is output in the following manner:

T CDI±AAAAA

Where T indicates the three tag bits, relative, index and program operator, as one octal digit. This is followed by a space and then two octal digits for the instruction code, CD. If the addressing is indirect an I will be output after CD or a space if addressing is direct. If the address is relative, tag digit equal to 4 or greater, and BP 4 is set, the contents of the location counter are subtracted from the address portion of the instruction and the result is output as a sign and five digits of absolute value. If the addressing is non relative, tag digit less than 4, or if BP 4 is reset the sign position will be spaced over and the address output as five octal digits.

3. EXAMPLES

3.1 To load the octal number, 01234567 in location 347:

00347*01234567. CR

3.2 To load an instruction to add a word whose address is in a word 4 previous to the instruction itself which is at 7046:

07046*55I-4)CR

In memory this would appear as 45547042. If an instruction mode typeout were called for it would appear as:

07046* 4 55I-00004)CR

when BP 4 is set and as:

07046* 4 55I 07042)CR

when BP 4 is reset.

USE: (Cont.) 3.3 To initiate the punchout of words 542 through 556:

00542*00556P

4. RECOVERY OF PROGRAM CONTROL

If control is taken from the system and the operator wishes to return to the system using console operation there are two methods:

- 4.1 If location 0001 has not been destroyed by some other program operation then control can always be recovered by the following procedure:
- a. Move COMPUTE switch to IDLE.
 - b. Press START button.
 - c. STEP COMPUTE switch.
 - d. Move COMPUTE switch to RUN.
- 4.2 If location 0001 has been destroyed control can be recovered by inserting in the C register and executing a BRU to the address originally entered into A when the system was loaded. After this location 0001 will be restored and control will go to the system which will then address the keyboard.

5. SUMMARY OF OPERATIONS

OPERATION	CODE
Set location	* L
Enter word and advance location counter	□) .
Set location to register A	' @
Step location	\$
Start compute at location	J # =
Enter subroutine at location	,
Fill from photoreader	F :
Verify from photoreader	V
Stop fill or verify and return to keyboard	/
" " " " " " " " BP 4 SET # (SC)	

USE: (Cont.)	OPERATION	CODE
	Set tag field for program operator	First Digit 1
	Set tag field for index	First Digit 2
	Set tag field for program operator and index	First Digit 3
	Set tag field for relative addressing	First Digit 4
	Set tag field for program operator and relative addressing	First Digit 5
	Set tag field for index and relative addressing	First Digit 6
	Set tag field for program operator, index, and relative addressing	First Digit 7
	Set indirect address tag	I
	Set relative forward	+&
	Set relative backward	-
	Start typeout octal format BP 2 RESET	T
	Start Typeout absolute instruction format, BP 2 SET, BP 4 RESET	T
	Start Typeout relative instruction format, BP 2 SET, BP 4 SET	T
	Start punch octal format, BP 2 RESET	P
	Start punch absolute instruction format, BP 2 SET, BP 4 RESET	P
	Start punch relative instruction format, BP 2 SET, BP 4 SET	P
	Clear and reset	CR
	Ignore	TB
	Ignore	SP
	Ignore	BS
	Ignore	DL

METHOD:

Each digit or character is read into memory. A table search is then performed to determine if this code is a special or control code. If it is, then a transfer of control is made to the beginning of the appropriate control routine. If it is not found in the table it is assumed to be an octal digit and the least significant three bits are shifted into the right end of an accumulating word. Whenever a control code is encountered which uses previous data it picks this up from the accumulated word.

In the process of inputting an instruction the tag and instruction code are accumulated as three octal digits and then if an I is input it causes the contents of the accumulated word to be transferred to the hold word and shifted to the left end of the word. Bit 9 of this hold word is then set to a one and a hold flag is set. A plus or minus sign will cause a similar operation. If the hold flag is reset when the sign is encountered the accumulated word is shifted and transferred to hold and a relative flag as well as the hold flag, is set. If the hold flag was set when the sign was encountered only the relative flag is set. In either case bit 0 of the hold word is then set to one.

Additional digits are now accumulated until the enter symbol is encountered. If the hold flag were reset the contents of the accumulated word would be stored at the address specified by the location counter. However, if the hold flag is set and the relative flag reset the lower 14 bits of the accumulated word are merged with the contents of hold and then stored. When the hold is set and the relative flag is set the contents of the accumulated word are added or subtracted, depending on the sign that set the relative flag, to the location counter and the result merged with the contents of hold. After this the word is stored, all flags are reset, hold and accumulate are cleared, and the location counter is incremented by one.

In the case of the output operations the starting address is in the location counter and the ending address in the accumulated word. Since the set location operation clears the accumulated word the ending address will be zero if no other address is input. The output proceeds to increment the location counter after each word is output and compares it to the accumulated word. When they agree it terminates output and returns control to the input section.

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 1 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02130	0 EOM 00000	START CLW
02131	0 EOM 20004	DIR
02132	0 CLR 30003	
02133	4 STA 02326	CLEAR ACCUM
02134	4 STA 02327	CLEAR HOLD
02135	4 STA 02550	RESET FLAG 1
02136	4 LDA 02560	R1; SET SW1 FOR KEYBOARD EOM
02137	4 STA 02152	*
02140	4 LDA 02563	R4; SET SW2 FOR KEYBOARD WIM
02141	4 STA 02154	*
02142	4 LDA 02165	R9; SET SW3 TO NOP
02143	4 STA 02156	*
02144	4 LDA 02266	SET UP RESTART
02145	0 STA 00001	*
02146	4 LDA 02323	R10; RESET SW5 FOR LOAD
02147	4 STA 02224	*
02150	0 SKS 21000	READY SKBRW; WAIT FOR READY
02151	4 BRU 02150	*
02152	0 EOM 01001	SW1 ADDRESS INPUT DEVICE
02153	4 LDX 02325	LOC; FOR DISPLAY

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

PROGRAMMER: A. W. ENGLAND, SDS

Catalog No. 000011

PAGE 2 of 15

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02154	4 WIM 02554	SW2 T1; INPUT
02155	4 LDB 02554	T1
02156	0 NOP 00000	SW3 NOT USED
02157	0 RCY 20011	SET UP TO SCAN LIST
02160	4 LDB 02530	*
02161	4 LDX 02537	*
02162	6 SKM 02527	SCAN CONTROL LIST
02163	4 BRX 02162	*
02164	6 BRUI 02527	GO TO CONTROL SECTION
02165	0 NOP 00000	R9
02166	0 LDA 00025	IDA SC3; INDIRECT ADDRESS
02167	4 BRU 02205	SIGN +3
02170	0 LSH 00006	DIGIT SHIFT OCTAL DIGIT INTO ACCUM
02171	4 LDB 02326	ACCUM; *
02172	0 LCY 20003	*
02173	4 STB 02326	ACCUM; *
02174	4 BRU 02152	SW1+1
02175	4 LDA 02326	LOCSET ACCUM; LOCATION SET
02176	0 ETR 00027	SAVE ADDRESS PART
02177	4 STA 02325	LOC

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 3 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02200	0 CLR 30003	
02201	4 BRU 02173	DIGIT+3
02202	4 SKA 02550	SIGN FLAG1; HAS I CODE BEEN READ?
02203	4 BRU 02321	FMP; YES
02204	0 ABC 20005	; NO, CLB
02205	4 STB 02550	FLAG
02206	4 LDB 02326	ACCUM; MOVE [ACCUM] TO HOLD
02207	0 LCY 20017	15; *
02210	4 STB 02327	HOLD; *
02211	4 BRU 02200	LOCSET+3
02212	4 LDA 02531	ENTER C2
02213	4 SKA 02550	FLAG1; I CODE ONLY?
02214	4 BRU 02236	FORM; YES
02215	0 LSH 00001	; NO
02216	4 SKA 02550	FLAG1; + CODE?
02217	4 BRU 02234	ADD; YES
02220	0 LSH 00001	; NO
02221	4 SKA 02550	FLAG1; - CODE?
02222	4 BRU 02232	SUB; YES
02223	4 LDA 02326	ACCUM; NO

**SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING**

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 4 **of** 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02224	4 STAI 02325	SW5 LOC; LOAD/VERIFY SWITCH
02225	4 MIN 02325	LOC
02226	0 CLR 30003	RESET
02227	4 STA 02550	FLAG1
02230	4 STA 02327	HOLD
02231	4 BRU 02201	LOCSET+4
02232	4 SUB 02326	SUB ACCUM; -LOC
02233	0 LSH 00001	MUL BY 2; -2LOC
02234	4 ADD 02325	ADD LOC; +LOC
02235	0 MRG 00025	SC3; SET RELOCATABLE TAG
02236	4 ADD 02326	FORM ACCUM
02237	4 MRG 02535	C6; SAVE ADDRESS AND TAG
02240	4 EOR 02535	C6; *
02241	4 MRG 02327	HOLD
02242	4 BRU 02224	SW5
02243	0 EOM 00000	FILL CLW; FILL FROM TAPE OPERATION
02244	4 LDX 02323	R10; FOR LOAD
02245	4 LDB 02561	R2; FOR READER WIM
02246	4 LDA 02522	R12; FOR READER EOM
02247	4 STX 02224	SW5;

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 5 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02250	4 STA 02152	SW1
02251	4 STB 02154	SW2
02252	4 BRU 02150	READY
02253	0 EOM 00000	VERSET CLW; VERIFY FROM TAPE OPERATION
02254	4 LDX 02324	R11; FOR VERIFY
02255	4 BRU 02245	FILL +2
02256	4 BRU 02150	} UNUSED
02257	0 EOM 00000	
02260	4 LDA 02522	
02261	0 SKS 20400	
02262	4 LDA 02564	
02263	4 LDB 02561	
02264	4 BRU 02250	
02265	0 SKS 20040	STOP BP4
02266	4 BRU 02130	START; BP4 SET STOP INPUT
02267	4 BRU 02152	SW1; CONTINUE INPUT
02270	4 LDA 02275	AT ADDRA; SET LOCATION TO A
02271	4 BRU 02176	LOCSET+1
02272	0 LSH 00006	SUBR MAKE B NEGATIVE
02273	0 EOM 00000	JUMP CLW

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 6 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02274	4 STB 02555	T2
02275	4 LDA 02551	ADDRA A
02276	4 LDB 02552	A+1
02277	4 LDX 02553	A+2
02300	4 SKN 02555	T2
02301	4 BRU 02325	LOC; START COMPUTE
02302	4 BRM 02325	LOC; START SUBROUTINE
02303	4 BRU 02130	START; SUBROUTINE RETURN
02304	0 LDB 00026	VERIFY SC4; ALL IS
02305	4 SKMI 02325	LOC;
02306	4 BRU 02310	+2; NON COMPARE
02307	4 BRU 02225	SW5+1; COMPARE
02310	0 EOM 00000	CLW
02311	4 LDBI 02325	LOC; BRING WORD FROM MEMORY
02312	4 LDX 02325	LOC
02313	0 HLT 02000	K1 VERIFY HLT
02314	0 SKS 20200	BP2
02315	4 BRU 02317	+2; SET, CONTINUE TO VERIFY
02316	4 BRU 02130	START; RESET, RETURN TO KEYBOARD
02317	4 MIN 02325	LOC

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 7 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02320	4 BRU 02150	READY
02321	4 STA 02550	FPM FLAG1
02322	4 BRU 02200	SETLOC+3
02323	4 STAI 02325	R10 LOC
02324	4 BRU 02304	R11 VERIFY
02325	0 HLT 00100	LOC
02326	0 HLT 00000	ACCUM
02327	0 HLT 00000	HOLD
02330	4 LDA 02567	TYPE R8; START OF TYPE ROUTINE
02331	0 EOM 03041	TYPE
02332	4 BRU 02335	PUNCH+2
02333	4 LDA 02566	PUNCH R7; START OF PUNCH ROUTINE
02334	0 EOM 01044	PUNCH
02335	4 STA 02406	SW4; SET UP OUTPUT INSTRUCTION
02336	4 LDB 02540	CRCHAR
02337	4 BRM 02404	SW4-2; OUTPUT CR
02340	4 LDB 02325	LOC; SET UP FOR OUTPUT OF LOCATION
02341	4 LDA 02536	FIVE; *
02342	0 LSH 00011	9; *
02343	4 BRM 02410	OUT; TO OUTPUT LOCATION

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 8 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02344	4 LDB 02472	*CHAR; OUTPUT SETLOC CHARACTER
02345	4 BRM 02404	SW4-2; *
02346	4 LDB 02542	NEXTWD TBCHAR; OUTPUT TAB CHARACTER
02347	4 BRM 02404	SW4-2; *
02350	4 LDB 02466	EIGHT; FOR OCTAL FORMAT
02351	0 SKS 20200	BP2; TEST FOR FORMAT DESIRED
02352	4 LDB 02467	INST; FORM INSTRUCTION FORMAT
02353	0 RCY 20027	23; PUT MASK IN A
02354	4 LDBI 02325	LOC; BRING WORD AT LOCATION TO B
02355	4 BRM 02410	OUT
02356	4 LDB 02543	HCCHAR; OUTPUT TERMINATION CHARACTER
02357	4 BRM 02404	SW4-2; *
02360	4 LDB 02540	CRCHAR; OUTPUT CR
02361	4 BRM 02404	SW4-2; *
02362	0 LDB 00027	SC5
02363	4 LDA 02325	LOC
02364	4 SKM 02326	ACCUM; CHECK FOR END
02365	0 SKS 20400	BP1; NOT END
02366	4 BRU 02376	DONE; END OR BP1 SET
02367	0 ADD 00024	SC2; INCREMENTS LOC

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 9 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02370	4 STA 02325	LOC
02371	4 SKA 02532	C3; IS LOC AN EVEN EIGHTH
02372	4 BRU 02346	NEXTWD; NO
02373	4 LDB 02536	FIVE; YES
02374	0 RCY 20017	15; SET UP TO OUTPUT LOC
02375	4 BRU 02343	P+8
02376	4 LDB 02541	DONE /CHAR
02377	4 BRM 02404	SW4-2
02400	0 EOM 14000	TOPW; TERMINATE OUTPUT
02401	0 SKS 21000	BRW; BUFFER READY
02402	4 BRU 02401	-1; NO
02403	4 BRU 02200	SETLOC+3; YES
02404	4 HLT 02377	SW4-2
02405	4 STB 02554	T1; STORE OUTPUT CHARACTER
02406	4 MIW 02554	SW4 T1; OUTPUT THE CHARACTER
02407	4 BRR 02404	-3
02410	4 HLT 02355	OUT ; OUTPUT WORD SUBROUTINE
02411	4 STB 02555	T2; SAVE WORD
02412	4 STA 02556	T3; SAVE KEY
02413	4 LDA 02556	CONT T3

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 10 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02414	Ø SKA 00026	SC4; IS KEY ZERO
02415	4 BRU 02417	+2; NO
02416	4 BRR 02410	OUT; YES, FINISHED
02417	Ø ABC 20005	
02420	Ø LSH 00002	; SHIFT KEY DIGIT
02421	4 STB 02556	T3; SAVE KEY
02422	4 SKA 02533	C4; IS DIGIT 2 OR 3
02423	4 BRU 02431	DGTOUT; YES
02424	Ø SKA 00024	SC2; NO, IS DIGIT 1
02425	4 BRU 02441	1/R; YES
02426	4 LDB 02547	SPACE SPCHAR; NO, OUTPUT SPACE
02427	4 BRM 02404	SW4-2
02430	4 BRU 02413	CONT
02431	4 STA 02557	DGTOUT T4; KEY DIGIT TO X
02432	4 LDX 02557	T4; *
02433	4 LDA 02555	T2; WORD TO A
02434	Ø ABC 20005	
02435	2 LSH 00000	Ø; SHIFT 2 OR 3
02436	4 STB 02555	T2; SAVE WORD
02437	Ø RSH 00006	6; MAKE OCTAL CODE

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 11 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02440	4 BRU 02427	SPACE+1; OUTPUT THE DIGIT
02441	4 LDB 02544	I/R ICHAR
02442	4 SKN 02555	T2; IS WORD INDIRECT
02443	4 LDB 02547	SPCHAR; NO
02444	4 BRM 02404	SW4-2; OUTPUT SPACE OR I
02445	4 LDA 02555	T2; SHIFT OFF INDIRECT BIT
2446	0 LSH 00001	1; *
02447	4 STA 02555	T2; *
02450	0 SKS 20040	BP4; RELATIVE ADDRESS FORMAT
02451	4 SKNI 02325	LOC; YES, IS WORD RELATIVE?
02452	4 BRU 02426	SPACE; NON RELATIVE, NO RELATIVE TAG
02453	0 RSH 00012	10; YES
02454	4 SUB 02325	LOC
02455	0 LSH 00012	10;
02456	4 LDB 02545	+CHAR
02457	4 STA 02555	T2; SAVE RELATIVE INCREMENT
02460	4 SKN 02555	T2; IS INCREMENT NEGATIVE?
02461	4 BRU 02427	SPACE+1; NO
02462	0 EOR 00026	SC4; YES, COMPLIMENT INCREMENT
02463	4 ADD 02313	K1; *

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 12 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02464	4 LDB 02546	-CHAR
02465	4 BRU 02457	-6
02466	37777600	EIGHT
02467	31733770	INST
02470	43302212	PERIOD ENTER; LIST OF CONTROL CHARACTERS
02471	43402212	▣ ENTER;
02472	54302175	L SETLOC; ALSO *CHAR
02473	45402175	* SETLOC
02474	41402270	@ AT
02475	41302273	# JUMP
02476	44102273	J JUMP
02477	45302225	\$ SW5+1
02500	47302272	COMMA SUBR
02501	42602243	F FILL
02502	47102257	: FILL
02503	46302330	T TYPE
02504	44702333	P PUNCH
02505	43702265	SC STOP
02506	46102130	/ START
02507	42002202	+ SIGN

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 13 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02510	44002202	- SIGN
02511	43102166	I IDA
02512	45202226	CR RESET
02513	46402153	U SW1+1; UNUSED
02514	40202170	2 DIGIT; TO AVOID CONFUSING 2 WITH R12
02515	46502253	V VERSET
02516	40002170	0 DIGIT; FOR EXPANSION
02517	40002170	0 DIGIT; *
02520	40002170	0 DIGIT; *
02521	40002170	0 DIGIT; *
02522	00201004	R12 EOM RPTW,1,1
02523	43202153	BS SW1+1; IGNORE
02524	47202153	TB SW1+1; *
02525	41202153	SP SW1+1; *
02526	47702153	DL SW1+1; *
02527	40002170	LSTEND DIGIT
02530	07700000	C1
02531	01000000	C2
02532	00000007	C3
02533	00000002	C4

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 14 of 15

PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23-62

LOCATION	INSTRUCTION	REMARKS
02534	0000077	C5
02535	37740000	C6
02536	00077740	FIVE
02537	07777741	NEGATIVE NUMBER OF ITEMS IN LIST
02540	52000000	CRCHAR
02541	61000000	/CHAR
02542	72000000	TCCHAR
02543	34000000	□CHAR
02544	31000000	ICCHAR
02545	20000000	+CHAR
02546	40000000	-CHAR
02547	12000000	SPCHAR
02550	00000000	FLAG1
02551	41241000	A
02552	41502243	B
02553	12345670	X
02554	33010013	T1
02555	07700000	T2
02556	00000000	T3
02557	00000013	T4

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: BASIC UTILITY PACKAGE IV

Catalog No. 000011

PAGE 15 of 15

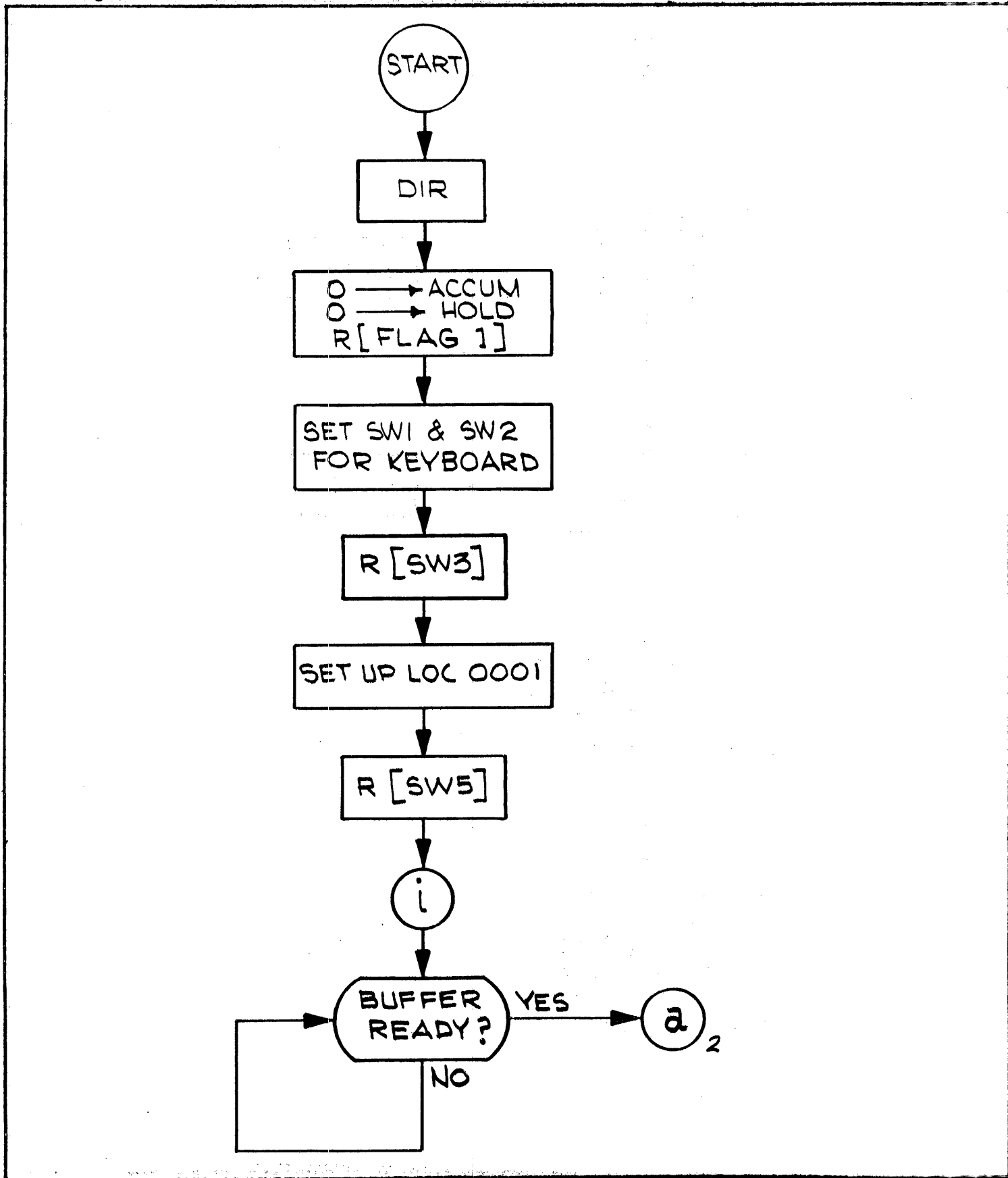
PROGRAMMER: A. W. ENGLAND, SDS

DATE 11-23#62

LOCATION	INSTRUCTION	REMARKS
02560	00201001	R1 EOM RKBW,1,1
02561	43202554	R2 WIM T1
02562	00201041	R3 EOM TYPW,1,1
02563	43202554	R4 WIM T1
02564	00200006	R5 UNUSED
02565	44302000	R6 UNUSED
02566	41202554	R7 MIW T1
02567	41202554	R8 MIW T1

Flow Diagram

BASIC UTILITY PACKAGE IV

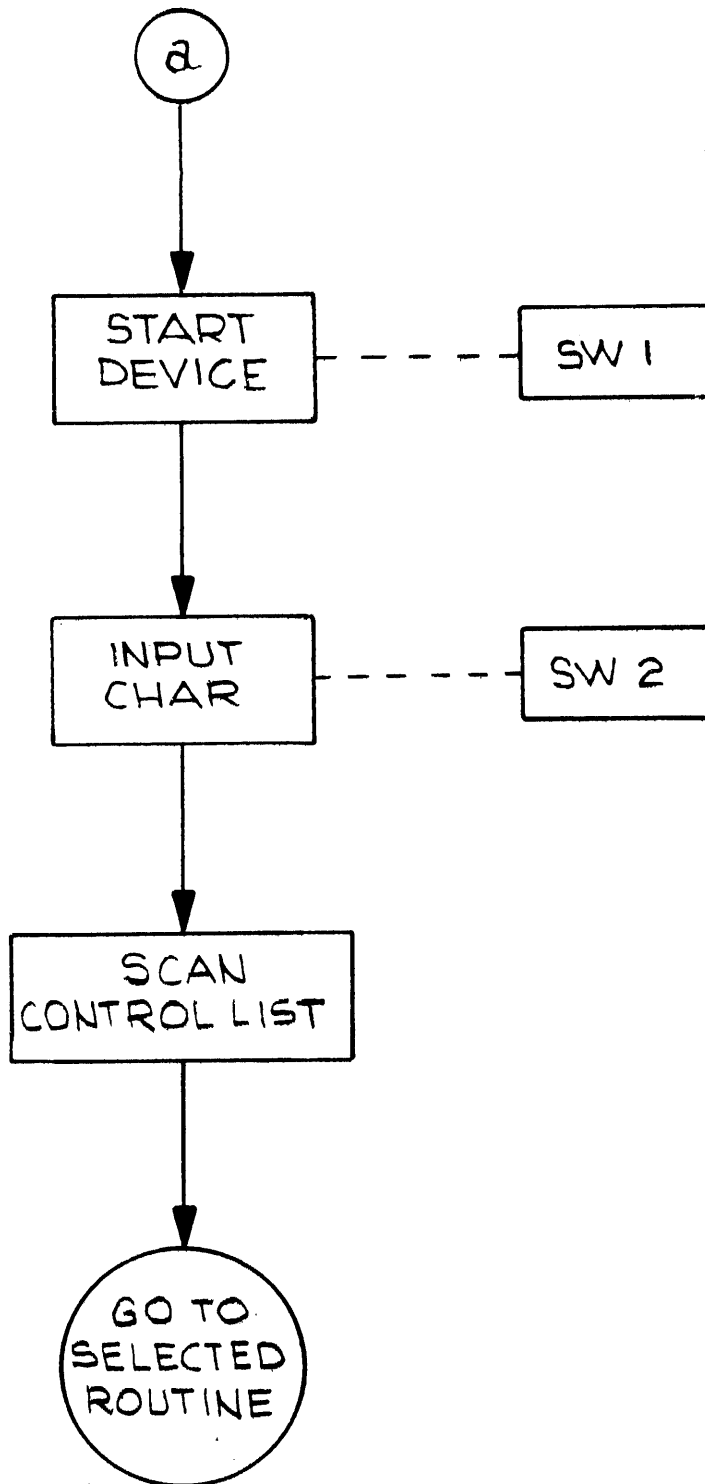


Flow Diagram

BASIC UTILITY PACKAGE IV

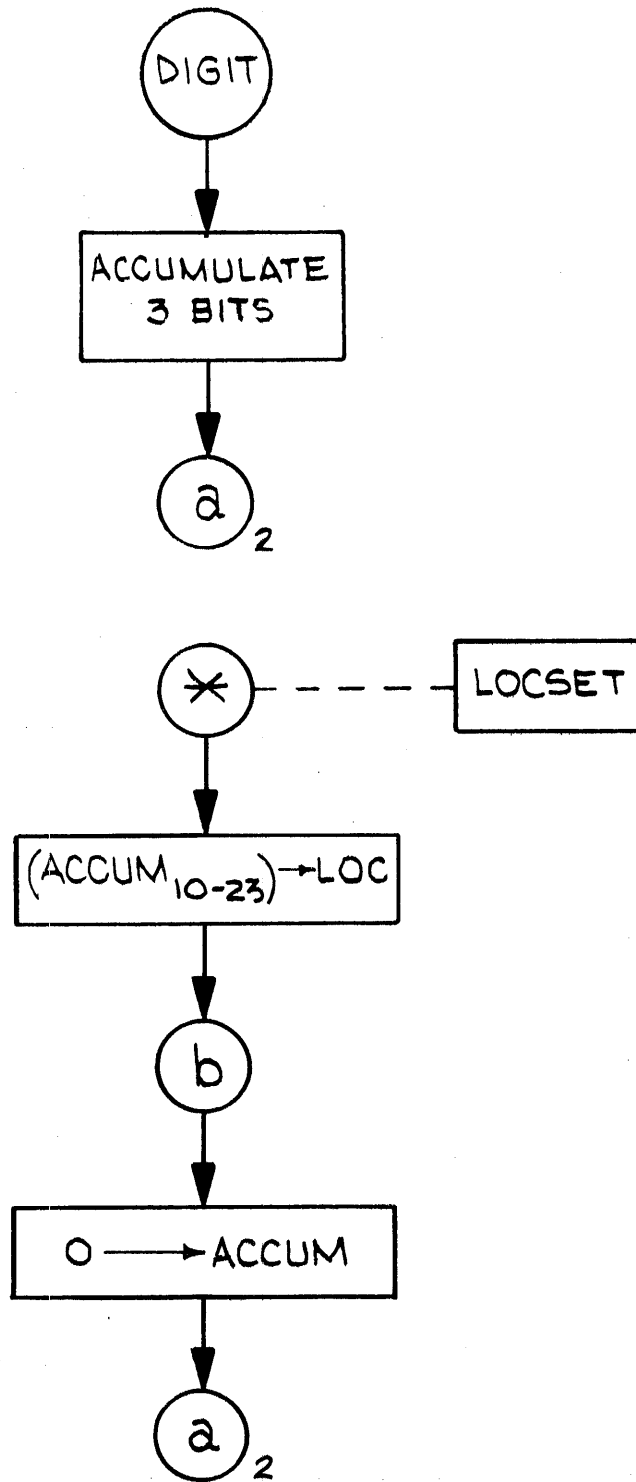
Catalog No. 000011

Page 2 of 13



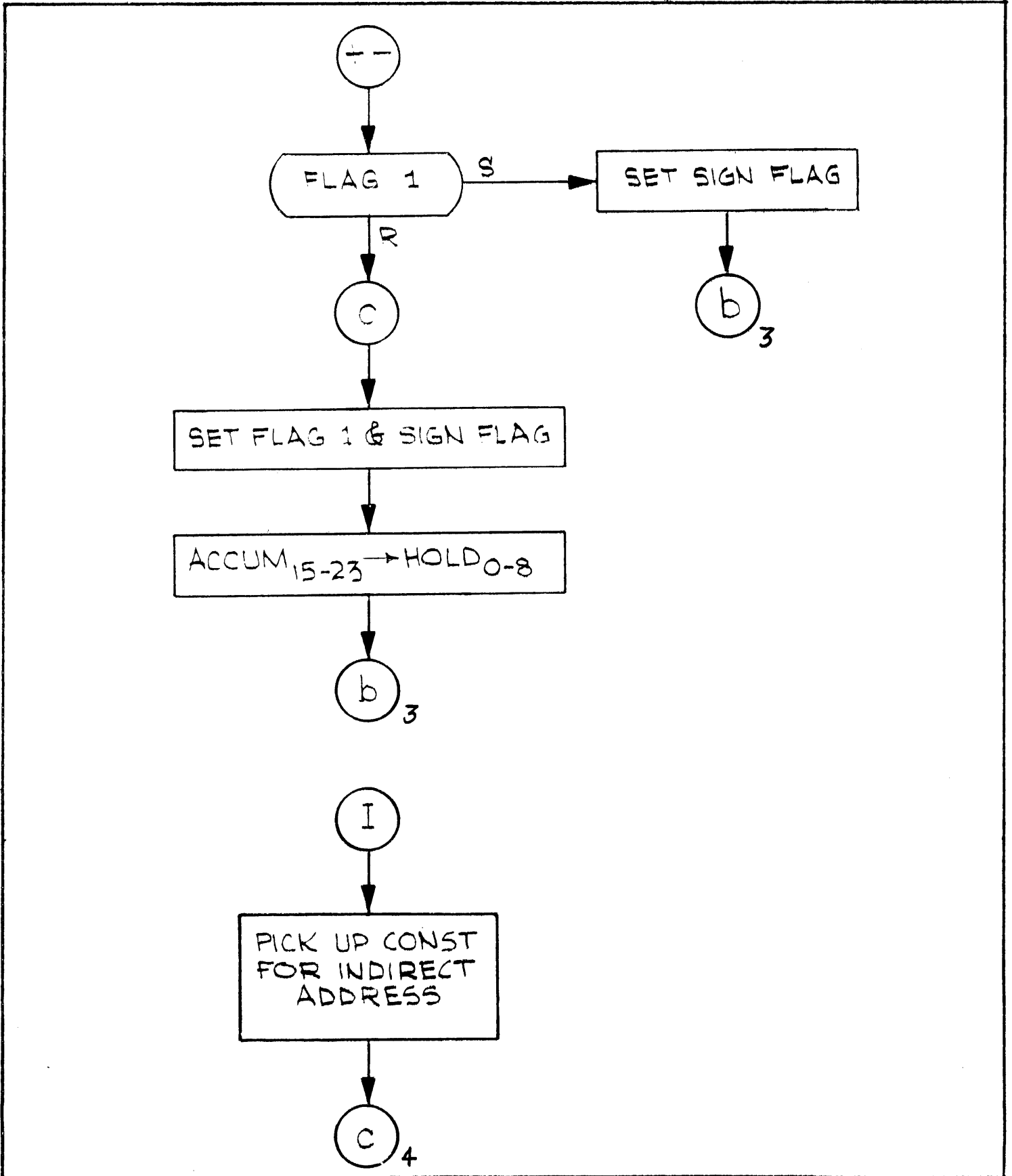
Flow Diagram

BASIC UTILITY PACKAGE IV



Flow Diagram

BASIC UTILITY PACKAGE IV

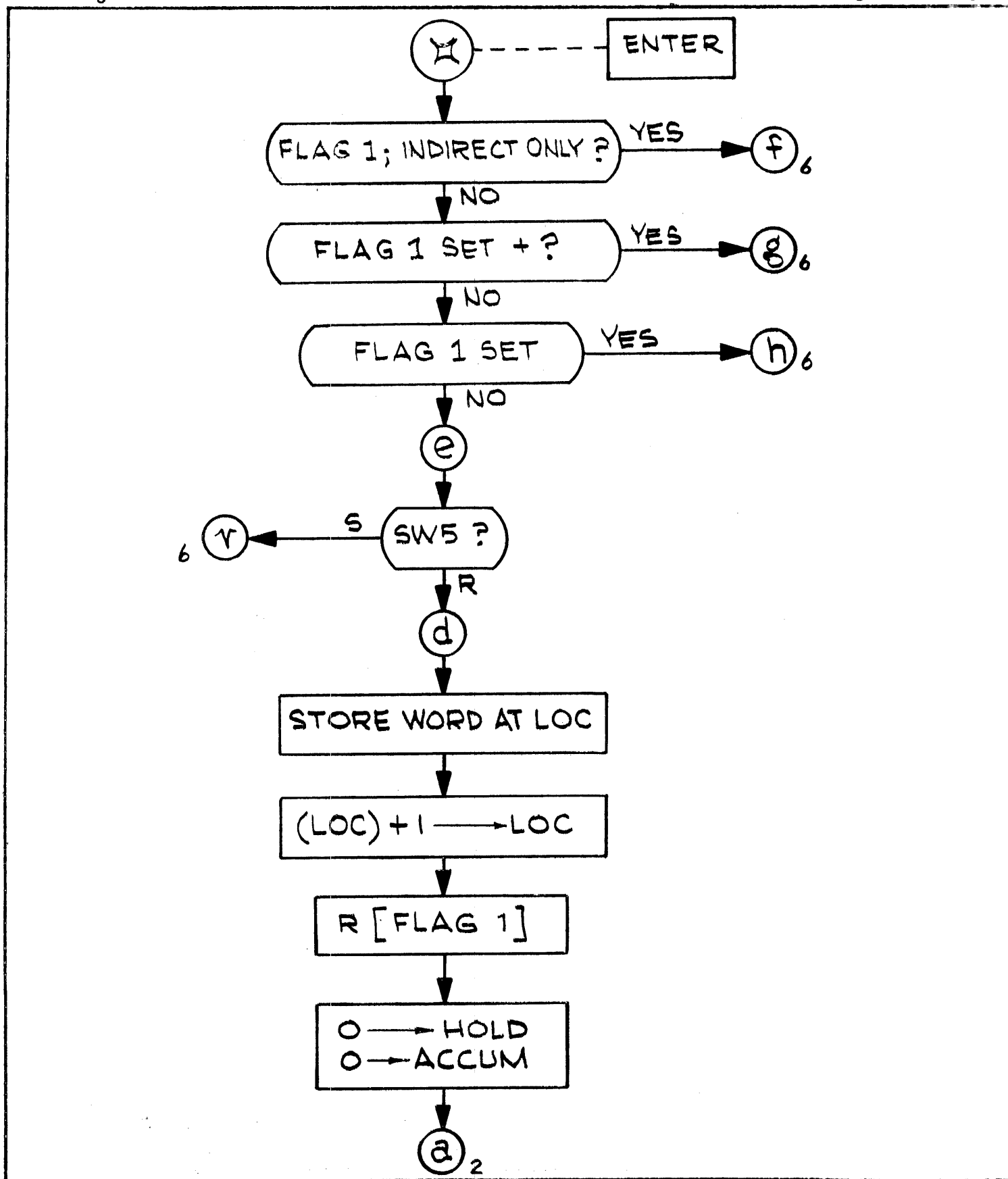


Flow Diagram

BASIC UTILITY PACKAGE IV

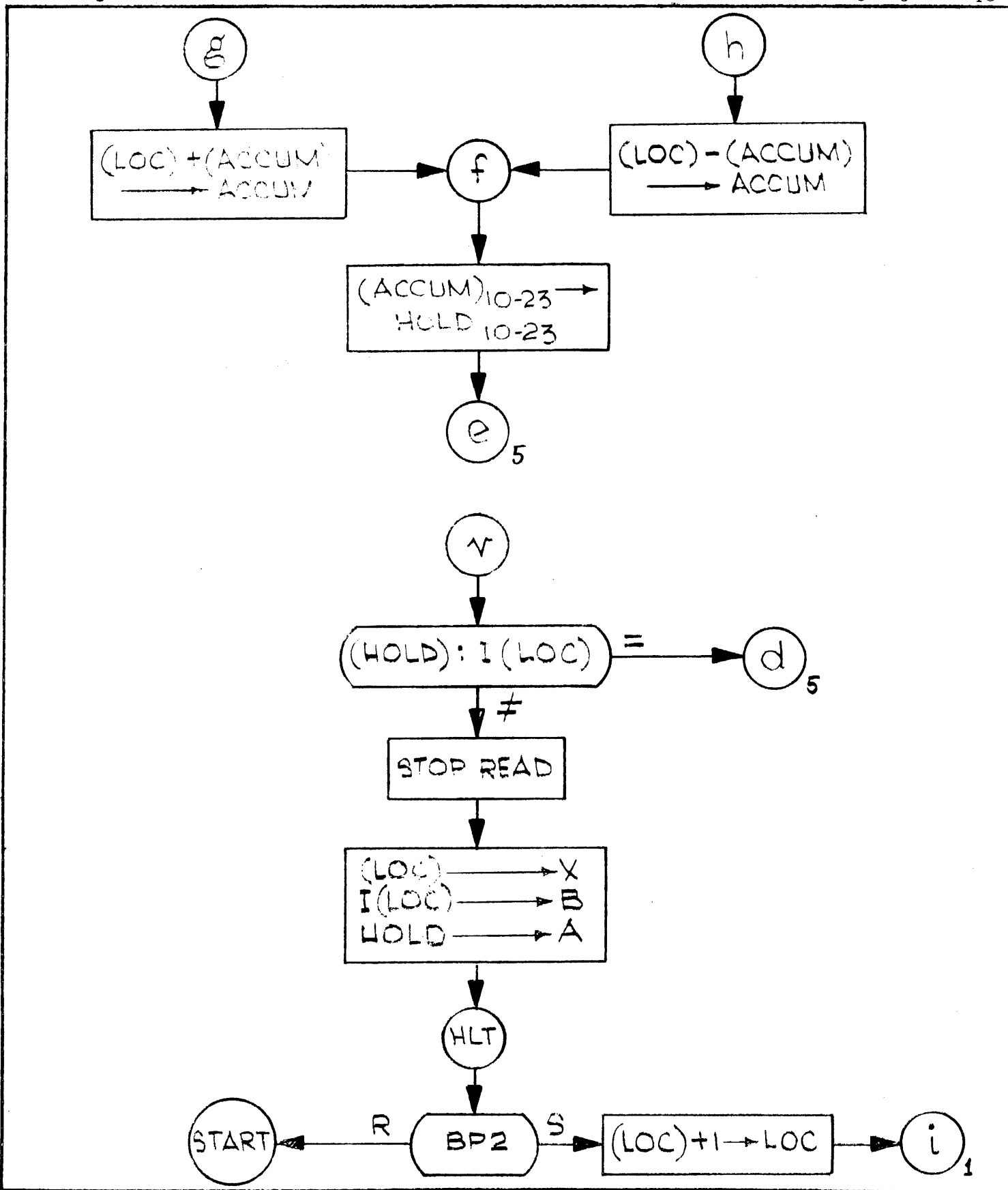
Catalog No. 000011

Page 5 of 13



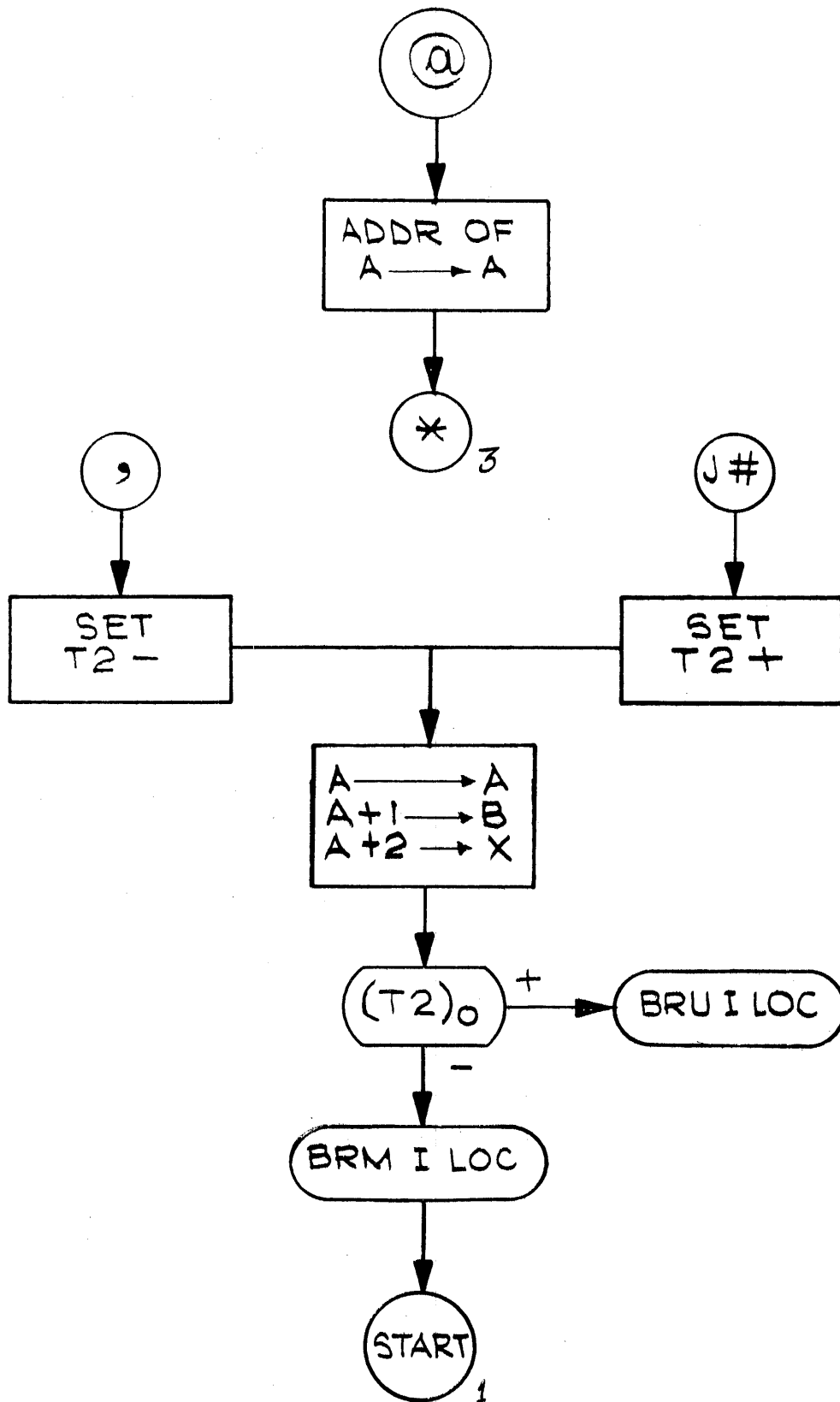
Flow Diagram

BASIC UTILITY PACKAGE IV



Flow Diagram

BASIC UTILITY PACKAGE IV

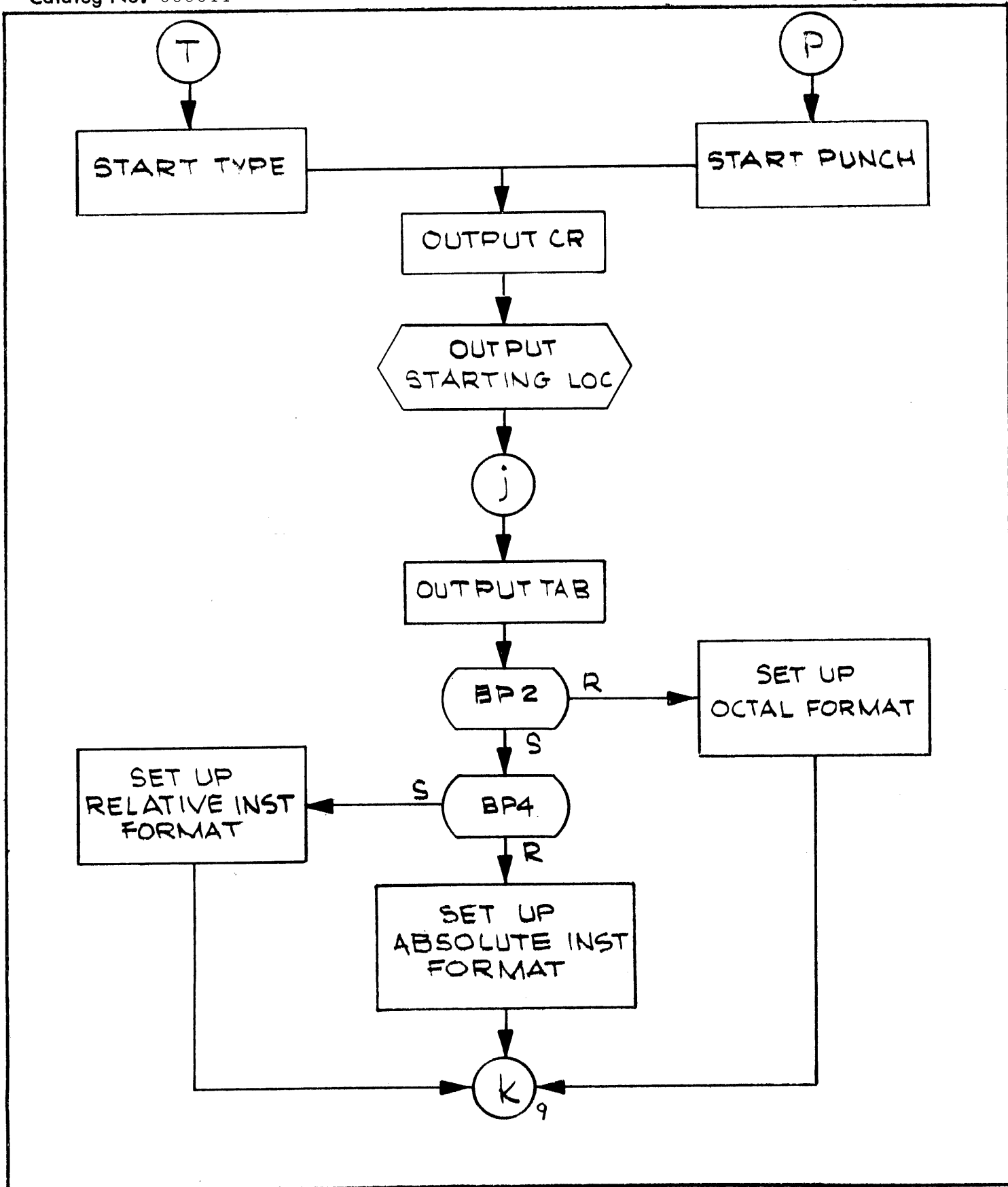


Flow Diagram

BASIC UTILITY PACKAGE IV

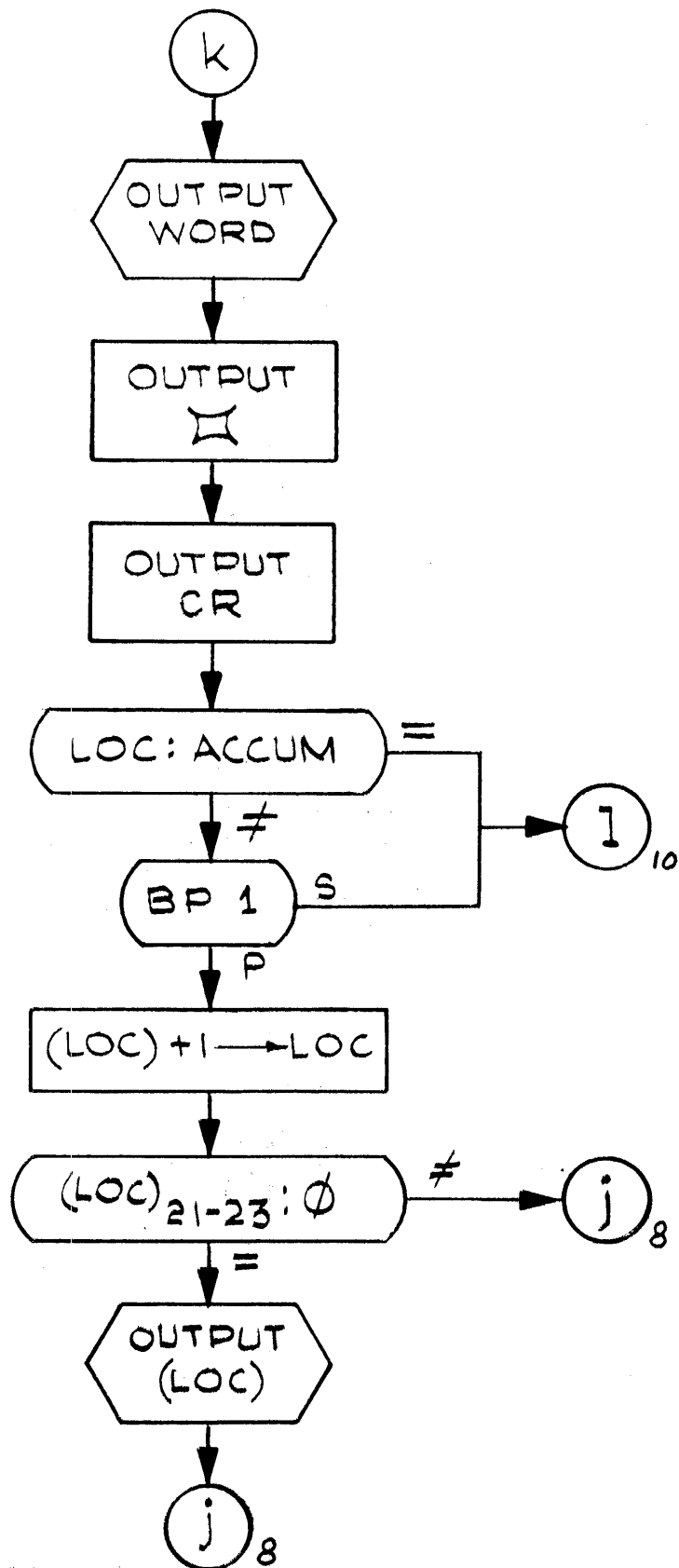
Catalog No. 000011

Page 8 of 13



Flow Diagram

BASIC UTILITY PACKAGE IV

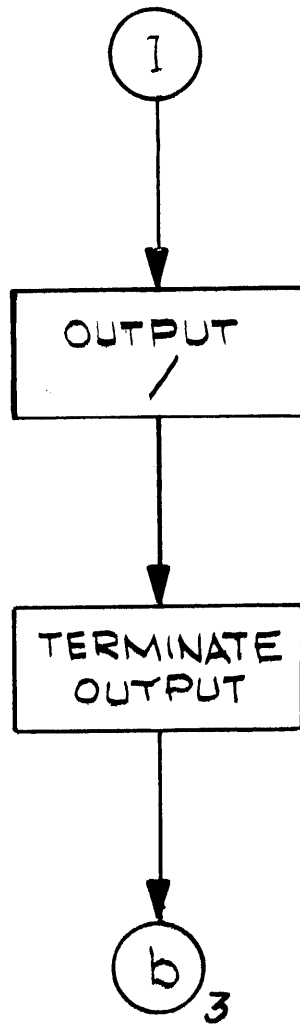


Flow Diagram

BASIC UTILITY PACKAGE IV

Catalog No. 000011

Page 10 of 13

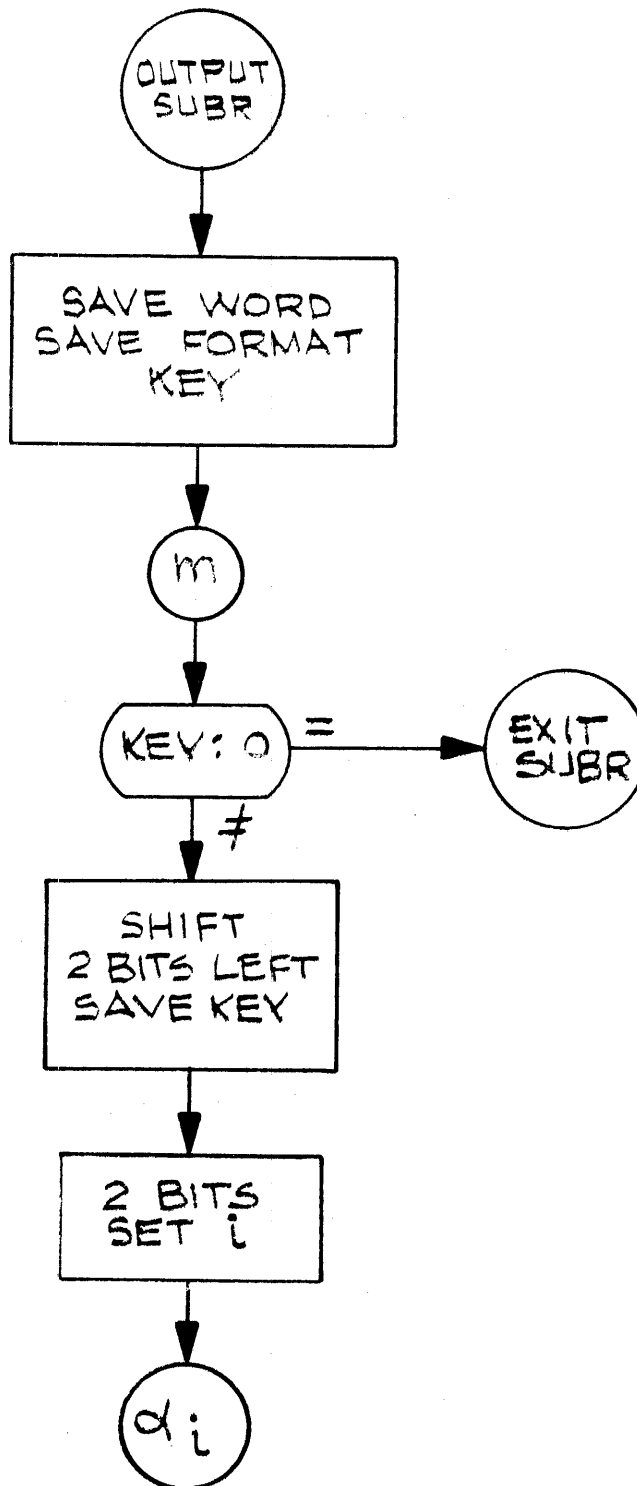


Flow Diagram

BASIC UTILITY PACKAGE IV

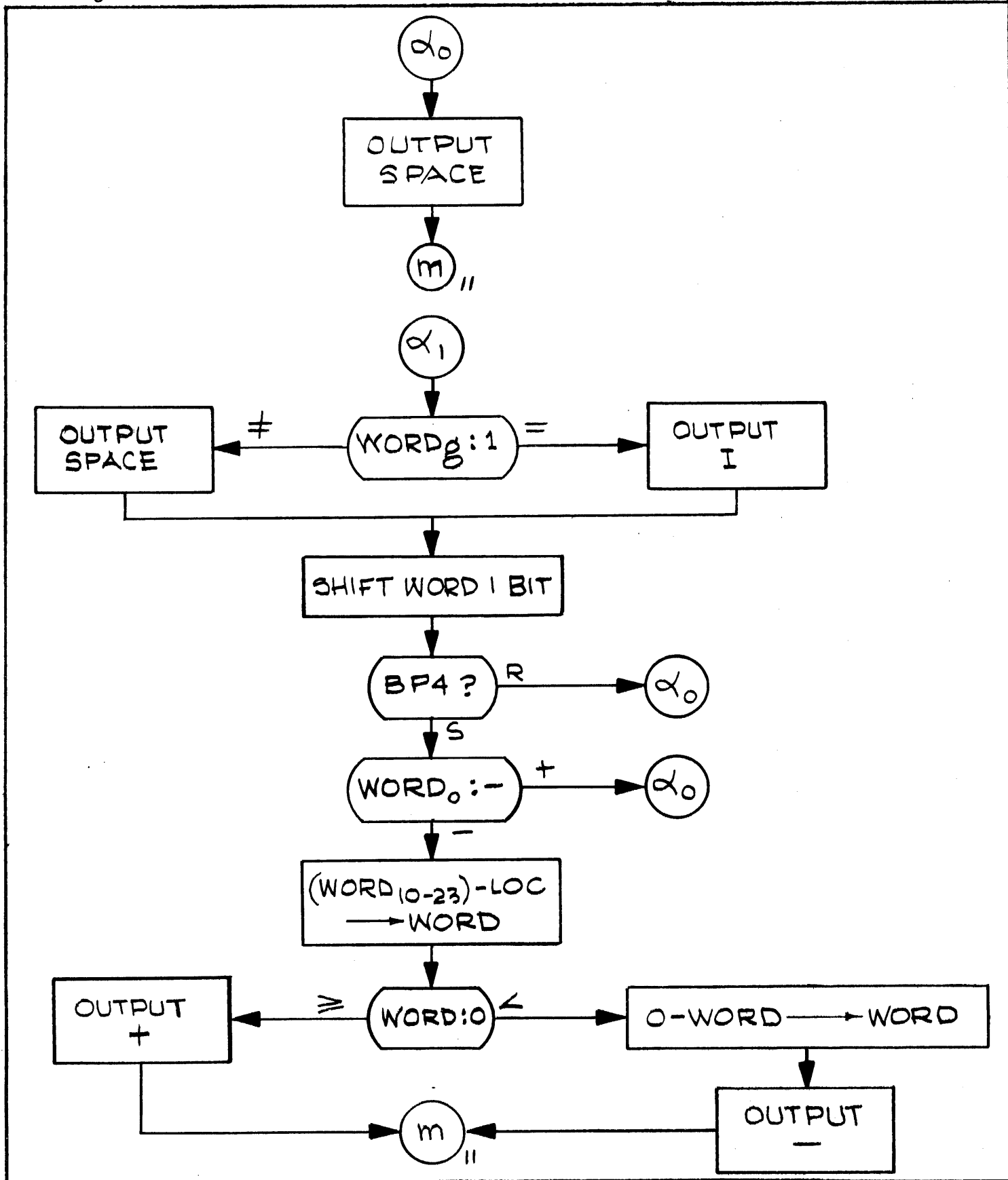
Catalog No. 000011

Page 11 of 13



Flow Diagram

BASIC UTILITY PACKAGE IV

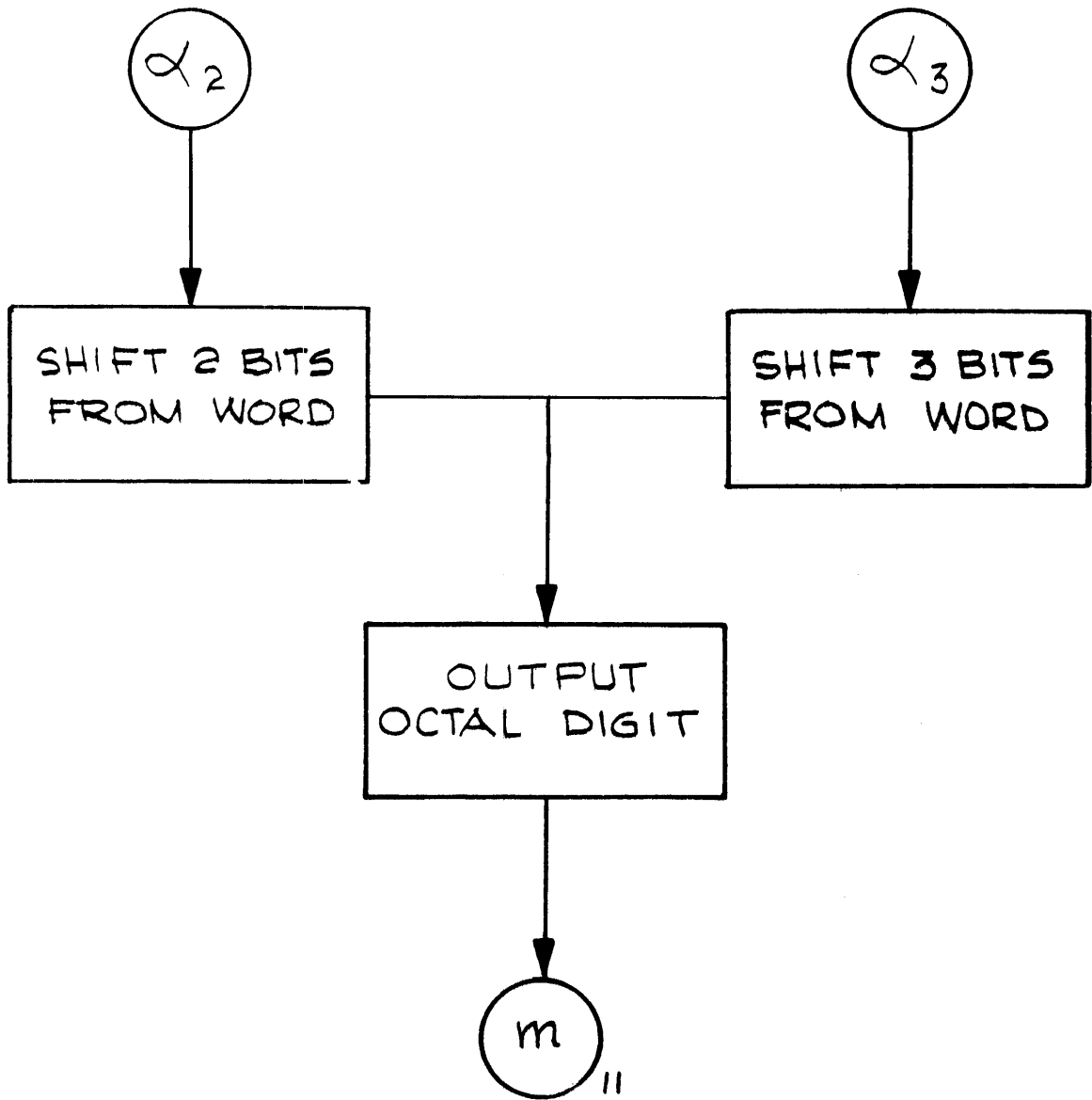


Flow Diagram

BASIC UTILITY PACKAGE IV

Catalog No. 000011

Page 13 of 13



IDENTIFICATION: DEBUG

AUTHOR: R. C. Shepardson, SDS

ACCEPTED: January 11, 1964

COMPUTER
CONFIGURATION: Any SDS 910 or 920 computer

PURPOSE: This is a relocatable routine which will aid the user in debugging.

Functions which may be performed by this routine are:

1. Make in-core corrections or insertions.
2. Dump selected memory areas on the printer or typewriter.
3. Perform snapshots at selected points.
4. Allow the user to seize control at selected points.
5. Perform masked memory searches.

PROGRAMMED
OPERATORS: None

STORAGE: This relocatable routine requires 419_{10} (643_8) locations. Locations 2- 14_8 are used for temporaries. The loader uses 1- 63_8 . The standard constants in 23 8 -27 8 are used. The loader will store in location 1 a BRU to the load origin.

TIMING: I/O device speed.

USE: LOADING

The routine is preceded by a relocatable loader which requires the following loading procedure:

1. Set the A register to the desired load origin.
2. Set breakpoint switches (see Breakpoint Settings).
3. Perform standard fill procedure.

USE: (cont.)

BREAKPOINT SETTINGS

- BP1 - Reset - Console typewriter input
Set - Card reader input
- BP2 - Reset - Console typewriter output
Set - Buffered printer output
- BP3 - Reset - Single space output
Set - Double space output
- BP4 - Reset - No seizure by user at each snapshot
Set - Transfer control to user after each snapshot

CONTROL

Control may be transferred to DEBUG by branching to the load origin.

Another alternative is to execute a:

BRM load origin + 16

which will save and print the contents of the P, A, B and X registers, after which the DEBUG routine will seize control. An exit request will restore the contents of the registers and return.

The debugging functions available are listed below:

1. NOP Request

Input: N location list.

This request will store NOP instructions in each of the locations specified in the location list. Control is then returned for the next request.

2. ALTER Request

Input: A location, alter list.

This request will store the octal words specified by the alter list into monotonically increasing locations.

Contiguous commas leave the appropriate location(s) unchanged.

USE: (cont.)

The following example best illustrates the use of this request:

A2075, 7602100, 3502012, 102066, 17, , 77, 27/3, 77777777.

The above requests alters memory as follows:

2075	07602100
2076	03502012
2077	00102066
2100	00000017
2101	unchanged
2102	00000077
2103	} 00000003
thru	
2130	
2131	

Card input requests will not allow a block alteration (as in locations 2103 thru 2130 above) except as the last alteration on the card because of timing restrictions.

3. INSERT Request

Input: I location, octal instruction list.

This request will cause the list of octal instructions to be logically inserted following the location specified.

The following example will illustrate the method used:

I 403, 27700002, 3704013.

<u>Before</u>	<u>After</u>
403 07104013	001 BBBB
BBBBB	07104013
BBBBB+1	27700002
BBBBB+2	03704013
BBBBB+3	00100404

Any insertions use memory immediately following the DEBUG Routine (designated as BBBB above).

Caution should be used in making insertions because the instruction at the location of the insertion will be moved.

USE: (cont.)

4. DUMP Request

Input: D block.

This request will dump onto the buffered printer or the console typewriter the contents of the memory block specified and return control for the next request.

The format of the output is eight octal words per line. If all numbers on one or more lines are identical, all lines except the first will be suppressed.

Example:

D1400-1427.

or

D1400.

Appendix II contains a sample of the dump output.

5. SNAP SHOT Request

Input: S location, block list.

This request will insert at the location specified a calling sequence which, when executed, will print on the console typewriter or printer the location of the snapshot and the contents of the A, B and X registers and the contents of memory blocks specified in the block list. Furthermore, if BP4 is set, control will be transferred following the snapshot to the DEBUG routine to enable the user to make additional requests at that point. Otherwise, control returns as usual to the main program.

Example:

S 4017,200-220,0,740-743.

6. EXIT Request

Input: X

When the user has seized control during a snapshot (BP 4 set) this request will cause the A, B and X registers to be restored and control to be returned to the point where the snapshot occurred.

USE: (cont.)

7. BRANCH Request

Input: B location.

This request restores the A, B and X registers and then performs a branch to the specified location.

8. RESTORE Request

Input: R location list.

This request will logically remove the insertion (including snapshot insertion) made at the location specified. Control is then returned for the next request.

Example:

R 1260, 3102, 4017.

9. TOGGLE Request

Input: T toggle list.

This request enables the user to reassign or eliminate the breakpoint toggle tests within the DEBUG routine in the event that the breakpoint toggle settings conflict with his program.

The toggle list consists of 1 to 4 characters. The i^{th} character corresponds to the option normally associated with the i^{th} breakpoint toggle as follows:

- a. 1 - Assign breakpoint toggle 1 (to the option normally associated with the i^{th} breakpoint toggle).
- b. 2 - Assign breakpoint toggle 2
- c. 3 - Assign breakpoint toggle 3
- d. 4 - Assign breakpoint toggle 4
- e. S - Assume the breakpoint toggle normally associated with the i^{th} option set
- f. R - Assume the breakpoint toggle normally associated with the i^{th} option reset

Example:

T4RRS.

T12S.

USE: (cont.)

10. LOOK Request

Input: L lower bound, upper bound, value, mask.

This request searches the memory area designated by the bounds for all locations whose contents are equivalent to the value specified using the mask.

INPUT COMMENTS

Both forms of the space character and the carriage return character are completely ignored.

\$ will cause the current request to be immediately terminated. The next request is then read.

. designates the end of each request except the EXIT request.

Appendix I contains a rigorous description of the syntax of the requests.

MODIFICATIONS

The variable BBB in the DEBUG Routine addresses the last location used of the insertion block. The user may wish to change the memory area used for the insertion block by altering the contents of BBB which is in load origin +570₈.

METHOD:

Not Applicable.

The meta-language defining the syntax is similar to that which is used in the definition of the ALGOL syntax.

```

<nop request> ::= N <location list> .
<alter request> ::= A <location> , <alter list> .
<insert request> ::= I <location> , <instruction list> .
<snapshot request> ::= S <location> , <block list> .
<dump request> ::= D <block> .
<restore request> ::= R <location list> .
<branch request> ::= B <location> .
<exit request> ::= X
<toggle request> ::= T <toggle list> .
<search request> ::= L <location> , <location> , <octal number> ,
    <octal number> .
<location list> ::= <location> , <location list> | <location>
<instruction list> ::= <octal number> , <instruction list> | <octal number>
<alter list> ::= <alter entry> , <alter list> | <alter entry>
<alter entry> ::= , | <octal number> / <octal number> | <octal number>
<block list> ::= <block> , <block list> | <block>
<block> ::= <location> - <location> | <location>
<toggle list> ::= <toggle designation> <toggle list> | <toggle designator>
<toggle designator> ::= 1 | 2 | 3 | 4 | R | S

```

<location> is 1 to 5 octal digits.

<octal number> is 1 to 8 octal digits.

Spaces (60 or 12) and carriage return characters are ignored.

\$ will immediately terminate a request.

APPENDIX II

Dump Output

Catalog No. 000014

00540 05100000 03503374 04500014 07640000 03540000 00100537 03503374 05540000
00550 03540000 07603374 05100000 03503374 03703375 04530003 07540000 06700001
00560 02000000 07703373 04301031 07103375 05100000 03503374 03703375 07540000
00570 00100572 00100655 03503375 07603374 07703375 04301000 03503377 04500014
00580 01400354 04600014 06503376 01703377 07200025 00100621 04610012 05303377
00610 00100617 05303377 00100616 01700354 06500024 00100660 04630003 01700025
00620 00100660 07603377 04600014 05303376 00100542 01700354 05303374 00100655
00630 05303377 00103452 00100660 05500024 05303377 00100660 04600014 05403376
00640 04600014 00100660 01700025 05303374 00100651 05500024 05303377 00103457
00650 00100660 05303377 00100660 04600014 05503375 00100540 04610012 05400024
00660 07103375 05100000 05540000 05100000 04301720 07740000 05703375 03503362
00670 06500001 03503363 04610012 01403336 06620001 03503364 07500025 03503371
00700 07600000 03503372 07603362 00103444 25400000 00220001 03503355 07603337
00710 27200000 00100716 07203367 07203366 00100722 00101111 07203365 07203367
00720 00100722 00101101 07600025 27200001 00100726 00101101 07203363 00100731
00730 00103442 27600000 07203335 00100757 04630003 05503364 04600014 06700001
00740 05503363 04301000 26500001 04600014 01700025 03503363 04610012 04301000
00750 26500001 07603363 25300001 00100755 05103371 07103366 00101271 01403336
00760 04620005 07703362 04301031 07103370 04301000 00103422 26500001 01700025
00770 01700025 07200025 00100774 00100735 05503364 07200025 07500025 00100736
01000 00000000 26500001 26500001 26500001 26500001 26500001 26500001 26500001
01010 - 01027 26500001
01030 05101000 00000000 26400001 26400001 26400001 26400001 26400001 26400001
01040 26400001 26400001 26400001 26400001 26400001 26400001 05101031 04501720
01050 03603365 05600001 03503363 07600026 03503371 07600000 03503372 04610012
01060 01403335 06620003 04620005 07740000 04301031 03503364 27600000 05503363
01070 05500024 00220001 03503362 07603337 27200000 00101105 07203362 07203364

SDS 900 SERIES PROGRAM LIBRARY

LISTING

DEBUG, Relocatable Loader with Automatic BRU Into 1

Address	Op Code	Op Name	Op Type	Op Comment
00000	00002		1	FGRT
00002	2 32 00012	START	2	BSS
00003	0 41 00002		3	WIM 10.2
00004	0 71 00007		4	BRX START
00005	2 32 00064		5	LDX NOP
00006	0 41 00005		6	WIM WIM LAST.2
00007	0 20 77726		7	BRX WIM
00010	0 35 00006		8	NOP NOP* -LAST+10
00011	0 16 00062		9	F00 STA RELADR
00012	0 35 00001		10	MKG BRUMOP
00013	0 02 00604	BLOCK	11	STA JUMP
00014	0 32 00003		12	EGM 604
00015	0 32 00003		13	WIM ID2
00016	0 76 00003		14	WIM ID2
00017	0 17 00063		15	LDA ID2
00020	0 72 00063		16	EBR 109
00021	0 55 00006		17	SKA 109
00022	0 01 00030		18	ADD RELADR
00023	0 00 00000		19	BRU 24
00024	00000001	ZERO	20	PZE
00025	40000000	ONE	21	DEC 1
00026	77777777	SIGN	22	ECT 40000000
00027	00037777	ONES	23	DEC -1
00030	0 14 00027	ADRMSK	24	ECT 37777
00031	0 35 00005		25	ETR ADRMSK
00032	0 55 00060		26	STA COUNT
00033	0 35 00053		27	ADD EAX
00034	0 76 00003		28	STA MODIFY
00035	0 32 00004		29	LDA ID2
00036	0 40 21000	READ	30	WIM WORD
00037	0 01 00047		31	SKS 21000
00040	0 75 00006		32	BRU STORE
00041	0 17 00063	ENDBLK	33	LDB COUNT
00042	0 72 00053		34	EBR 109
00043	0 36 00006		35	SKA 109
00044	0 72 00061		36	STB RELADR
00045	0 01 00013		37	SKA TAGBIT
00046	0 01 00001		38	BRU BLOCK
00047	0 71 00004		39	BRU JUMP
00050	0 72 00025	STORE	40	LDX WORD
00051	0 53 00004		41	SKA SIGN
00052	0 01 00054		42	SKN WORD
00053	2 77 00000		43	BRU NOKEL
00054	0 37 40005	MODIFY	44	EAX 0.2
00055	0 61 00005	NOKEL	45	STX* COUNT
00056	0 61 00053		46	MIN COUNT
00057	0 01 00035		47	MIN MODIFY
00058	2 77 00000		48	BRU READ
00061	20000000	EAX	49	EAX 0.2
00062	0 01 00000	TAGBIT	50	ECT 20000000
00063	0 00 40000	BRUMOP	51	BRU 0
	00001	109	52	HLT*
	00005	JUMP	53	BOOL 1
		ID2	54	BOOL 3

DEBUG, Relocatable Loader with Automatic BRU Into 1

Page 2 of 2

Catalog No. 000014

00004	55	WORD	BOOL	4
00005	56	COUNT	BOOL	5
00006	57	RELAOK	BOOL	6
00004	58	LAST	EQU	*
00000	59		END	

SDS 900 SERIES PROGRAM LIBRARY

LISTING

DEBUG

				DEBUG ROUTINE (RELOCATABLE) R C	
				12/30/63	
			1	*	
			2	*	
			3		REL
		00000	4		ORG 0
00000	0 02	00000	5	DISW	DISW
00001	4 23	00544	6	X	EXU BPT1
00002	4 01	00435	7		BRU RCDW
00003	4 43	00241	8		BRM CRET
00004	4 71	00361	9		LDX PRNXT
00005	4 41	00000	10		BRX *
00006	0 02	02001	11		RKBW 1.1
00007	4 43	00272	12	X1	BRM IN05
00010	4 71	00616	13		LDX M10
00011	6 70	00573	14		SKM TBL+10.2
00012	4 01	00002	15		BRU **2
00013	6 01	40603	16		BRU* TBL+20.2
00014	4 41	37775	17		BRX *-3
00015	4 01	37763	18		BRU DISW
00016	0 00	00000	19	PM	PZE
00017	4 43	00130	20		BRM SN1
00020	4 76	37776	21		LDA PM
00021	4 35	00071	22		STA SNAP1
00022	4 43	00136	23		BRM SN2
00023	4 01	37756	24		BRU X
00024	4 43	00227	25	DUMP	BRM IN0
00025	0 35	00005	26		STA AAA
00026	0 76	00002	27		LDA IN01
00027	4 72	00604	28		SKA 037
00030	4 01	00004	29		BRU DUMP2
00031	4 43	00222	30		BRM IN0
00032	0 54	00005	31		SUB AAA
00033	4 01	00002	32		BRU **2
00034	0 76	00023	33	DUMP2	CLA
00035	0 35	00003	34		STA CT
00036	0 02	00000	35		DISW
00037	4 43	00265	36		BRM DJMDUM
00040	4 01	37741	37		BRU X
00041	4 43	00212	38	ALTER1	BRM IN0
00042	0 35	00005	39		STA AAA
00043	0 46	30003	40	ALTER	CLR
00044	0 36	00010	41	ALTER2	STB CT1
00045	4 43	00206	42		BRM IN0
00046	0 46	00014	43		XAB
00047	0 76	00002	44		LDA IN01
00050	4 72	00557	45		SKA 02
00051	4 01	00002	46		BRU **2
00052	4 01	37772	47		BRU ALTER2
00053	0 36	40005	48	ALTER3	STB* AAA
00054	0 61	00005	49		MIN AAA
00055	0 60	00010	50		SKR CT1
00056	0 20	77773	51	MS	NOP* -5
00057	0 53	00010	52		SKN CT1
00050	4 01	37773	53		BRU ALTER3
00051	4 01	37762	54		BRU ALTER

N / /

00062	4	43	00126	55	SNAP	BRM	INS1
00063	4	75	40505	56		LDB*	BBB
00064	4	35	40504	57		STA*	BBB
00065	4	61	00503	58		MIN	BBB
00066	4	76	00530	59		LDA	BRMSNI
00067	4	35	40501	60		STA*	BBB
00070	4	61	00500	61		MIN	BBB
00071	4	36	40477	62		STB*	BBB
00072	4	43	00161	63	NMIN	BRM	INO
00073	4	75	40475	64		LDB*	BBB
00074	4	35	40474	65		STA*	BBB
00075	4	61	00473	66		MIN	BBB
00076	0	76	00023	67		CLA	
00077	4	35	40471	68		STA*	BBB
00100	4	61	00470	69		MIN	BBB
00101	4	36	40467	70		STB*	BBB
00102	0	76	00002	71		LDA	INO1
00103	4	72	00530	72		SKA	037
00104	4	01	37766	73		BRU	NMIN
00105	4	43	00146	74		BRM	INO
00106	4	71	00462	75		LDX	BBB
00107	2	54	37776	76		SUB	-2.2
00110	2	35	37777	77		STA	-1.2
00111	4	01	37761	78		BRU	NMIN
00112	0	00	00000	79	SNAP1	PZE	
00113	4	43	00034	80		BRM	SN1
00114	4	71	37776	81		LDX	SNAP1
00115	2	76	00001	82		LDA	1.2
00116	4	72	00505	83		SKA	SNAP5
00117	4	01	00003	84		BRU	*+3
00120	2	77	00002	85		EAX	2.2
00121	4	01	37774	86		BRU	*-4
00122	0	54	00024	87		SUB	ONE
00123	4	43	00036	88		BRM	SN2
00124	4	71	37766	89	SNAP7	LDX	SNAP1
00125	2	76	00001	90		LDA	1.2
00126	4	72	00475	91		SKA	SNAP5
00127	4	01	00010	92		BRU	SNAP6
00130	4	61	37762	93		MIN	SNAP1
00131	4	61	37761	94		MIN	SNAP1
00132	0	35	00005	95		STA	AAA
00133	2	76	00002	96		LDA	2.2
00134	0	35	00003	97		STA	CT
00135	4	43	00167	98		BRM	DUMDUM
00136	4	01	37766	99		BRU	SNAP7
00137	4	23	00411	100	SNAP6	EXU	BPT4
00140	4	01	37641	101		BRU	X.
00141	4	01	00002	102		BRU	*+2
00142	0	02	00000	103	EXIT	DISW	
00143	4	76	00422	104		LDA	AREG
00144	4	75	00422	105		LDB	BREG
00145	4	71	00422	106		LDX	XREG
00146	4	51	37744	107		BRR	SNAP1
00147	0	00	00000	108	SNI	PZE	

DISPLAY REGISTERS

00150	4	35	00415	109		STA	AREG
00151	4	36	00415	110		STB	BREG
00152	4	37	00415	111		STX	XREG
00153	4	43	00302	112		BRM	SELECT
00154	4	76	00443	113		LDA	SNAP2
00155	4	43	00243	114		BRM	OUTH
00156	4	12	00464	115		MIW	BLANK
00157	4	51	37770	116		BRR	SN1
00160	0	00	00000	117	SN2	PZE	
00161	0	66	00017	118		RSH	15
00162	4	71	37674	119		LDX	M5
00163	4	43	00244	120		BRM	OUT0
00164	4	71	00440	121		LDX	M3
00165	0	37	00011	122	SNAP4	STX	T1
00166	6	76	00435	123		LDA	SNAP3+3.2
00167	4	43	00231	124		BRM	OUTH
00170	0	71	00011	125		LDX	T1
00171	6	75	00377	126		LDB	AREG+3.2
00172	4	71	00206	127		LDX	M8
00173	4	43	00234	128		BRM	OUT0
00174	0	71	00011	129		LDX	T1
00175	4	41	37770	130		BRX	SNAP4
00176	0	02	14000	131		TOPW	
00177	4	51	37761	132		BRR	SN2
00200	4	43	00007	133	INSERT	BRM	INS1
00201	4	75	40367	134		LDB*	BBB
00202	4	35	40366	135		STA*	BBB
00203	4	61	00365	136		MIN	BBB
00204	4	36	40364	137		STB*	BBB
00205	4	43	00046	138		BRM	INO
00206	4	01	37773	139		BRU	*-5
00207	0	00	00000	140	INS1	PZE	
00210	4	43	00043	141		BRM	INO
00211	4	61	00357	142		MIN	BBB
00212	4	16	00357	143		MRG	BRU
00213	0	35	00005	144		STA	AAA
00214	4	35	40354	145		STA*	BBB
00215	4	61	40353	146		MIN*	BBB
00216	4	75	00352	147		LDB	BBB
00217	0	76	40005	148		LDA*	AAA
00220	0	36	40005	149		STB*	AAA
00221	4	51	37766	150		BRR	INS1
00222	4	43	00031	151	RESTOR	BRM	INO
00223	0	35	00005	152		STA	AAA
00224	0	71	40005	153		LDX*	AAA
00225	2	76	00000	154		LDA	0.2
00226	0	35	40005	155		STA*	AAA
00227	4	01	37773	156		BRU	RESTOR
00230	4	43	00023	157	NOP	BRM	INO
00231	0	35	00005	158		STA	AAA
00232	4	76	00140	159		LDA	NOPINS
00233	0	35	40005	160		STA*	AAA
00234	4	01	37774	161		BRU	NOP
00235	4	43	00016	162	BRUT0	BRM	INO

00236	0	02	00000	163	DISW	
00237	0	35	00005	164	STA	AAA
00240	4	76	00325	165	LDA	AREG
00241	4	75	00325	166	LDB	BREG
00242	4	71	00325	167	LDX	XREG
00243	0	01	40005	168	BRU*	AAA
00244	0	00	00000	169	CRET	PZE
00245	4	43	00177	170	BRM	BRTW
00246	0	02	02041	171	TYPW	1.1
00247	4	12	00370	172	MIW	052
00250	0	02	14000	173	TGPW	
00251	4	43	00173	174	BRM	BRTW
00252	4	51	37772	175	BRR	CRET
00253	0	00	00000	176	IN0	PZE
00254	0	76	00002	177	LDA	IN01
00255	4	75	00361	178	LDB	077
00256	4	70	00354	179	SKM	033
00257	4	01	00002	180	BRU	*+2
00260	4	01	37521	181	BRU	X
00261	4	43	00020	182	BRM	IN05
00262	4	72	00353	183	SKA	070
00263	4	01	00014	184	BRU	IN02
00264	4	14	00345	185	ETR	07
00265	0	35	00007	186	IN03	STA
00266	4	43	00013	187	BRM	IN06
00267	4	72	00346	188	SKA	070
00270	4	01	00005	189	BRU	IN04
00271	0	66	20003	190	RCY	3
00272	0	76	00007	191	LDA	T2
00273	0	67	20003	192	LCY	3
00274	4	01	37771	193	BRU	IN03
00275	0	76	00007	194	IN04	LDA
00276	4	51	37755	195	BRR	IN0
00277	0	61	00005	196	IN02	MIN
00300	4	01	37754	197	BRU	IN0+1
00301	0	00	00000	198	IN05	HLT
00302	0	32	00002	199	WIM	IN01
00303	0	76	00002	200	LDA	IN01
00304	4	75	00332	201	LDB	077
00305	4	70	00335	202	SKM	BLANK
00306	4	01	00002	203	BRU	*+2
00307	4	01	37773	204	BRU	IN05+1
00310	4	70	00322	205	SKM	033
00311	4	01	00002	206	BRU	*+2
00312	0	02	00000	207	DISW	
00313	4	70	00325	208	SKM	053
00314	4	01	00002	209	BRU	*+2
00315	4	01	37463	210	BRU	DISW
00316	4	70	00134	211	SKM	060
00317	4	01	00002	212	BRU	*+2
00320	4	01	37762	213	BRU	IN05+1
00321	4	70	00316	214	SKM	052
00322	4	51	37757	215	BRR	IN05
00323	4	01	37757	216	BRU	IN05+1

00324	0 00 00000	217	DUMDUM	HLT	
00325	4 43 00060	218	DUMPI	BRM	DL0C
00326	0 71 00026	219		LDX	0NES
00327	0 77 40005	220		EAX*	AAA
00330	0 75 00026	221		LDB	0NES
00331	0 36 00010	222		STB	CT1
00332	2 76 00000	223		LDA	0.2
00333	0 61 00010	224		MIN	CT1
00334	2 70 00001	225		SKM	1.2
00335	4 01 00002	226		BRU	*+2
00336	4 41 37775	227		BRX	*-3
00337	0 61 00010	228		MIN	CT1
00340	0 76 00010	229		LDA	CT1
00341	4 73 00270	230		SKG	07
00342	4 01 00023	231		BRU	PRNXT
00343	4 14 00276	232		ETR	037770
00344	0 54 00024	233		SUB	0NE
00345	0 35 00004	234		STA	TU
00346	0 55 00005	235		ADD	AAA
00347	0 35 00005	236		STA	AAA
00350	0 76 00003	237		LDA	CT
00351	0 54 00004	238		SUB	TU
00352	0 35 00003	239		STA	CT
00353	0 12 00025	240		MIW	SIGN
00354	4 12 00266	241		MIW	BLANK
00355	4 12 00265	242		MIW	BLANK
00356	4 71 37500	243		LDX	MS
00357	0 75 00005	244		LDB	AAA
00360	0 67 20011	245		LCY	9
00361	4 43 00046	246		BRM	OUT0
00362	0 76 00023	247		CLA	
00363	0 35 00006	248		STA	PRCT
00364	4 12 00256	249	PRNXT1	MIW	BLANK
00365	0 75 40005	250	PRNXT	LDB*	AAA
00366	4 71 00012	251		LDX	M8
00367	4 43 00040	252		BRM	OUT0
00370	0 61 00005	253		MIN	AAA
00371	0 60 00003	254		SKR	CT
00372	0 20 00000	255	N0PINS	N0P	
00373	0 53 00003	256		SKN	CT
00374	4 01 00003	257		BRU	*+3
00375	0 02 14000	258		TOPW	
00376	4 51 37726	259		BRR	DUMDUM
00377	0 60 00006	260		SKR	PRCT
00400	0 20 77770	261	M8	N0P*	-8
00401	0 53 00006	262		SKN	PRCT
00402	4 01 37762	263		BRU	PRNXT1
00403	0 02 14000	264		TOPW	
00404	4 01 37721	265		BRU	DUMPI
00405	0 00 00000	266	DL0C	PZE	
00406	4 43 00047	267		BRM	SELECT
00407	4 76 00222	268		LDA	07
00410	0 35 00006	269		STA	PRCT
00411	0 75 00005	270		LDB	AAA

00412	4	71	37444	271		LDX	M5	
00413	0	67	20011	272		LCY	9	
00414	4	43	00013	273		BRM	OUT0	
00415	4	12	00225	274		MIW	BLANK	
00416	4	12	00224	275		MIW	BLANK	
00417	4	51	37766	276		BRR	DL0C	
00420	0	00	00000	277	OUTH	PZE		
00421	4	71	00204	278		LDX	M4	
00422	0	35	00004	279		STA	T0	
00423	0	12	00004	280		MIW	T0	
00424	0	67	00006	281		LSH	6	
00425	4	41	37775	282		BRX	*-3	
00426	4	51	37772	283		BRR	OUTH	
00427	0	00	00000	284	OUT0	PZE		
00430	0	76	00023	285		CLA		
00431	0	66	20003	286		KCY	3	
00432	0	36	00004	287		STB	T0	
00433	0	12	00004	288		MIW	T0	
00434	0	67	20006	289		LCY	6	
00435	4	41	37773	290		BRX	OUT0+1	
00436	4	51	37771	291		BRR	OUT0	
00437	4	43	00005	292	RCDW	BRM	BRTW	
00440	0	40	12006	293		CRTW	1	
00441	4	01	37777	294		BRU	*-1	
00442	0	02	02006	295		RCDW	1.1	
00443	4	01	37344	296		BRU	X1	
00444	0	00	00000	297	BRTW	PZE		
00445	0	40	21000	298		BRTW		
00446	4	01	37777	299		BRU	*-1	
00447	4	23	00077	300		EXU	BPT2	
00450	4	01	00002	301		BRU	*+2	
00451	4	51	37773	302		BRR	BRTW	
00452	0	40	12060	303	060	SKS	12060	
00453	4	01	37777	304		BRU	*-1	PRTW 1
00454	4	51	37770	305		BRR	BRTW	
00455	0	00	00000	306	SELECT	PZE		
00456	4	23	00070	307		EXU	BPT2	
00457	4	01	00006	308		BRU	DUMPIA	
00460	4	43	37564	309		BRM	CRET	
00461	4	23	00066	310		EXU	BPT3	
00462	4	43	37562	311		BRM	CRET	
00463	0	02	02041	312		TYPW	1.1	
00464	4	51	37771	313		BRR	SELECT	
00465	4	43	37757	314	DUMPIA	BRM	BRTW	
00466	4	23	00061	315		EXU	BPT3	
00467	4	01	00003	316		BRU	*+3	
00470	0	02	10460	317		EQM	10460	PSCW 1.0
00471	4	01	00002	318		BRU	*+2	
00472	0	02	12460	319		EQM	12460	PSCW 1.2
00473	4	43	37751	320		BRM	BRTW	
00474	0	02	02060	321		EQM	2060	
00475	4	51	37760	322		BRR	SELECT	PLPW 1.1
00476	0	46	30003	323	SERCH	CLR		
00477	0	35	00003	324		STA	CT	

00500	4	43	37553	325		BRM	IN0
00501	0	35	00005	326		STA	AAA
00502	4	43	37551	327		BRM	IN0
00503	0	35	00012	328		STA	AAA1
00504	4	43	37547	329		BRM	IN0
00505	0	35	00013	330		STA	VALUE
00506	4	43	37545	331		BRM	IN0
00507	0	02	00000	332		DISW	
00510	0	35	00014	333		STA	MASK
00511	0	76	40005	334	NXT2	LDA*	AAA
00512	0	75	00014	335		LDB	MASK
00513	0	70	00013	336		SKM	VALUE
00514	4	01	00006	337		BRU	NXT1
00515	4	43	37670	338		BRM	DLOC
00516	0	75	40005	339		LDB*	AAA
00517	4	71	37661	340		LDX	M8
00520	4	43	37707	341		BRM	OUT0
00521	0	02	14000	342		TOPW	
00522	0	76	00012	343	NXT1	LDA	AAA1
00523	0	73	00005	344		SKG	AAA
00524	4	01	37255	345		BRU	X
00525	0	61	00005	346		MIN	AAA
00526	4	01	37763	347		BRU	NXT2
00527	4	71	00076	348	TOGGLE	LDX	M4
00530	0	37	00011	349	T0G1	STX	T1
00531	4	43	37550	350		BRM	IN05
00532	4	70	00100	351		SKM	033
00533	4	01	00002	352		BRU	**2
00534	4	01	37244	353		BRU	DISW
00535	4	71	00026	354		LDX	M6
00536	6	70	00021	355		SKM	TBL1+0.2
00537	4	41	37777	356		BRX	*-1
00540	6	76	00025	357		LDA	TBL1+12.2
00541	0	71	00011	358		LDX	T1
00542	6	35	00007	359		STA	BPT4+1.2
00543	4	41	37765	360		BRX	T0G1
00544	4	01	37234	361		BRU	DISW
00545	0	40	20400	362	BPT1	BPT	1
00546	0	40	20200	363	BPT2	BPT	2
00547	0	40	20100	364	BPT3	BPT	3
00550	0	40	20040	365	BPT4	BPT	4
00551	6	76	76701	366	TBL1	BCI	6.XXX1XXX2XXX3XXX4XXX5XXX
00557	0	40	20400	367		BPT	1
00560	0	40	20200	368		BPT	2
00561	0	40	20100	369		BPT	3
00562	0	40	20040	370		BPT	4
00563	0	20	77772	371	M6	N0P*	-6
00564	0	72	00023	372		SKA	ZERO
00565	0	00	00000	373	AREG	PZE	
00566	0	00	00000	374	BREG	PZE	
00567	0	00	00000	375	XREG	PZE	
00570	4	01	00052	376	BBB	BRU	LAST
00571	0	01	00000	377	BRU	BRU	0
00572	6	76	76745	378	TBL	BCI	7.XXXNXXXAXXXIXXXSXXDXXXRXXX0

00601	67676767	379			
00602	67676763	380		BCI	1.XXXX
00603	67676743	381		BCI	1.XXXT
00604	4 00 37424	382		BCI	1.XXXL
00605	4 00 37234	383		PZE	NOP
00606	4 00 37372	384		PZE	ALTER1
00607	4 00 37253	385		PZE	INSERT
00610	4 00 37214	386		PZE	SNAP
00611	4 00 37411	387		PZE	DUMP
00612	4 00 37423	388		PZE	RESTOR
00613	4 00 37327	389		PZE	BRUTO
00614	4 00 37713	390		PZE	EXIT
00615	4 00 37661	391		PZE	TOGGLE
00616	4 43 37274	392		PZE	SEKCH
00617	62452147	393	BRMSN1	BRM	SNAP1
00620	12122112	394	SNAP2	BCI	1.SNAP
00623	77740000	395	SNAP3	BCI	3. A 3 X
00624	0 00 77775	396	SNAP5	OCT	77740000
00625	0 00 77774	397	M3	PZE	-3
00626	0 00 77766	398	M4	PZE	-4
00627	00000002	399	M10	PZE	-10
00630	00000004	400	02	OCT	2
00631	00000007	401	04	OCT	4
00632	00000033	402	07	OCT	7
00633	00000037	403	033	OCT	33
00634	0 00 00040	404	037	OCT	37
00635	00000070	405	040	HLT	32
00636	00000077	406	070	OCT	70
00637	52525252	407	077	OCT	77
00640	00000053	408	052	OCT	52525252
00641	00037770	409	053	OCT	53
	00642	410	037770	OCT	37770
00642	12121212	411	LAST	EQU	*
		412	BLANK	OCT	12121212
	00002	413	CLA	OPD	07600023
	00003	414	IN01	BOOL	2
	00004	415	CT	BOOL	3
	00005	416	TO	BOOL	4
	00006	417	AAA	BOOL	5
	00007	418	PRCT	BOOL	6
	00010	419	T2	BOOL	7
	00011	420	CT1	BOOL	10
	00012	421	T1	BOOL	11
	00013	422	AAAI	BOOL	12
	00014	423	VALUE	BOOL	13
	00023	424	MASK	BOOL	14
	00024	425	ZERO	BOOL	23
	00024	426	ONE	BOOL	24
	00025	427	01	BOOL	24
	00026	428	SIGN	BOOL	25
	00000	429	ONES	BOOL	26
			END		

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 4

Catalog No. 020012

IDENTIFICATION: Paper Tape Reproducer Program

AUTHOR: A. W. England, SDS

ACCEPTED: 15 August 1963

COMPUTER CONFIGURATION: Any 910 or 920 with punch, reader, and typewriter.

PURPOSE: To reproduce binary paper tape. Only tapes which have an integral multiple of four characters in each block can be reproduced with this program.

PROGRAMMED OPERATORS: N/A

STORAGE: The program occupies 270_{10} locations from 200g to 616g. The next 512 words are reserved for record table storage. The remainder of memory is used to hold the records of the tape to be reproduced.

TIMING: All operations proceed at the maximum rate of either the punch (60 characters per second) or the reader (300 characters per second).

USE:

- I. TO LOAD PROGRAM
 - A. Insert tape in reader.
 - B. With COMPUTE switch in IDLE press START button.
 - C. Move COMPUTE switch to RUN.
 - D. Set BP 1.
 - E. Raise and lower FILL switch.
- II. TO REPRODUCE A TAPE

A tape may be reproduced by first reading it, then verifying it, punching one or several copies of it, and finally verifying the copies. Each of these functions of the program will be described below. Upon

USE: (Cont)

completion of each function, control will be returned to the operator via the typewriter, which is signified by the illuminated typewriter light and the presence of 000001 in the I/O address lights.

A function is initiated by typing one control letter; R, V, or P. The letter P may be preceded by a number to indicate the number of copies to be made.

Below is the procedure for reproducing tapes:

A. Read

1. Place the tape to be reproduced in the reader.
2. RESET BP 1.
3. Type R.
4. When the tape runs out of the reader, SET BP 1.

B. Verify

1. Place the tape to be verified in the reader.
2. Reset BP 1.
3. If there is only one copy to be verified or if there are several copies to be verified one at a time, RESET BP 2.
4. Type V. The tape will be read and verified. If an error is found, the reader will stop at the end of the copy and the program will type VERIFY ERROR.
5. If several copies are to be verified at once, SET BP 2 and type V.

When the tape runs out of reader or onto the the last length of trailer, SET BP 1.

C. Punch

After the tape has been read and verified, it may be punched as follows:

USE: (Cont)

1. If the tape is to have a short leader RESET BP 3. If it is to have a long leader (for mounting on a reel) SET BP 3.
2. If the tape is to have a short trailer, RESET BP 4. If it is to have a long trailer (for mounting on a reel), SET BP 4.
3. If only one copy is to be made, RESET BP 2 and type P. When the copy has been punched the light will come on.
4. If more than one copy is to be punched, SET BP 2 and type a carriage return, then the number of copies to be made, and the letter P. The program will punch the desired number of copies and stop. If it appears that there is not sufficient paper tape to punch all the copies, BP 2 may be RESET and the program will stop after the copy it is then punching.

D. Verify New Tape

Follow procedure as outlined in B above.

III. ERRORS

A. Reading

1. If a Read error occurs, the program will stop the tape and type READ ERROR.
2. If the tape to be reproduced exceeds the capacity of memory, the program will stop the tape and type STORAGE FULL.
3. If the tape to be reproduced has more than 512 blocks on it, the program will stop the tape and type TABLE FULL.

B. Verifying

If a copy fails verification, the program will stop the tape after that copy and type VERIFY ERROR.

IV. BREAKPOINTS

<u>BP NO.</u>	<u>RESET</u>	<u>SET</u>
1	Normal	Stop
2	One	Many
3	Short Leader	Long Leader
4	Short Trailer	Long Trailer

METHOD:

When a tape is read, the program records the gap length preceding the punched information and stores this in the record table. It also maintains the starting addresses of each record read. When Breakpoint 1 is set, the read is stopped and an end indicator is inserted in the table.

Verify is similar to read except that no attempt is made to verify the length of gaps. Each word of the record read from tape is compared with the corresponding word in memory. Any disagreement is indicated.

Punching utilizes the gap count generated during read to reproduce the proper length gaps between records. Each record is punched from memory with gaps as required. At the beginning and end of the tape the program punches either short (3 feet) or long (10 feet) leader depending on the settings of Breakpoints 3 and 4.

SDS 900 SERIES PROGRAM LIBRARY
PROGRAM LISTING
Paper Tape Reproducer Program

Page 1 of 6

Catalog No. 020012

Address	Op Code	Data	Instruction	Comments
00200	0 71	00027	BEGIN LDX	SC5
00201	0 76	00026	LDA	SC4
00202	2 35	00000	STA	0.2
00203	2 72	00000	SKA	0.2
00204	0 01	00207	BRU	**3
00205	2 77	34000	EAX	NEG2K.2
00206	0 01	00201	BRU	*-5
00207	0 37	00612	STX	LIMIT
00210	0 76	00244	LDA	R8
00211	0 35	00001	STA	1
00212	0 02	20004	ENTER DIR	
00213	0 02	00001	E9M	RKBW1
00214	0 32	00012	WIM	T
00215	0 76	00012	LDA	T
00216	0 75	00255	LDB	C4 77
00217	0 70	00252	SKM	R
00220	0 01	00222	BRU	**2 N8T R
00221	0 01	00256	BRU	READ
00222	0 70	00253	SKM	P
00223	0 01	00225	BRU	**2 N8T P
00224	0 01	00373	BRU	PUNCH
00225	0 70	00254	SKM	V
00226	0 01	00230	BRU	**2 N8T V
00227	0 01	00471	BRU	VERIFY
00230	0 70	00247	SKM	CR
00231	0 01	00233	BRU	**2 N8T CR
00232	0 01	00245	BRU	CLEAR
00233	0 14	00255	DIGIT ETR	C4 ACCUMULATE DIGITS
00234	0 35	00012	STA	T
00235	0 46	30003	RCH	30003
00236	0 76	00250	LDA	PCNT
00237	0 67	00001	LSH	1
00240	0 55	00250	ADD	PCNT
00241	0 67	00001	LSH	1
00242	0 55	00012	ADD	T
00243	0 35	00250	STA	PCNT
00244	0 01	00212	R8 BRU	ENTER
00245	0 46	30003	CLEAR RCH	30003 CLEAR PCNT
00246	0 01	00243	BRU	*-3
00247	00000052		CR 8CT	52
00250	0 00	00000	PCNT PZE	
00251	0 00	00000	RPCNT PZE	
00252	00000051		R 8CT	51
00253	00000047		P 8CT	47
00254	00000065		V 8CT	65
00255	00000077		C4 8CT	77
00256	0 76	00575	READ LDA	R1 SET INTERRUPTS
00257	0 75	00576	LDB	R2 /
00260	0 35	00031	STA	I1W /BRU C&NB

00261	0 36 00033		STB	I2W	/BRU I2RD
00262	0 76 00611		LDA	START	STARTING ADDRESS OF STORA
00263	0 35 00610		STA	ADDR	
00264	0 35 00616		STA	TBL	
00265	0 71 00574		LUX	TBLS	TABLE SIZE TO TBLC
00266	0 02 20002		EIR		ENABLE INTERRUPT
00267	0 02 03604		E9M	RPTW4	START READER
00270	0 00 00000	WAITII	HLT		WAIT II
00271	0 32 40610	C9NB	WIM*	ADDR	
00272	0 61 00610		MIN	ADDR	
00273	0 76 00612		LDA	LIMIT	
00274	0 73 00610		SKG	ADDR	
00275	0 01 40323		BRU*	E3	
00276	0 01 40277		BRU*	**1	
00277	0 00 00270		PZE	WAITII	
00300	0 40 20010	I2RD	SKS	SBEW	
00301	0 01 40321		BRU*	E1	
00302	0 32 00014		WIM	T+2	
00303	0 76 00014		LDA	T+2	
00304	0 72 00026		SKA	SC4	
00305	0 01 40321		BRU*	E1	
00306	0 41 00310		BRX	**2	TBLC+1 TO TBLC
00307	0 01 40322		BRU*	E2	
00310	0 76 00610		LDA	ADDR	
00311	2 35 01616		STA	TBLE.2	
00312	0 76 00577		LDA	R3	BRU C9NA
00313	0 35 00031		STA	IIW	
00314	0 76 00320		LDA	BIAS	
00315	0 02 03604		E9M	RPTW4	
00316	0 01 40317		BRU*	**1	
00317	0 00 00324		PZE	C9NT	
00320	77700000	BIAS	9CT	77700000	
00321	0 00 00343	E1	PZE	ERR1	
00322	0 00 00355	E2	PZE	ERR2	
00323	0 00 00364	E3	PZE	ERR3	
00324	0 55 00557	C9NT	ADD	C1	00000200
00325	0 40 20400		SKS	BPI	
00326	0 01 00336		BRU	ST9P	
00327	0 01 00324		BRU	*-3	
00330	0 14 00560	C9NA	ETR	C2	37700000
00331	2 16 01616		MRG	TBLE.2	
00332	2 35 01616		STA	TBLE.2	
00333	0 76 00575		LDA	R1	
00334	0 35 00031		STA	IIW	
00335	0 01 00271		BRU	C9NB	
00336	2 76 01616	ST9P	LDA	TBLE.2	
00337	0 16 00025		MRG	SC3	
00340	2 35 01616		STA	TBLE.2	
00341	0 02 00000		E9M	0	
00342	0 01 00212		BRU	ENTER	

00343	0	02	00000	ERR1	E8M	0	
00344	0	02	20004		DIR		
00345	0	02	03641		E8M	TYPW4	
00346	0	12	00562		MIW	EM1	CR REA
00347	0	12	00563		MIW	EM1+1	D SP ER
00350	0	12	00564		MIW	EM1+2	RBR CR
00351	0	02	14000	T8P	E8M	T8PW	
00352	0	40	21000		SKS	SPRW	
00353	0	01	00352		BRU	*-1	
00354	0	01	00212		BRU	ENTER	
00355	0	02	00000	ERR2	E8M	0	
00356	0	02	20004		DIR		
00357	0	02	03641		E8M	TYPW4	
00360	0	12	00565		MIW	EM2	CR TAH
00361	0	12	00566		MIW	EM2+1	LE SP F
00362	0	12	00567		MIW	EM2+2	U LL CR
00363	0	01	00351		BRU	T8P	
00364	0	02	20004	ERR3	DIR		
00365	0	02	03641		E8M	TYPW4	
00366	0	12	00570		MIW	EM3	CR STB
00367	0	12	00571		MIW	EM3+1	R AGE
00370	0	12	00572		MIW	EM3+2	SP FUL
00371	0	12	00573		MIW	EM3+3	L . . CR
00372	0	01	00351		BRU	T8P	
00373	0	76	00250	PUNCH	LDA	PCNT	
00374	0	54	00024		SUB	SC2	
00375	0	35	00251		STA	RPCNT	
00376	0	76	00600		LDA	R4	
00377	0	35	00424		STA	SW1	
00400	0	71	00574		LUX	TBL5	
00401	2	76	01616		LDA	TBLE.2	
00402	0	14	00027		ETR	SC5	
00403	0	35	00610		STA	ADDR	
00404	0	76	00614		LDA	SLC	SHORT LEADER COUNT
00405	0	40	20100		SKS	BP3	
00406	0	76	00613		LDA	LLC	LONG LEADER COUNT
00407	0	02	20004		DIR		
00410	0	14	00560	C8NE	ETR	C2	
00411	0	37	00012		STX	T	
00412	0	02	01644	L88P	E8M	PPTW4	
00413	0	54	00561		SUB	C3	
00414	0	72	00025		SKA	SC3	
00415	0	01	00423		BRU	SW1-1	
00416	0	71	00422		LUX	PWC	
00417	0	35	00013		STA	T+1	KILL TIME
00420	0	41	00417		BRX	*-1	
00421	0	01	00412		BRU	L88P	
00422	000	00000		PWC	ACT	60000	
00423	0	71	00012		LUX	T	
00424	0	20	00000	SW1	N9P		

00425	2 76 01617		LDA	TBLE+1.2	
00426	0 14 00027		ETR	SC5	
00427	0 12 40610	BUT	MIW*	ADDR	
00430	0 61 00610		MIN	ADDR	
00431	0 73 00610		SKG	ADDR	
00432	0 01 00434		BRU	**2	
00433	0 01 00427		BRU	BUT	
00434	0 02 14000		EEM	TBPW	
00435	0 41 00436		BRX	**1	
00436	0 40 21000		SKS	SBRW	
00437	0 01 00436		BRU	*-1	
00440	2 53 01616		SKN	TBLE.2	
00441	0 01 00450		BRU	C8NF	
00442	0 76 00601	C8NC	LDA	R5	N8T D8NE
00443	0 35 00424		STA	SW1	D8NE
00444	0 76 00614		LDA	SLC	S(SW1) BRU C8ND
00445	0 40 20040		SKS	BP4	
00446	0 76 00613		LDA	LLC	
00447	0 01 00410		BRU	C8NE	
00450	2 76 01616	C8NF	LDA	TBLE.2	
00451	0 14 00027		ETR	SC5	
00452	0 35 00610		STA	ADDR	
00453	2 76 01616		LDA	TBLE.2	
00454	0 01 00410		BRU	C8NE	
00455	0 02 14000	C8ND	EEM	TBPW	
00456	0 40 21000		SKS	SBRW	
00457	0 01 00456		BRU	*-1	
00460	0 40 20200		SKS	BP2	
00461	0 01 00463		BRU	**2	
00462	0 01 00212		BRU	ENTER	
00463	0 76 00251		LDA	RPCNT	
00464	0 54 00024		SUB	SC2	
00465	0 35 00251		STA	RPCNT	
00466	0 72 00025		SKA	SC3	
00467	0 01 00212		BRU	ENTER	
00470	0 01 00376		BRU	PUNCH+3	
00471	0 76 00602	VERIFY	LDA	R6	BRU V1
00472	0 75 00603		LDB	R7	BRU V2
00473	0 35 00031		STA	I1W	
00474	0 36 00033		STB	I2W	
00475	0 71 00574	C8NTV	LDX	TALS	
00476	0 46 30003		RCH	30003	
00477	0 35 00615		STA	VFLG	R(VFLG)
00500	2 76 01616		LDA	TBLE.2	
00501	0 72 00025		SKA	SC3	
00502	0 01 00543		BRU	VD8NE	
00503	0 14 00027		ETR	SC5	
00504	0 35 00610		STA	ADDR	
00505	0 75 00026	VL88P	LDB	SC4	
00506	0 02 03604		EEM	RPTW4	

00507	0 02 20002		EIR			
00510	0 40 20400	PAUSE	SKS	BPI		
00511	0 01 00212		BRU	ENTER		
00512	0 01 00510		BRU	*-2		
00513	0 32 00016	V1	WIM	T+4		
00514	0 76 00016		LDA	T+4		
00515	0 70 40610		SKM+	ADDR		
00516	0 36 00615		STB	VFLG		
00517	0 61 00610		MIN	ADDR		
00520	0 01 40521		BRU+	*+1		
00521	0 00 00510		PZE	PAUSE		
00522	0 32 00016	V2	WIM	T+4		
00523	0 40 20010		SKS	SBLW		
00524	0 36 00615		STB	VFLG		
00525	0 76 00016		LDA	T+4		
00526	0 72 00026		SKA	SC4		
00527	0 36 00615		STB	VFLG		
00530	0 76 00610		LDA	ADDR		
00531	0 75 00027		LDB	SC5		
00532	0 01 40533		BRU+	*+1		
00533	0 00 00534		PZE	*+1		
00534	2 70 01617		SKM	TBLE+1.2		
00535	0 01 00540		BRU	V2A		
00536	0 41 00500		BRX	CENTV+3		
00537	0 01 00545		BRU	ERR4		
00540	0 76 00026	V2A	LDA	SC4		
00541	0 35 00615		STA	VFLG		
00542	0 01 00536		BRU	*-4		
00543	0 53 00615	VDBNE	SKN	VFLG		
00544	0 01 00554		HRU	VCENT		
00545	0 02 20004	ERR4	DIR			
00546	0 02 03641		E9M	TYPW4		
00547	0 12 00604		MIW	EM4	CR VER	
00550	0 12 00605		MIW	EM4+1	IFY SP	
00551	0 12 00606		MIW	EM4+2	ERR0	
00552	0 12 00607		MIW	EM4+3	R.. CR	
00553	0 01 00351		BRU	T9P		
00554	0 40 20200	VCENT	SKS	BP2		
00555	0 01 00475		BRU	CENTV		
00556	0 01 00212		BRU	ENTER		
00557	00000100	C1	9CT	100		
00560	37700000	C2	9CT	37700000		
00561	00100000	C3	9CT	00100000		
00562	52512521	EM1	9CT	52512521.24122551.51465152		
00565	52632122	EM2	9CT	52632122.43251226.64434352		
00570	52626346	EM3	9CT	52626346.51212725.12266443.43333362		
00574	77777000	TALS	DEC	-512		
00575	0 01 00271	R1	BRU	C6N5		
00576	0 01 00300	R2	BRU	I2RD		
00577	0 01 00330	R3	BRU	CANA		

00600	0 20 00000	R4	NBP	
00601	0 01 00455	R5	BRU	C9ND
00602	0 01 00513	R5	BRU	V1
00603	0 01 00522	R7	BRU	V2
00604	52652551	EM4	ECT	52652551.31267012.25515146.51333352
00610	0 00 00000	AADR	PZE	
00611	0 00 01616	START	PZE	TBLE
00612	0 00 00000	LIMIT	PZE	
00613	16000000	LLC	ECT	16000000
00614	04400000	SLC	ECT	04400000
00615	0 00 00000	VFLG	PZE	
00616	0 00 00000	TBL	PZE	
	01616	TBLE	EQD	TBL+512
	03604	RPTW4	B99L	03604
	20010	SBEW	B99L	20010
	20400	BPI	B99L	20400
	20200	BP2	B99L	20200
	20100	BP3	B99L	20100
	20040	BP4	B99L	20040
	00023	SC1	B99L	23
	00024	SC2	B99L	24
	00025	SC3	B99L	25
	00026	SC4	B99L	26
	00027	SC5	B99L	27
	03641	TYPW4	B99L	03641
	14000	TBPW	B99L	14000
	21000	SBRW	B99L	21000
	00012	T	B99L	12
	01644	PPTW4	B99L	01644
	00001	RKBW1	B99L	00001
	34000	NEG2K	B99L	34000
	00031	I1W	B99L	31
	00033	I2W	B99L	33
	00200	END	BEGIN	

IDENTIFICATION: FORTRAN Memory Save

AUTHOR: Robert C. Shepardson, SDS

ACCEPTED: November 15, 1963

COMPUTER

CONFIGURATION: Any 910 or 920 computer with paper tape reader and punch.

PURPOSE: To punch a self-loading paper tape representing the FORTRAN Program which is in core and optionally to punch any of the following:

1. The FORTRAN variables
2. COMMON
3. Run-Time.

PROGRAMMED

OPERATORS: None.

STORAGE: 360 words (relocatable).

TIMING: Paper tape punch speed.

USE: Breakpoint switches 1, 2, and 3 are used as follows to designate the options desired:

- | | |
|------|--|
| BP 1 | Reset - Don't punch variables
Set - Punch variables |
| BP 2 | Reset - Don't punch COMMON
Set - Punch COMMON |
| BP 3 | Reset - Don't punch Run-Time
Set - Punch Run-Time |

The routine is on a self-loading tape which loads itself into the topmost 360₁₀ locations of eraseable storage. If there are not at least 360₁₀ locations of eraseable storage available (as indicated by (72₈) in the Run-Time), the tape stops and the computer halts at location 16₈. The operator may then place a starting address P in the A register and clear the halt; the routine will then load itself into locations P through P+357₁₀.

USE: (Cont)

RELOADING

The procedure for resuming execution of the FORTRAN program (dumped on paper tape) depends upon whether or not the BP 3 option (punch Run-Time) was invoked.

A. Self-loading tape does not contain the Run-Time

1. Load FORTRAN Run-Time
2. Load self-loading FORTRAN program
3. Branch to location 400_8 .

B. Self-loading tape includes the Run-Time

1. Load self-loading FORTRAN program. The computer will type "LOADING COMPLETE" and halt.
2. Clear the halt.

METHOD:

After being loaded, the FORTRAN Memory Save program will punch out a loader followed by the FORTRAN program and optionally the variables, COMMON and Run-Time. The following table defines precisely the locations which are punched:

Unconditionally	71 thru 75_8	EOADR, EOSIZE, EOTAG, EOIND, SENWRD
	160_8 thru 247_8	User POPS and System Routine Linkages
Program without variables (BP 1 reset)	$(400_8)-10_8$ thru (EOADR)-1	but not including the dummies, temporaries, equivalenced variables, arrays and scalars (see Memory Layout at Run-Time, FORTRAN Operators Manual).
Program with variables (BP 1 set)	$(400_8)-10_8$ thru (EOADR)-1	

METHOD: (Cont)	COMMON (BP 2 set)	(EOADR) + (EOSIZE) thru Top of Memory
	Run-Time (BP 3 set)	1 76 _g thru 157 _g 250 _g thru (400 _g)-10 _g

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LISTING

FORTTRAN Memory Save

Page 1 of 11

Catalog No. 022002

			1	FART	RELADATABLE LOADER INTO ERASABLE
			2	*	11-1-63
00000		00002	3	BSS	2
00002	2 32	00012	4	START	10,2
00003	0 41	00002	5	BRX	START
00004	0 71	00007	6	LDA	NBP
00005	2 32	00071	7	WIM	WIM
00006	0 41	00005	8	BRX	WIM
00007	0 20	77721	9	NBP	NBP*
00010	0 76	00072	10	CHECK	LDA
00011	0 54	00070	11		SUB
00012	0 72	00025	12		SKA
00013	0 01	00016	13		BRU
00014	0 55	00071	14	FITS	ADD
00015	0 01	00017	15		BRU
00016	0 00	40000	16	100	HLT*
00017	0 35	00006	17	FBR	STA
00020	0 16	00263	18		MAG
00021	0 35	00002	19		STA
00022	0 01	00030	20		BRU
00023	0 00	00000	21	ZERA	P7E
00024	000000001		22	BNE	DEC
00025	400000000		23	SIGN	ACT
00026	777777777		24	BNES	DEC
00027	000377777		25	ADRMSK	ACT
00030	0 02	00604	26	BLACK	ERM
00031	0 32	00003	27		WIM
00032	0 32	00003	28		WIM
00033	0 76	00003	29		LDA
00034	0 17	00016	30		FBR
00035	0 72	00016	31		SKA
00036	0 55	00006	32		ADD
00037	0 14	00027	33		ETR
00040	0 35	00005	34		STA
00041	0 55	00067	35		ADD
00042	0 35	00062	36		STA
00043	0 76	00003	37		LDA
00044	0 32	00004	38	READ	WIM
00045	0 40	21000	39		SKS
00046	0 01	00056	40		BRU
00047	0 75	00005	41	ENDBLK	LOB
00050	0 17	00016	42		FBR
00051	0 72	00016	43		SKA
00052	0 36	00006	44		STR
00053	0 72	00077	45		SKA
00054	0 01	00030	46		BRU
00055	0 01	00002	47		BRU
00056	0 71	00004	48	STORE	LDA
00057	0 72	00025	49		SKA
00060	0 53	00004	50		SKN

00061	0 01	00063	51		RRU	NAREL
00062	2 77	00000	52	MODIFY	EAX	0.2
00063	0 37	40005	53	NAREL	STX*	CAUNT
00064	0 61	00005	54		MIN	CAUNT
00065	0 61	00062	55		MIN	MODIFY
00066	0 01	00044	56		RRU	READ
00067	2 77	00000	57	EAX	EAX	0.2
00070	00000550		58	PRSIZE	ACT	550
	00002		59	JUMP	RRR	2
	00003		60	ID2	RRR	3
	00004		61	WORD	RRR	4
	00005		62	CAUNT	RRR	5
	00006		63	RELADR	RRR	6
	00071		64	EOADR	RRR	71
	00072		65	EOSIZE	RRR	72
	00077		66	TAGRIT	RRR	77
	00263		67	BRUM9P	RRR	263
	00071		68	LAST	RRR	*
	00000		69		END	

```

1 * FARTRAN MEMBRY SAVE R C SHEPARDSON
2 * 11-1-63
3 * SW1 SET - PUNCH VARIABLES
4 * SW2 SET - PUNCH COMMAN
5 * SW3 SET - PUNCH RUN TIME
6 *
7 *
00023 8 ZER0 BRBL 23
00024 9 ONE BRBL 24
00071 10 E0A BRBL 71
00072 11 E0S7 BRBL 72
00071 12 E9A EQU E0A
00071 13 ERADR EQU E0A
00072 14 E9S7 EQU E0S7
00400 15 MPS BRBL 400
16 CLA RPD 7500023
17 CLB RPD 7500023
18 MDC RPD 5000000
19 CAX MACR0
20 STA 2
21 LDX 2
22 ENDM
23 CXA MACR0
24 STX 2
25 LDA 2
26 ENDM
27 CNA MACR0
28 FAR 9NES
29 ADD 9NE
30 ENDM
00025 31 9NES BRBL 26
32 ADC RPD 5500000
33 SKR MACR0 A
34 MDC A
35 NRP
36 SKN A
37 ENDM
38 *
39 REL
00000 40 ARG 0
41 *
00000 42 START LDX M62 PUNCH LEADER
00001 0 40 21000 43 RPTW
00002 4 01 37777 44 BRU *-1
00003 0 02 00544 45 PTLW 1.4
00004 4 12 00505 46 MIW LRAD+62.2
00005 4 41 37777 47 BRX *-1
00006 0 02 14000 48 TBPW
00007 4 76 00502 49 LDA =4 DUMP 71-75 UNCF
00010 4 71 00502 50 LDX =940071

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00011	4	43	00167	51	ARM	DUMP
00012	4	71	00501	52	LDX	=A40160
00013	4	76	00501	53	LDA	=A67
00014	4	43	00164	54	ARM	DUMP
			55	*		
00015	4	76	00500	56	LDA	=2
00016	4	35	00253	57	STA	TEMP
00017	4	71	00477	58	LDX	=A37777
00020	2	77	10000	59	P1 FAX	4096.2
00021	2	75	10000	60	LDB	4096.2
00022	2	35	10000	61	STA	4096.2
00023	0	72	00026	62	SKA	ONE
00024	4	01	00002	63	BRU	++2
00025	4	01	00007	64	BRU	=2
00026	2	36	10000	65	STB	4096.2
			66	SKR	TEMP	
00027	4	60	00242		MDC	A
00030	0	20	00000		NAP	
00031	4	53	00240		SKN	A
00032	4	01	37766	67	BRU	P1
00033	2	77	10000	68	FAX	4096.2
00034	4	37	00352	69	P2 STX	MSIZE
			70	*		
00035	0	40	20400	71	RPT	1
00036	4	01	00003	72	BRU	P4
00037	4	43	00047	73	ARM	PNVAR
00040	4	01	00002	74	BRU	++2
00041	4	43	00027	75	P4 ARM	PVAR
00042	0	40	20200	76	RPT	2
00043	4	43	00104	77	ARM	PCRM
00044	0	40	20100	78	RPT	3
00045	4	43	00116	79	ARM	PRUNT
00046	4	76	00020	80	LDA	BRUTRI
00047	0	35	00006	81	STA	6
00050	0	35	00007	82	STA	7
00051	0	76	00023	83	CLA	
00052	0	40	20100	84	RPT	3
00053	4	01	00002	85	BRU	++2
00054	0	35	00006	86	STA	6
00055	0	76	00024	87	LDA	ONE
00056	4	71	00011	88	LDX	AA6
00057	4	43	00121	89	ARM	DUMP
00060	0	40	21000	90	RPTW	
00061	4	01	37777	91	BRU	*-1
00062	0	02	02641	92	TYPW	1.4
00063	4	12	00434	93	MIW	=A52254524
00064	0	02	14000	94	TAPW	
00065	0	00	00000	95	HLT	
00066	0	01	00001	96	P1 BRUTRI	BRU
00067	0	00	40006	97	AA6 P7E*	6

DETERMINE MSIZE

DUMP PROGRAMS

FINISHED

				98	*			
				99	*			
				100	*			PUNCH ALL BP P
00070	0	00	00000	101	PVAR	PZE		
00071	0	76	00400	102		LDA	MPS	
00072	4	16	00426	103		MRG	=840000	
				104		CAX		
00073	0	35	00002			STA	2	
00074	0	71	00002			LDX	2	
00075	4	14	00421	105		ETR	=937777	
00076	4	35	00173	106		STA	TEMP	
00077	0	76	00071	107		LDA	ERA	
00100	4	14	00416	108		ETR	=937777	
00101	4	54	00170	109		SUB	TEMP	
00102	4	55	00417	110		ADD	=7	
00103	2	77	37770	111		EAX	-8.0	
00104	4	43	00074	112		BRM	DUMP	
00105	4	51	37763	113		BRR	PVAR	
				114	*			PUNCH NO VARIA
00106	0	00	00000	115	PNVAR	PZE		
00107	0	76	00071	116		LDA	ERAND	
00110	4	14	00406	117		ETR	=937777	
00111	4	54	00411	118		SUB	=1	
00112	4	35	00276	119		STA	BETA	
00113	0	76	00400	120		LDA	MPS	
00114	4	14	00402	121		ETR	=937777	
00115	4	54	00406	122		SUB	=8	
00116	4	35	00271	123		STA	ALPHA	
00117	4	16	00401	124		MRG	=840000	
				125		CAX		
00120	0	35	00002			STA	2	
00121	0	71	00002			LDX	2	
00122	2	76	00004	126	PNVAR1	LDA	4.2	
00123	4	54	00377	127	PNVAR2	SUB	=1	
00124	4	54	00263	128		SUB	ALPHA	
00125	4	43	00053	129		BRM	DUMP	
00126	4	71	00261	130		LDX	ALPHA	
00127	2	76	00000	131		*LDA	.2	
00130	4	14	00366	132		ETR	=937777	
00131	4	73	00257	133		SKG	BETA	
00132	4	01	00002	134		BRU	++2	
00133	4	51	37753	135		BRR	PNVAR	
00134	4	35	00253	136		STA	ALPHA	
00135	4	16	00363	137		MRG	=840000	
				138		CAX		
00136	0	35	00002			STA	2	
00137	0	71	00002			LDX	2	
00140	2	76	00000	139		*LDA	.2	
00141	4	72	00363	140		SKA	=810000000	
00142	4	01	00002	141		BRU	++2	

00143	4	01	37757	142	RRU	PNVARI	
00144	2	76	00000	143	*LDA	.2	
00145	4	14	00351	144	ETR	=837777	
00146	4	01	37755	145	RRU	PNVARI	
				146	*		PUNCH COMMAND
00147	0	00	00000	147	PCRM	P7E	
00150	0	76	00071	148	LDA	E9A	
00151	0	55	00072	149	ADD	E997	
00152	4	16	00346	150	MFG	=840000	
				151	CAX		
00153	0	35	00002		STA	2	
00154	0	71	00002		LDX	2	
00155	4	17	00350	152	ERR	=877737777	
00156	0	55	00024	153	ADD	BNE	
00157	4	55	00227	154	ADD	M917E	
00160	4	14	00336	155	ETR	=837777	
00161	4	43	00017	156	RRM	DUMP	
00162	4	51	37765	157	RRR	PCRM	
				158	*		PUNCH RUN TIME
00163	0	00	00000	159	PRUNT	P7E	
00164	4	71	00342	160	LDX	=840001	
00165	0	76	00023	161	CLA		
00166	4	43	00012	162	RRM	DUMP	
00167	4	71	00340	163	LDX	=840076	
00170	4	76	00340	164	LDA	=40	
00171	4	43	00007	165	RRM	DUMP	
00172	4	71	00337	166	LDX	=840250	
00173	0	76	00400	167	LDA	MPS	
00174	4	54	00336	168	SUB	=176	
00175	4	14	00321	169	ETR	=837777	
00176	4	43	00002	170	RRM	DUMP	
00177	4	51	37764	171	RRR	PRUNT	
				172	*	DUMP	
				173	*	INPUT X = ORIGIN RIT0 = 1	
				174	*	CT = COUNT - 1	
				175	*		
00200	0	00	00000	176	DUMP	P7E	
00201	4	35	00071	177	STA	CT	
00202	0	75	00024	178	LDB	BNE	
00203	4	36	00060	179	STB	QUEE	
00204	0	76	00023	180	CLA		
00205	4	35	00060	181	STA	ZCT	
00206	4	35	00060	182	STA	NZCT	
00207	4	37	00060	183	STX	BRG	
00210	0	75	00026	184	NEXT	ANES	
00211	2	70	00000	185	SKM	0.2	
00212	4	01	00010	186	RRU	N7	
00213	4	61	00052	187	MIN	ZCT	
				188	SKR	CT	
00214	4	60	00056		MDC	A	

00215	0	20	00000			NBP	
00216	4	53	00054			SKN	A
00217	4	41	37771	190		BRX	NEXT
00220	0	75	00023	190		CLB	
00221	4	36	00042	191		STB	QUER
00222	4	76	00043	192	NZ	LDA	ZCT
00223	4	73	00041	193		RKG	CR
00224	4	01	00022	194		BRU	LT9
00225	4	37	00044	195		STX	TEMP
00226	4	71	00041	196		LDX	BRG
00227	4	76	00037	197		LDA	NZCT
00230	4	43	00102	198		BRM	PPT
00231	4	76	00036	199		LDA	BRG
00232	4	55	00034	200		ADD	NZCT
				201		CAX	
00233	0	35	00002			STA	2
00234	0	71	00002			LDX	2
00235	4	76	00030	202		LDA	ZCT
00236	4	43	00035	203		BRM	PPTR
00237	4	71	00032	204		LDX	TEMP
00240	4	37	00027	205		STX	BRG
00241	0	76	00023	206		CLA	
00242	4	35	00023	207		STA	ZCT
00243	4	75	00020	208		LOB	QUER
00244	4	36	00022	209		STB	NZCT
00245	4	01	00006	210		BRU	LT9A
00246	4	55	00015	211	LT9	ADD	QUER
00247	4	55	00017	212		ADD	NZCT
00250	4	35	00016	213		STA	NZCT
00251	0	76	00023	214		CLA	
00252	4	35	00013	215		STA	ZCT
				216	LT9A	SKR	CT
00253	4	60	00017			MDC	A
00254	0	20	00000			NBP	
00255	4	53	00015			SKN	A
00256	4	41	37732	217		BRX	NEXT
00257	4	71	00010	218		LDX	BRG
00260	4	76	00006	219		LDA	NZCT
00261	4	43	00051	220		BRM	PPT
00262	4	51	37716	221		BRR	DUMP
00263	0	00	00000	222	QUER	P7E	
00264	0	00	00000	223	CR	DEC	R
00265	0	00	00000	224	ZCT	P7E	
00266	0	00	00000	225	NZCT	P7E	
00267	0	00	00000	226	BRG	P7E	
00270	0	00	00000	227	TEMP1	P7E	
00271	0	00	00000	228	TEMP	P7E	
00272	0	00	00000	229	CT	P7E	
00273	0	00	00000	230	PPTR	P7E	
00274	4	35	00110	231	PPTR1	STA	TEMP2

LESS THAN 9

00275	4	60	00107	232	QKR	TEMP2
00276	0	20	00000		MDC	A
00277	4	53	00105		NAP	
00300	4	01	00002	233	SKN	A
00301	4	51	37772	234	ARU	**2
00302	4	76	00102	235	ARR	PPTS
00303	4	73	00230	236	LDA	TEMP2
00304	4	01	00002	237	SKG	=255
00305	4	76	00226	238	ARU	**2
00306	0	67	00017	239	LDA	=255
00307	4	14	00225	240	LSH	15
00310	4	35	00073	241	ETR	=837700000
				242	STA	TEMP2
00311	0	37	00002		CYA	
00312	0	76	00002		STX	2
00313	4	14	00222	243	LDA	2
00314	4	16	00067	244	ETR	=877777
00315	4	35	00066	245	MRG	TEMP2
00316	0	40	21000	246	STA	TEMP2
00317	4	01	37777	247	BRTW	
00320	0	02	00644	248	ARU	*-1
00321	4	12	00062	249	PTLW	1.4
00322	4	12	00061	250	MIW	TEMP2
00323	0	02	14000	251	MIW	TEMP2
00324	4	76	00060	252	TBPW	
00325	4	54	00206	253	LDA	TEMP2
00326	4	73	00210	254	SUB	=255
00327	4	51	37744	255	SKG	=0
00330	2	77	00400	256	ARR	PPTS
00331	4	01	37743	257	EAX	256.2
00332	0	00	00000	258	ARU	PPTS1
00333	0	54	00024	259	P7E	
00334	4	73	00203	260	SUB	8NE
00335	4	51	37775	261	SKG	=-1
00336	0	40	21000	262	BRR	PPT
00337	4	01	37777	263	BRTW	
00340	0	75	00023	264	ARU	*-1
00341	4	35	00043	265	CLB	
00342	4	76	00171	266	STA	TEMP2
00343	4	73	00041	267	LDA	=255
00344	4	01	00002	268	SKG	TEMP2
00345	4	76	00037	269	ARU	**2
00346	4	35	00034	270	LDA	TEMP2
00347	0	67	00017	271	STA	TEMP4
00350	4	16	00170	272	LSH	15
00351	4	14	00170	273	MRG	=840000000
00352	4	35	00031	274	ETR	=877740000
				275	STA	TEMP2
00353	0	37	00002		CYA	
					STX	2

00354	0	76	00002		LDA	2	
00355	4	14	00160	276	ETR	=977777	
00356	4	16	00025	277	MRG	TEMP3	
00357	4	35	00024	278	STA	TEMP3	
00360	0	02	00644	279	PTCW	1.4	
00361	4	12	00022	280	MIW	TEMP3	
00362	4	55	00154	281	ADC	=0	RESET CARRY IND
00363	4	76	00020	282	LDA	TEMP3	
00364	2	12	00000	283	MIW	0.2	PPT25
00365	2	55	00000	284	ADC	0.2	
				285	SKR	TEMP4	
00366	4	50	00014		MDC	A	
00367	0	20	00000		NBP		
00370	4	53	00012		SKN	A	
00371	4	41	37773	286	RRX	PPT25	
00372	4	55	00144	287	ADC	=0	
00373	4	35	00007	288	STA	TEMP4	
00374	4	12	00006	289	MIW	TEMP4	
00375	0	02	14000	290	TBPW		
00376	4	76	00006	291	LDA	TEMP2	
00377	4	54	00143	292	SUB	=256	
00400	4	41	37734	293	RRX	PPT+2	
00401	4	51	37731	294	RRR	PPT	
00402	0	00	00000	295	TEMP4	P7E	
00403	0	00	00000	296	TEMP3	P7E	
00404	0	00	00000	297	TEMP2	P7E	
00405	4	00	40006	298	LRANA	P7E*	LOAD
00406	0	00	00000	299	MSI7E	P7E	
00407	0	00	00000	300	ALPHA	P7E	
00410	0	00	00000	301	BETA	P7E	
00411	0	00	77702	302	M62	P7E*	-62
00412	0	00	77703	303	M61	P7E	-61
				304	*		FORTRAN RECOVERY LOADER - R C SHEPA
				305	*		
				306	*		INPUT - CW, N WORDS ADC CHECKSUM
				307	*		CW0 =0 THEN LOAD ZERBES INTO MEMBRY
				308	*		CW1-R = CSUNT -1
				309	*		CW9 = 1
				310	*		CW10-23 = ORIGIN
				311	*		STOP 5 - PARITY 9P CHECKSUM ERROR
				312	*		
				313	*		USER LOC4Z
				314	*		USER LOCATIONS 0.2-70 OCTAL - MAINT
				315	*		
				316	*		
				317	*		
				318	*		
				319	*		
				320	*		OR LOAD HLT OR BRU INTO LOC 6
				321	*		WHICH BEGINS LOOP FOR EACH RECORD

Code	QTY	UNIT	DESCRIPTION	PRICE	ITEM	PRICE	QTY
			322				
		00413	323	* LBAD	EDU	*	
00413	2	32	00012	324	WIM	10.2	2
00414	0	41	00002	325	BRX	2	3
00415	0	71	00007	326	LNX	7	4
00416	0	32	00002	327	WIM	2	5
00417	0	01	00002	328	BRU	2	6
00420	0	00	77713	329	P7E*	-53	7
00421	0	00	00000	330	PZE		8
00422	0	00	00000	331	P7E		9
00423	2	32	00071	332	WIM	57.2	2
00424	0	40	20010	333	BETW		4
00425	0	01	00065	334	BRU	52	5
00426	0	40	21000	335	BRTW		6
00427	0	01	00006	336	BRU	6	7
00430	0	02	02604	337	RPTW	1.4	8
00431	0	42	00046	338	BRM	38	9
00432	0	35	00002	339	STA	2	10
00433	0	71	00002	340	LNX	2	11
00434	0	14	00022	341	ETR	18	12
00435	0	66	00017	342	BRH	15	13
00436	0	17	00026	343	FBR	22	14
00437	0	35	00003	344	STA	3	15
00440	0	75	00026	345	LDB	22	16
00441	0	01	00030	346	BRU	24	17
00442	2	77000000		347	ACT	377000000	18
00443	0	00	00000	348	PZE		19
00444	0	00	00001	349	P7E	1	20
00445	4	00000000		350	ACT	400000000	21
00446	7	77777777		351	ACT	777777777	22
00447	0	00277777		352	ACT	37777	23
00450	0	53	00002	353	SKN	2	24
00451	0	01	00054	354	BRU	44	25
00452	0	53	00003	355	SKN	3	26
00453	0	01	00042	356	BRU	34	27
00454	0	42	00046	357	BRM	38	28
00455	2	35	00000	358	STA	0.2	29
00456	0	55	00002	359	ADD	2	30
00457	0	35	00002	360	STA	2	31
00460	0	61	00003	361	MIN	3	32
00461	0	41	00032	362	BRX	26	33
00462	0	42	00046	363	BRM	38	34
00463	0	70	00002	364	SKM	2	35
00464	0	01	00005	365	BRU	5	36
00465	0	01	00004	366	BRU	4	37
00466	0	00	00000	367	P7E		38
00467	0	32	00000	368	WIM	0	39
00470	0	40	20010	369	BETW		40
00471	0	01	00005	370	BRU	5	41
00472	0	76	00000	371	LDA	0	42

U

GNW SUBP

00473	0	51	00046	372	RRR	38	43	
00474	0	42	00046	373	RRM	38	44	
00475	0	70	00002	374	SKM	2	45	
00476	0	01	00005	375	RRU	5	46	
00477	0	76	00023	376	LDA	19	47	
00500	2	35	00000	377	STA	0.2	48	
00501	0	51	00003	378	MIN	3	49	
00502	0	53	00003	379	SKN	3	50	
00503	0	01	00004	380	BRU	4	51	
00504	0	41	00060	381	BRX	48	52	
00505	0	02	00000	382	DISM		53	
00506	0	00	00000	383	HLT		54	CHECK SU
00507	0	01	00006	384	BRU	6	55	
00510	0	00	00000	385	HLT		56	NOT USED
			00000	386	END	START		
00511	000000004							
00512	000400071							
00513	00040160							
00514	00000067							
00515	00000002							
00516	00037777							
00517	52254524							
00520	00040000							
00521	00000007							
00522	00000001							
00523	00000010							
00524	10000000							
00525	77737777							
00526	00040001							
00527	00040076							
00530	00000061							
00531	00040250							
00532	00000260							
00533	00000377							
00534	27700000							
00535	00077777							
00536	00000000							
00537	77777777							
00540	40000000							
00541	77740000							
00542	00000400							

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 4

Catalog No. 034001

IDENTIFICATION: Card Reader Test Program

AUTHOR: F. Valadez, SDS

ACCEPTED: 10 May 1963

COMPUTER
CONFIGURATION: Any SDS 920 or SDS 910 with a typewriter, and SDS
Model 9151 card reader.

PURPOSE: To provide an acceptance test for the SDS 9151 card
reader.

PROGRAMMED
OPERATORS: None

STORAGE: Octal locations 200-613 (268 words).

TIMING: Not applicable.

USE: The Card Reader Test Program consists of a self-
loading paper tape and a special 64-card test deck.
The card deck is sequentially numbered and must be
in correct order to run the test.

To perform the card reader test, proceed as follows:

1. Load the program by normal Fill procedure. When
the program is loaded the computer will halt.
2. Check the test deck for correct sequencing of cards.
3. Select either the binary or Hollerith test by means
of Breakpoint Switch 1.

BP 1 set: Hollerith read test

BP 1 reset: Binary read test
4. Load the test deck and turn on the EOF ON
indicator.
5. Clear the computer halt to start the test.

Normal Run

If the test deck reads through successfully one of the
following messages will be typed out, depending on the
mode selected: "Binary test complete" or "Hollerith

JSE: (cont.)

test complete". The computer will then halt. At this time the test deck may be reloaded and the program repeated by clearing the halt.

Note: During the Hollerith read test, the VALIDITY CHECK light will be on continuously.

Error Indication

If an error occurs during the test, a message will be typed and the computer will halt. If an error halt occurs, the entire program must be restarted.

The following error messages are possible:

1. BIN check error:

The binary check character (52522525) read from columns 1 and 2 of the last card is not correct. The A register contains the pattern read from the card while the B register contains the value which should have been read.

2. HOL check error:

Either the Hollerith character (T) read from column 3 is not correct or a validity check has occurred while reading it. The A register contains the binary-coded value of the Hollerith character read from the card while the B register contains the value which should have been read.

3. IDN check error:

The identification number read from the last card does not sequentially follow that of the preceding card. The A register contains the sequence number read from the card while the B register contains the expected sequence number.

4. Error in column N:

The information read from the particular card column is not correct. For the binary test, the A register contains the binary pattern read from the card, while the B register contains the pattern which should have been read. For the Hollerith test, the A register contains the Hollerith value read from the card, while the B register contains the binary pattern that should be in that card column.

USE: (cont.) 5. Signal not present:

At certain places, the program tests for the presence of the following signals:

Card Reader ready to feed (SKS 12006)

Card Reader ready to read one column (SKS 14006)

The program will loop before continuing until the particular signal is received. Upon terminating the test, the Card Reader end-of-file signal (SKS 11006) is tested.

METHOD:

Each card in the test deck contains the following fields:

1. Binary check character (columns 1 and 2.)
2. Hollerith check character (column 3).
3. Identification number (columns 4 and 5).
4. Test data (columns 8 through 71)

Columns 6, 7, and 72-80 are blank.

The test data contains every possible columnwise combination of punches arranged in ascending binary order. Column binary information is read from top to bottom, where the 12-row is the most significant bit and the 9-row is the least significant bit.

Each field on the card is read and interpreted for correctness as follows:

1. Columns 1 and 2 are read in the binary mode and form a check character whose octal value is 52522525.
2. Column 3 is read in the Hollerith mode and is the letter "T". The octal value is 63.
3. Columns 4 and 5 are read in Hollerith and converted to binary by the program to form the card identification number. This number is then checked for correct sequence.
4. Binary test: Columns 8 through 71 are read in the binary mode, one column at a time. Each column is checked against an internal binary counter. Between columns, the W buffer is disconnected and the program waits for Card Reader ready (SKS 12006) before reading the next column.

METHOD: (cont.)

Hollerith test: Columns 8 through 71 are read in the Hollerith mode, one column at a time. The octal value read from a particular column is used to select a binary pattern from a table. This value is compared with the internal binary counter pattern. The two patterns should match for valid Hollerith characters and not match for non-valid Hollerith characters. The validity error signal should be set for non-valid Hollerith characters.

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM LISTING

Card Reader Test Program

Page 1 of 5

Catalog No. 034001

* CARD READER CHECKOUT PROGRAM

*
 * BP1 RESET FOR BINARY READ TEST.
 * BP1 SET FOR HOLLERITH READ TEST
 *

00200	0 02	20004	DIR		
00201	0 46	30003	CLR		
00202	0 35	00607	STA	SUM	
00203	0 35	00610	STA	CARD	
00204	0 61	00610	MIN	CARD	
00205	0 40	12006	START SKS	12006	READY TO FEED
00206	0 01	00272	BRU	EFT	
*					
00207	0 02	03606	RCBW	1,4	READ BINARY
00210	0 32	00611	WIM	TEMP	CHECK CHARACTER
00211	0 76	00611	LDA	TEMP	
00212	0 75	00472	LDB	ONES	
00213	0 70	00470	SKM	BC	
00214	0 01	00345	BRU	ERR1	
*					
00215	0 02	02006	RCDW	1,1	READ HOLLERITH
00216	0 32	00611	WIM	TEMP	CHECK CHARACTER
00217	0 40	20010	BETW		
00220	0 01	00350	BRU	ERR2	
00221	0 76	00611	LDA	TEMP	
00222	0 14	00466	ETR	077	
00223	0 70	00471	SKM	HC	
00224	0 01	00350	BRU	ERR2	
*					
00225	0 32	00611	WIM	TEMP	FORM CARD I.D.
00226	0 76	00611	LDA	TEMP	
00227	0 14	00466	ETR	077	
00230	0 75	00456	LDB	C0	
00231	0 67	00001	LSH	1	
00232	0 35	00611	STA	TEMP	
00233	0 67	00002	LSH	2	
00234	0 55	00611	ADD	TEMP	
00235	0 35	00612	STA	TEMP&1	
00236	0 32	00611	WIM	TEMP	
00237	0 76	00611	LDA	TEMP	
00240	0 14	00466	ETR	077	
00241	0 55	00612	ADD	TEMP&1	
00242	0 75	00472	LDB	ONES	
00243	0 70	00610	SKM	CARD	
00244	0 01	00353	BRU	ERR3	
00245	0 32	00611	WIM	TEMP	
00246	0 32	00611	WIM	TEMP	
00247	0 40	20400	BPT	1	
00250	0 01	00275	BRU	HREAD-2	

*

* BINARY READ TEST

*					
00251	0 71 00465		LDX	DM64	
00252	0 02 03206	BREAD	RCBW	1,2	
00253	0 02 00000		EOM	0	
00254	0 40 14006		SKS	14006	READY TO READ
00255	0 01 00254		BRU	*-1	
00256	0 02 03206		RCBW	1,2	
00257	0 32 00611		WIM	TEMP	
00260	0 40 20010		BETW		
00261	0 01 00357		BRU	ERR4	
00262	0 76 00611		LDA	TEMP	
00263	0 14 00467		ETR	07777	
00264	0 70 00607		SKM	SUM	
00265	0 01 00357		BRU	ERR4	
00266	0 61 00607		MIN	SUM	
00267	0 41 00252		BRX	BREAD	
00270	0 02 12006		EOM	12006	SKIP REMAINDER
00271	0 61 00610		MIN	CARD	
00272	0 40 11006	EFT	SKS	11006	SKIP IF NOT EOF
00273	0 01 00327		BRU	EXIT	
00274	0 01 00205		BRU	START	

* HOLLERITH READ TEST

*					
00275	0 75 00472		LDB	ONES	
00276	0 71 00465		LDX	DM64	
00277	0 02 02006	HREAD	RCDW	1,1	
00300	0 02 00000		EOM	0	
00301	0 40 14006		SKS	14006	READY TO READ
00302	0 01 00301		BRU	*-1	
00303	0 02 02006		RCDW	1,1	
00304	0 32 00611		WIM	TEMP	
00305	0 76 00611		LDA	TEMP	
00306	0 14 00466		ETR	077	
00307	0 35 00611		STA	TEMP	
00310	0 37 00606		STX	TX	
00311	0 71 00611		LDX	TEMP	
00312	2 76 00505		LDA	HABLE, 2	
00313	0 71 00606		LDX	TX	
00314	0 70 00607		SKM	SUM	
00315	0 01 00324		BRU	T	
00316	0 40 20010		BETW		
00317	0 01 00356		BRU	ERR4A	
00320	0 61 00607		MIN	SUM	
00321	0 41 00277		BRX	HREAD	
00322	0 02 00000		EOM	0	
00323	0 01 00271		BRU	EFT-1	
00324	0 40 20010	T	BETW		
00325	0 01 00320		BRU	*-5	

00326	0 01	00356		BRU	ERR4A	
00327	0 02	02641	EXIT	TYPW	1,4	DONE MESSAGES
00330	0 40	20400		BPT	1	
00331	0 01	00341		BRU	*8	
00332	0 12	00445		MIW	MSG10	
00333	0 12	00446		MIW	MSG10&1	
00334	0 71	00462		LDX	DM4	
00335	2 12	00456		MIW	MSG15&4,2	
00336	0 41	00335		BRX	*-1	
00337	0 00	00000		HLT		
00340	0 01	00200		BRU	START-5	
00341	0 12	00447		MIW	MSG11	
00342	0 12	00450		MIW	MSG11&1	
00343	0 12	00451		MIW	MSG11&2	
00344	0 01	00334		BRU	*-8	
00345	0 71	00427	ERR1	LDX	MSG1	
00346	0 75	00470		LDB	BC	
00347	0 01	00412		BRU	TYPE	
00350	0 71	00430	ERR2	LDX	MSG2	
00351	0 75	00471		LDB	HC	
00352	0 01	00412		BRU	TYPE	
00353	0 71	00431	ERR3	LDX	MSG3	
00354	0 75	00610		LDB	CARD	
00355	0 01	00412		BRU	TYPE	
00356	0 76	00611	ERR4A	LDA	TEMP	
00357	0 35	00605	ERR4	STA	TA	
00360	0 46	30003		CLR		
00361	0 35	00613		STA	TEMP&2	
00362	0 76	00461		LDA	D72	
00363	0 37	00606		STX	TX	
00364	0 55	00606		ADD	TX	
00365	0 73	00457		SKG	D9	
00366	0 01	00372		BRU	*84	
00367	0 54	00460		SUB	D10	
00370	0 61	00613		MIN	TEMP&2	
00371	0 01	00365		BRU	*-4	
00372	0 35	00606		STA	TX	
00373	0 71	00613		LDX	TEMP&2	
00374	2 75	00473		LDB	CTABLE,2	
00375	0 67	00006		LSH	6	
00376	0 71	00606		LDX	TX	
00377	2 75	00473		LDB	CTABLE,2	
00400	0 67	00022		LSH	18	
00401	0 35	00443		STA	MSG5&4	
00402	0 71	00464		LDX	DM6	
00403	0 02	02641		TYPW	1,4	
00404	2 12	00445		MIW	MSG5&6,2	
00405	0 41	00404		BRX	*-1	
00406	0 76	00605		LDA	TA	
00407	0 75	00607		LDB	SUM	

00410	0 00 00000		HLT	
00411	0 01 00200		BRU	START-5
00412	0 02 02041	TYPE	TYPW	1,1
00413	0 12 00426		MIW	MSG0
00414	0 02 14000		TOPW	
00415	0 40 21000		BRTW	
00416	0 01 00415		BRU	*-1
00417	0 02 02641		TYPW	1,4
00420	0 37 00432		STX	MSG4
00421	0 71 00463		LDX	DM5
00422	2 12 00437		MIW	MSG4&5,2
00423	0 41 00422		BRX	*-1
00424	0 00 00000		HLT	
00425	0 01 00200		BRU	START-5
00426	52000000	MSG0	OCT	52000000
00427	22314512	MSG1	BCI	1,BIN
00430	30464312	MSG2	BCI	1,HOL
00431	31244512	MSG3	BCI	1,IDN
00432	12121212	MSG4	BCI	4, CHECK ERROR
00436	52525252		OCT	52525252
00437	25515146	MSG5	BCI	5,ERROR IN COLUMN
00444	52525252		OCT	52525252
00445	52522231	MSG10	OCT	52522231
00446	45215170		BCI	1,NARY
00447	52525230	MSG11	OCT	52525230
00450	46434325		BCI	2,OLLERITH
00452	12632562	MSG15	BCI	3, TEST COMPLE
00455	63255252		OCT	63255252
00456	00000000	C0	DEC	0
00457	00000011	D9	DEC	9
00460	00000012	D10	DEC	10
00461	00000110	D72	DEC	72
00462	77777774	DM4	DEC	-4
00463	77777773	DM5	DEC	-5
00464	77777772	DM6	DEC	-6
00465	77777700	DM64	DEC	-64
00466	00000077	O77	OCT	77
00467	00007777	O7777	OCT	7777
00470	52522525	BC	OCT	52522525
00471	00000063	HC	BCI	1,000T
00472	77777777	ONES	OCT	77777777
00473	00121212	CTABLE	BCI	10,0 1 2 3 4 5 6 7 8 9
00505	00001000	HTABLE	OCT	1000,400,200,100,40,20,10,4
00515	00000002		OCT	2,1,202,102,42,22,12,6
00525	00004000		OCT	4000,4400,4200,4100,4040,4020,4010,4004
00535	00004002		OCT	4002,4001,4202,4102,4042,4022,4012,4006
00545	00002000		OCT	2000,2400,2200,2100,2040,2020,2010,2004
00555	00002002		OCT	2002,2001,2202,2102,2042,2022,2012,2006
00565	00000000		OCT	0,1400,1200,1100,1040,1020,1010,1004
00575	00001002		OCT	1002,1001,1202,1102,1042,1022,1012,1006

00605	0	00	000000	TA	PZE	
00606	0	00	000000	TX	PZE	
00607	0	00	000000	SUM	PZE	
00610	0	00	000000	CARD	PZE	
00611	0	00	000000	TEMP	PZE	
00612	0	00	000000		PZE	
00613	0	00	000000		PZE	
			00337	END		EXIT&8

DONE PASS 2

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 3

Catalog No. 034002

IDENTIFICATION: Card Punch Test Program Package

AUTHOR: F. Valadez, SDS

ACCEPTED: 9 May 1963

COMPUTER
CONFIGURATION: SDS 920 or SDS 910 with SDS model 9156 card punch system.
For the verify test, an SDS model 9151 card reader and a typewriter are required.

PURPOSE: To provide an acceptance test for the SDS model 9156 card punch system.

PROGRAMMED
OPERATORS: None.

STORAGE: 172 words.

TIMING: N/A

USE: The test package contains two acceptance tests whose outputs can be verified on-line, plus a special service test that can be used for checkout. The acceptance tests are selected by breakpoint switch settings, while the service test is entered by executing a branch instruction in the C register.

The test package tape is self-loading by normal Fill procedure. After the tape has been loaded, the computer will halt. At this time, set the breakpoint switches as outlined under the description of the desired test, and clear the halt to start the test.

A. TEST 1 - SINGLE CHARACTER PER CARD

This test punches the entire Hollerith character set, one character per card. The same character is repeated in columns 1-80 of each card. The following punch signals are tested: SKS 12046, SKS 14046.

To select this test, set Breakpoint Switch 1; reset Breakpoint Switches 2, 3, and 4.

When the test is completed, the computer will halt. The test can be repeated by clearing the halt.

USE: (cont.) B. TEST 2 - ENTIRE CHARACTER SET ON CARD

This test punches the entire Hollerith character set on every card, in rotating fashion. Thus, every Hollerith character will be punched in every card column. The following punch signal is tested: SKS 14046.

To select this test, set Breakpoint Switch 2; reset Breakpoint Switches 1, 3, and 4.

When the test is completed, the computer will halt. The test can be repeated by clearing the halt.

C. SERVICE TEST

This test punches the pattern in the A register across the entire card. Every fourth column will contain the same information.

Before starting the test, enter the pattern to be punched in the A register. To start the test, reset Breakpoint Switch 1 and execute a BRU 342 (00100342) from the C register.

Punching will start and continue until Breakpoint Switch 1 is set. When the switch is set, the computer will halt. To restart the test, raise BP 1 and clear the halt.

To leave the service routine and return to the acceptance test, execute a BRU 200 (00100200) from the C register.

D. VERIFICATION

This test can be used to verify the cards punched by Test 1 or Test 2 only. There is no verification for the service test.

To use this test, first run either Test 1 or Test 2. When the punch test is completed, set Breakpoint Switch 3 in addition to the Breakpoint setting for the particular punch test. Load the cards into the reader and clear the halt. The information on the cards will now be read and checked for correctness.

If the information is all correct, the message "Verify Complete" will be typed. If an error is detected, "Verify Error" will be typed and the computer will halt. The last card read will be in error. It is not possible to continue the verify test. However, it can be restarted from the beginning by reloading the card deck and clearing the halt.

METHOD:

An initial card image is formed and stored in a buffer area. For the acceptance tests, the image is modified between cards; the service test does not alter the initial image.

The verify test generates and modifies the card images, and compares the results against the punched cards.

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM LISTING

Card Punch Test Program Package

Page 1 of 4

Catalog No. 034002

* CARD PUNCH TEST PROGRAM PACKAGE

*

* BP1 SET- SINGLE CHARACTER MODE.

* BP2 SET- ENTIRE CHARACTER SET

* BP3 SET- VERIFY MODE

*

00200	0	76	00403	START	LDA	DM64	
00201	0	35	00426		STA	DONE	
00202	0	40	20400		BPT	1	
00203	0	01	00210		RRU	TEST1	
00204	0	40	20200		BPT	2	
00205	0	01	00215		RRU	TEST2	
00206	0	00	00000		HLT		
00207	0	01	00200		BRU	START	
*							
00210	0	46	30003	TEST1	CLR		INITIALIZE SINGLE
00211	0	71	00402		LDX	DM20	CHARACTER TEST
00212	2	35	00454		STA	IMAGE&20,2	
00213	0	41	00212		BRX	*-1	
00214	0	01	00227		BRU	COM1	
*							
00215	0	71	00401	TEST2	LDX	DM16	INITIALIZE CHARACTER
00216	0	76	00407		LDA	CSTAR	SET TEST
00217	2	35	00450		STA	IMAGE&16,2	
00220	0	55	00406		ADD	CADD4	
00221	0	41	00217		RRX	*-2	
00222	0	71	00375		LDX	DM4	
00223	0	76	00407		LDA	CSTAR	
00224	2	35	00454		STA	IMAGE&20,2	
00225	0	55	00406		ADD	CADD4	
00226	0	41	00224		BRX	*-2	
*							
00227	0	40	20100	COM1	BPT	3	
00230	0	01	00310		BRU	VERIFY	
00231	0	76	00400		LDA	DM12	
00232	0	35	00425		STA	CARD	
00233	0	40	20200		BPT	2	OMIT BIT 13-TEST 2
00234	0	01	00237		BRU	*&3	
00235	0	40	12046		SKS	12046	BIT 13-PUNCH RUF RDY
00236	0	01	00235		RRU	*-1	
00237	0	40	14046		SKS	14046	BIT 12-PUNCH RDY
00240	0	01	00237		BRU	*-1	
00241	0	71	00402	COM2	LDX	DM20	
00242	0	02	00646		EOM	646	SELECT PUNCH
00243	2	12	00454		MIW	IMAGE&20,2	
00244	0	40	20010		BETW		
00245	0	01	00206		BRU	START&6	
00246	0	41	00243		BRX	*-3	
00247	0	02	14000		TOPW		COMPLETE ROW
00250	0	40	21000		BRTW		

00251	0	01	00250	BRU	*-1	
00252	0	40	20200	RPT	2	OMIT BIT 13-TEST 2
00253	0	01	00256	BRU	*&3	
00254	0	40	12046	SKS	12046	BIT 13-PUNCH BUF RDY
00255	0	01	00254	BRU	*-1	
00256	0	61	00425	MIN	CARD	
00257	0	53	00425	SKN	CARD	
00260	0	01	00262	BRU	*&2	
00261	0	01	00241	BRU	COM2	PUNCH NEXT ROW
00262	0	43	00271	BRM	ROTATE	
00263	0	61	00426	MIN	DONE	
00264	0	53	00426	SKN	DONE	TEST FOR DONE
00265	0	01	00267	BRU	*&2	
00266	0	01	00231	BRU	COM1&2	
00267	0	00	00000	COM5 HLT		
00270	0	01	00200	BRU	START	
*						
00271	0	00	00000	ROTATE PZE		CHANGE CARD IMAGE
00272	0	71	00402	LDX	DM20	
00273	0	76	00375	LDA	DM4	
00274	0	35	00424	STA	X2	
00275	2	76	00454	LDA	IMAGE&20,2	
00276	0	55	00404	ADD	1B5	
00277	0	67	20006	LCY	6	
00300	0	61	00424	MIN	X2	
00301	0	53	00424	SKN	X2	
00302	0	01	00304	BRU	*&2	
00303	0	01	00276	BRU	*-5	
00304	2	36	00454	STB	IMAGE&20,2	
00305	0	41	00273	BRX	ROTATE&2	
00306	0	02	20001	ROV		
00307	0	51	00271	BRR	ROTATE	
00310	0	71	00402	VERIFY LDX	DM20	
00311	0	40	12006	SKS	12006	CARD READER READY
00312	0	01	00311	BRU	*-1	
00313	0	02	02606	RCDW	1,4	
00314	0	75	00410	LDB	ONES	
00315	0	32	00427	WIM	TEMP	
00316	0	76	00427	LDA	TEMP	
00317	2	70	00454	SKM	IMAGE&20,2	COMPARE WORD
00320	0	01	00334	BRU	ERROR	
00321	0	41	00315	BRX	*-4	
00322	0	43	00271	BRM	ROTATE	
00323	0	61	00426	MIN	DONE	
00324	0	53	00426	SKN	DONE	TEST FOR DONE
00325	0	01	00327	BRU	*&2	
00326	0	01	00310	BRU	VERIFY	READ NEXT CARD
00327	0	02	02641	TYPW	1,4	DONE MESSAGE
00330	0	71	00377	LDX	DM6	
00331	2	12	00417	MIW	MSG1&6,2	

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00332 0 41 00331 BRX *-1
00333 0 01 00267 BRU COM5
00334 2 75 00454 ERROR LDB IMAGE&20,2 PRINT FRROR MSC
00335 0 02 02641 TYPW 1,4
00336 0 71 00376 LDX DM5
00337 2 12 00424 MIW MSC2&5,2
00340 0 41 00337 BRX *-1
00341 0 01 00267 BRU COM5

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*
* CARD PUNCH SERVICE ROUTINE.
* ENTER BY BRU 342
* EXIT BY BRU 200
* SET IMAGE IN A REGISTER BEFORE STARTING
* SET BPI TO STOP TEST
*

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00342 0 71 00402 SERV LDX DM20
00343 2 35 00454 STA IMAGE&20,2
00344 0 41 00343 BRX *-1
00345 0 71 00400 SERV1 LDX DM12
00346 0 37 00425 STX CARD
00347 0 40 12046 SKS 12046 RIT 13-PUNCH PUF RPY
00350 0 01 00347 BRU *-1
00351 0 40 14046 SKS 14046 RIT 12-PUNCH RPY
00352 0 01 00351 BRU *-1
00353 0 71 00402 SERV2 LDX DM20
00354 0 02 00646 EOM 646 SELECT PUNCH
00355 2 12 00454 MIW IMAGE&20,2
00356 0 41 00355 BRX *-1
00357 0 02 14000 TOPW
00360 0 40 21000 BRTW
00361 0 01 00360 BRU *-1
00362 0 40 12046 SKS 12046 RIT 13-PUNCH RUF RPY
00363 0 01 00362 BRU *-1
00364 0 61 00425 MIN CARD
00365 0 53 00425 SKN CARD
00366 0 01 00370 BRU *82
00367 0 01 00353 BRU SERV2
00370 0 40 20400 BPT 1
00371 0 01 00373 BRU *82
00372 0 01 00345 BRU SERV1
00373 0 00 00000 HLT
00374 0 01 00342 BRU SERV

```

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*
00375 77777774 DM4 DEC -4
00376 77777773 DM5 DEC -5
00377 77777772 DM6 DEC -6
00400 77777764 DM12 DEC -12
00401 77777760 DM16 DEC -16
00402 77777754 DM20 DEC -20
00403 77777700 DM64 DEC -64

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00404	01000000	1R5	DEC	1R5	
00405	01010101	CADD	OCT	01010101	
00406	04040404	CADD4	OCT	04040404	
00407	00010203	CSTAR	OCT	00010203	
00410	77777777	ONES	OCT	77777777	
00411	52525252	MSG1	OCT	52525252	
00412	65255131		RCI	4, VERIFY	COMPLETE
00416	52525252		OCT	52525252	
00417	52525252	MSG2	OCT	52525252	
00420	65255131		RCI	3, VERIFY	ERROR
00423	52525252		OCT	52525252	
00424	0 00 00000	X2	PZE		
00425	0 00 00000	CARD	PZE		
00426	0 00 00000	DONE	PZE		
00427	0 00 00000	TEMP	PZE		
00430	0 00 00000	IMAGE	PZE		
	00267		END	COM5	

DONE PASS 2

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 3

Catalog No. 044001

IDENTIFICATION: 15 KC Magnetic Tape Test Using Interrupt with Interlace Option

AUTHOR: Richard S. Resnick, SDS

ACCEPTED: 3 December 1962

COMPUTER CONFIGURATION: Any SDS 910 or SDS 920 with one 9140 or 9145 Magnetic Tape Unit.

PURPOSE: This program aids in testing the input/output capabilities of the 9140 or 9145 Magnetic Tape Unit using Interrupt and/or Interlace.

PROGRAMMED OPERATORS: None

STORAGE: Location 00033, locations 00200 thru 00377, and locations 01000 thru 02000 for data storage.

TIMING: Not applicable.

USE: The Interim Utility Package (II, III or IV), Catalog Numbers 090001 or 000011, must be in memory and is used to load this program. To load this program, the program is placed in the reader and the "F" key on the typewriter is depressed. Loading is then automatic.

This program tests the ability of the computer to output blocks of information to one tape unit by normal output methods using interrupt or by interlacing the information to the magnetic tape unit. The program also tests the ability of the computer to read information from the magnetic tape unit under the above-mentioned circumstances. The program essentially reads or writes the same word N times per block. The block length and word are initial parameters and do not change unless reloaded.

The Breakpoints have the following meaning:

Breakpoint 1 set = Repeat Test
Breakpoint 2 reset = Return Control to the Typewriter
Breakpoint 2 set = No Halt on Errors
Breakpoint 2 reset = Halt on errors
Breakpoint 3 set = Read (Input from Magnetic Tape)
Breakpoint 3 reset = Write (Output to Magnetic Tape)
Breakpoint 4 set = Interlace
Breakpoint 4 reset = No Interlace

USE: (Cont.)

The program operates under control of the Interim Utility Package. Several operations are performed by special subroutines. To perform an operation, the operator must address the desired operations subroutine from the keyboard by typing the operation's starting address, a star (*) and then a comma. The following is a list of the operation and their starting address:

LOAD A AND B = 'AAAAAAAA. BBBB BBBB.

This loads the A register with the desired block length and the B register with the desired data word.

SET-UP = 350* , (A = Number of words per block)
(B = word)

The program sets up the block length and word. It also initializes the other subroutines. The Pot constant is set up by this program.

CONTROL = 200* ,

This program performs the actual communication, one block per entry, in compliance with the Breakpoint settings.

REWIND = 320* ,

This program rewinds the tape to the beginning.

ERASE = 340* ,

This program erases 13 3/4 feet of tape.

BACK-UP = 330* ,

This program backs up one block per entry. Continuous back-up can be obtained by setting Breakpoint 1.

There are only two error halts:

Location 240 = Buffer Error

Location 272 = Data Error (A = Bits that failed)
(B = Location of error)

USE: (Cont.)

Example of Usage

'40. 12345671. 350 * , (Set BP 1, 4) 320 * ,
340 * , 200 * , (reset BP 1 after a few seconds)
(set BP 1, 3, 4) 330 * , (reset BP 1) 200 * , -

Set count to 32_{10} and word to 12345671.

Rewind tape to beginning.

Erase 13 feet.

Store 12345671, 32 words per block into magnetic tape
Interlace.

Back tape up.

Read magnetic tape unit and test results.

METHOD:

Not applicable.

**SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING**

PROBLEM: 15 KC MAGNETIC TAPE TEST USING
INTERRUPT WITH INTERLACE OPTION

PROGRAMMER: RICHARD S. RESNICK

Catalog No. 044001

PAGE 1 **of** 4

DATE 12/3/62

LOCATION	INSTRUCTION	REMARKS
00033* 200*	BRM 00315.	
	SKS 20100.	READ OR WRITE?
	BRU 00245.	READ - BRANCH TO READ
	LDB 00326.	WRITE
	STB 00232.	SET UP - WRITE PROGRAM
	LDB 00337.	
	STB 00241.	
	LDA 00371.	
210*	STA 00374.	SET UP WORD FOR IMAGE
	LDA 00367.	SET UP WRITE - EOM
	LDB 00347.	SET UP IW1 FOR WRITE
	STB 00031.	
	SKS 20040.	INTERLACE?
	BRU 00256.	YES - BRANCH TO INT
	EOR 00233.	REMOVE INTERLACE BIT FROM EOM
	STA 00231.	STORE EOM WORD
220*	LDX 00375.	
	LDA 00374.	PREPARE IMAGE
	STA 40372.	
	BRX 00222.	
	LDX 00375.	
	SKS 10410.	
	BRU 00230.	WAIT FOR MAG TAPE READY
	BRU 00225.	
230*	EOM 20002.	ENABLE INTERRUPT
	HLT 40000.	
	EOM 20004.	DISABLE INTERRUPT
	SKS 20010.	
	SKS 20200.	TEST BUFFER ERROR
	BRU 00241.	

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Catalog No. 044001
PAGE 2 **of** 4
DATE 12/3/62

LOCATION	INSTRUCTION	REMARKS
240*	HLT 60000.	BUFFER ERROR HALT
	SKS 20400.	REPEAT TEST ?
	BRU 00220.	YES -
	BRR 00200.	NO - RETURN CONTROL TO ILP4
	LDB 00325.	
	STB 00232.	SET UP READ PROGRAM
	LDB 00327.	
250*	STB 00241.	SET UP CHECK PROGRAM
	CLR 30003.	
	STA 00374.	SET UP ZERS FOR IMAGE
	LDA 00366.	SET UP READ - EOM
	LDB 00346.	SET UP IW1 FOR READ
	BRU 00213.	
	LDB 00317.	SET UP INTERLACE COMMAND
	STB 00232.	
260*	BRU 00217.	
	LDA 00276.	INITIATE COUNTER
	STA 00373.	
	LDX 00375.	
	LDB 00373.	ADDRESS IN B
	LDA 00071.	WORD IN A
	EOR 40372.	
	SKA 00370.	TEST WORD
270*	SKS 20200.	
	BRU 00273.	
	2 HLT 01000.	A = ERROR BITS
	MIN 00373.	B = LOCATION
	BRX 00264.	
	BRU 00242.	
	HLT 01000.	
	BRX 00276.	WAIT FOR IW1 INTERRUPT

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: 15 KC MAGNETIC TAPE TEST USING
INTERRUPT WITH INTERLACE OPTION
PROGRAMMER: RICHARD S. RESNICK

Catalog No. 044001
PAGE 3 of 4
DATE 12/3/62

LOCATION	INSTRUCTION	REMARKS
300*	HLT 00000. BRU 00234. HLT 00000. BRX 00302. EOM 14000. HLT 00000. BRU 00234.	WAIT FOR IW1 INTERBUPT WAIT FOR IW1 INTERBUPT FORCE LAST CHAR THRU BUFFER WAIT FOR IW2 INTERRUPT
310*	MIW 40372. BRU 40307.	OUTPUT
.	WIM 40372. BRU 40312.	INPUT
.	BRU 40315. POT 00376.	IW2 UNCOCK AND RETURN
320*.	EOM 14010. SKS 10410. BRR 00320. BRU 00322. BRU 00276. BRU 00302. BRU 00261.	REWIND TAPE UNIT COMMAND TEST FOR LEADER
330*.	EOM 07630. SKS 21000. BRU 00332. SKS 20400. BRU 00331. BRR 00330. NOP 00000.	REVERSE COMMAND TEST FOR END OF BLOCK REPEAT YES - CONTINUE

SCIENTIFIC DATA SYSTEMS
SDS 900 SERIES PROGRAM LISTING

PROBLEM: 15KC MAGNETIC TAPE TEST USING
INTERRUPT WITH INTERLACE OPTION

PROGRAMMER: RICHARD S. RESNICK

Catalog No. 044001
PAGE 4 of 4
DATE 12/3/62

LOCATION	INSTRUCTION	REMARKS
340*.	LDX 00240. EOM 03670. MIW 00377. BRX 00343. BRR 00340. BRM 00312. BRM 00307.	ERASE COMMAND ERASE 13 3/4 FEET
350*.	STB 00371. ADD 00272. STA 00372. SUB 00272. ABC 20005. RCY 20012. ADD 00276.	FROM INDEX LO + N WORD
360*	STA 00376. RCY 20016. EOR 00370. SUB 00370. STA 00375. BRR 00350. EOM 43610. EOM 43650.	FORM POT WORD FORM - N
370* /‡	777 77777.	

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 10

Catalog No. 044004

IDENTIFICATION: Multi-Magnetic Tape System Exerciser

AUTHOR: A. W. England, SDS

ACCEPTED: 24 June 1964

COMPUTER CONFIGURATION: All 920, 925, and 930 systems, or any 910 systems with a typewriter, which have one to sixteen tape units attached to the W and/or Y buffers. No interlace is required and the tapes may be of any density and speed within the limitations of the buffer to which they are attached.

PURPOSE: This program is designed to exercise from one to sixteen tape units by first writing random numbers in random length records on all tapes under test and then reading these records back and comparing them with the numbers written. An attempt is made to tabulate and output all useful information concerning the errors made, if any, the mode of operation of each unit, and the number of passes over the tape.

STORAGE: The program occupies the first 1155 words of memory. The remaining memory may be used for test record storage.

TIMING: The program requires approximately 20 minutes to write or read a full reel (2400 feet) of tape.

USE:

- 1.0 LOADING
Place tape in reader and FILL. When loading is complete the light on the typewriter will light if no loading error occurred.
- 2.0 KEYBOARD CONTROL
When the keyboard light is on, the operator has control over the program. By actuating various keys he may set the test parameters, inspect results or start the exerciser test running.
 - 2.1 REGAINING KEYBOARD CONTROL
Control may be returned to the keyboard mode at any time by moving the RUN-IDLE-STEP switch to IDLE, pressing the START button, and moving the switch first to STEP then to RUN.

USE: (Cont)

3.0 CONTROL FUNCTIONS

The following list contains the call letters for the various functions which the program will perform. These may be typed anytime the typewriter light is lit.

3.1 SELECT UNITS, "U"

The units to be exercised are selected by first typing the letter "U" followed by the several unit numbers separated by commas and finally a carriage return. After the last unit number followed by a comma is entered a carriage return must be given to terminate the unit select operation. Units on the W buffer are numbered 0-7 and on the Y buffer 10-17₈.

3.2 SET STARTING RANDOM NUMBER, "N"

The initial random number is set by first typing the octal number desired (up to 8 digits) and then the letter N. The number being typed can be set to zero by typing a carriage return.

3.3 SET MAXIMUM FILE LENGTH, "M"

The maximum number of records in the test file is set by typing the desired number of records in octal followed by the letter M. If the entire 2400 foot reel is to be written a maximum count of 10000₈ or greater should be sufficient.

3.4 SET MAXIMUM RECORD LENGTH, "L"

The maximum number of words in a record is set by typing the limit in octal followed by the letter L. If the specified maximum is less than or equal to 8 or greater than the maximum memory available then the maximum length is set equal to the memory available.

3.5 MODE SELECT

The recording mode, either BCD or Binary is selected by typing the appropriate letter.

3.5.1 Select Binary Mode, "B"

Typing the letter B will cause the appropriate EOM instructions to be converted to the binary mode of operation.

USE: (Cont) 3.5.2 Select BCD Mode, "D"

Typing the letter D will cause the EOM instructions to be set for BCD operation.

3.6 SELECT OUTPUT MEDIA

The output of the various messages and counters during the operation of the program can be on either the on-line typewriter or on paper tape for off-line listing. This is controlled by typing the appropriate letter before starting.

3.6.1 Select Typewriter Output, "T"

The typewriter is selected by typing the letter T.

3.6.2 Select Punch Output, "P"

The punch is selected by typing the letter P.

3.7 INITIATE TAPE OPERATION

After the appropriate parameters have been set the tape exercise operation may be initiated. There are three ways in which this may be done. If nothing has been recorded then the exercise must be begun with a START WRITE. However, once a file of information is written on tape and the program is stopped the other two starts can be used.

3.7.1 Start Write, "S"

To begin the exercise operation, type the letter S. The program will rewind all units and start to write a random number test file on the selected units.

3.7.2 Continue Operation, "C"

Once the exercise operation has been stopped with Breakpoint 1 (see section 4.1) it can be resumed from the point at which it was stopped by typing the letter C.

3.7.3 Restart Read, "R"

If during a read pass the program is stopped and the operator would like to reread the file from the beginning he can type the letter R to restart the read pass.

3.8 OUTPUT OPERATIONAL STATUS, "O"

The operator can inspect the status of the operation at anytime by stopping the program with Breakpoint 1 (see section 4.1) and typing the letter O. The program will then type out the status of the exercise operation as follows:

USE: (Cont)

3.8.1 Type of Pass

It types READ or WRITE depending on the type of pass in progress.

3.8.2 Mode of Operation

It then types the mode of operation, either BINARY or BCD.

3.8.3 Unit

The UNIT NO. of the tape unit currently being addressed is typed.

3.8.4 Program Counters

After this information the program will type a table of 17 counters each identified by a three or four character symbol. These symbols and their definitions follow:

MRC Maximum Record Count. This is the octal number entered with the M key at the start of the exercise operation.

MRL Maximum record length currently being used.

WRC Write Record Count. If in a write pass this indicates the number of records written. In a read pass it indicates the total number written in the previous write pass.

RRC Read Record Count. This indicates the number of records read during a read pass.

WPC Write Pass Count. The number of write passes completed.

RPC Read Pass Count. The number of read passes completed.

WEC Write Error Count. The number of write errors that have occurred.

RWEC Rewrite Error Count. This number of rewrite errors.

PREC Permanent Read Error Count. The records that were read bad 10 times.

CPEC Character Parity Error Count. The number of character parity errors that have occurred since the start of the exercise.

USE: (Cont)	LPEC	Longitudinal Parity Error Count. The number of longitudinal parity errors that have occurred. For each read try only one character or longitudinal parity can be counted and character parity has priority.
	WCEC	Word Count Error Counts. The number of word count errors that have occurred. A word count error occurs if the record read is longer or shorter than the record expected.
	CH1 CH2 CH3 CH4 CH5 CH6	Errors in Channels 1-6. Channel 1 is the most significant bit, channel 6 the least. These counters are also output whenever a read error occurs if Breakpoint 2 is RESET. After a read error output they are cleared.

4.0 BREAKPOINT SWITCHES

The four Breakpoint switches are used to change the status of the program while it is running. These functions are as follows:

4.1 BREAKPOINT 1

RESET: Normal

SET: Stop operation. After almost every tape operation there is a STOP point. If Breakpoint 1 is set the program will mark its place and return to the keyboard control mode. Operation can be continued by typing the letter C.

4.2 BREAKPOINT 2

RESET: Output counters and messages whenever the normal output situation occurs.

SET: Skip the output of messages and counters. This will inhibit all output except the OUT OF SYNC message and the FILE PROTECT ON message.

4.3 BREAKPOINT 3

RESET: At the end of a read pass go on to another write with new random numbers.

SET: At the end of a read pass go back and reread the same file again.

4.4 BREAKPOINT 4

RESET: Run without halts.

SET: Halt on a write error or at the end of a read pass. Clearing these halts will allow the program to continue.

USE: (cont.) 5.0 MESSAGES

The program will type or punch status messages at various times in the operation of the exercise. These are described below:

5.1 END OF PASS

At the end of a write or read pass the output will be either WRITE or READ, PASS DONE. This is followed by a carriage return and the following two lines:

```
WRITES  READS  WRITE ERR  REWRITES  BAD READS
aaaaaaaa bbbbbbbb cccccccc dddddddd eeeeeeee
```

where the a's represent the number of write passes in octal, the b's the number of read passes, the c's the number of write errors which have occurred, the d's the number rewrite errors, and the e's the number of records which were read erroneously 10 times.

5.2 REWRITE ERROR

If a write error is detected the program erases backward over the record and attempts to rewrite it. If this second attempt is also in error the program outputs the following counter titles:

```
WRITE PASS  RECORD NO.  WRITE ERRS  REWRITE ERRS
```

This is followed on the same line by the mode of operation (Binary or BCD) and the unit number. On the next line below the appropriate title it outputs the write pass count, the write record number count, the write error count and the rewrite error count. All counts are in octal.

5.3 READ ERROR

If a read error occurs the program rereads the record nine more times and then outputs the read pass, record number, mode, and unit number. This is followed by a carriage return, the message, READ ERROR another carriage return and then nine, eight-octal-digit counters which represent the following quantities (from left to right): character parity error count, longitudinal parity error count, word count error count, errors in channel 1, channel 2, etc., to channel 6. On the next line the program outputs a good or bad message for each of the 10 reads. This consists of the letter G if the read was correct or B if the read was incorrect.

USE: (cont.)

For example:

B G G G B G G G G G

Indicates that the first and fifth reads were bad and all others were good.

5.4 READ PASS OUT OF SYNC

The first word of every record is the number of records preceding it on the tape. When each record is read, the program compares this first word with the read record count. If they disagree the program backspaces and rereads the record a second time, if they still disagree then the difference between them is computed and the program spaces over as many records as necessary to position itself in front of the correct record. If the first word of this record does not agree with the read record count after two attempts the program ends the read pass and outputs the following. As in a read error it outputs the read pass count, read record number, mode, density and unit number. This is followed by this message:

```
READ PASS ABORT, OUT OF SYNC.
aaaaaaa      bbbbbbb
```

where the a's represent the first word of the first record read that did not agree with the read record count, and the b's represent the first word of the record read after spacing to what should have been the correct record. The program then goes to the end of read pass section where the end of pass output will be produced and from there on to another write or reread pass.

If a tape mark or the load point was encountered when spacing, the program terminates the read pass and outputs TAPE MARK before the other outputs. If it was the load point which was encountered it also outputs LOAD POINT. In either case the two words a and b will be the same since only one record was read.

5.5 FILE PROTECT ON

Before the program attempts to write on a tape it tests the file protect for that unit. If the file protect should be on, the program outputs: FILE PROTECT ON (Mode) UNIT NO. n. and returns to the keyboard mode.

METHOD:

1.0 WRITING

At the start of the write pass all units are rewound. The program then sets the tape control table for the lowest numbered unit and waits for it to be ready. As soon as this unit is ready a check is made to see if the tape is at

METHOD: (cont.)

the loadpoint. If it is not, another rewind is given and the program waits until it is ready and at the load point. A three inch section of tape is erased before the first random number record is written. After writing this record on the first unit the control table is set to the next higher numbered unit and the record is written again. This continues until a record has been written on all units under test. The program then generates a new record of random numbers and starts writing this on all units.

1.1 WRITE ERROR

If a write error occurs the program erases backward to the front of this record and attempts to rewrite it. If this second attempt is also in error then the program outputs the rewrite error message. It then erases backward over the record again, erases it forward and attempts to write the record again on a new section of tape. An error here is considered a new write error and the process continues until a correct write is made.

1.2 END OF PASS

The write pass is concluded if one of two conditions occurs: Either the write record count reaches the maximum record count or an end of reel is encountered on any tape under test. When one of these occurs the program writes an end of file on all units and rewinds them. It then outputs the end of pass message and proceeds to the read pass.

2.0 READING

A read pass is similar to a write except that the program reads each record into memory and compares it with the random numbers which it regenerates for each read. The first record must be read starting from the load point. This insures that the tape is always positioned properly for the start of the pass.

2.1 READ ERRORS

When a read error occurs the program will always reread the record nine more times for a total of ten attempts regardless of whether or not a subsequent read was correct. It then outputs the results of these reads. Several conditions can cause a read error.

2.1.1 Character Parity Errors

The program counts a character parity error as any buffer error which occurs before the gap is reached.

METHOD: (Cont)

2. 1. 2 Longitudinal Parity Error

If no character parity errors have occurred before the gap is reached and the buffer error is on after the tape stops, the program counts a longitudinal parity error.

2. 1. 3 Word Count Error

A word count error is defined as a record which was not of the length expected. The program tests for this in three ways. If more words than expected were read the read routine falls out of the loop too soon. The program also checks to see if the read loop should detect the end of record before expected. The third test is based on the fact that the program always writes records that consist of a multiple of four characters. Therefore, if the buffer contains anything other than zero at the end of the read an error has occurred.

2. 2 READ SYNCHRONIZATION

When each record is read the first word is compared against the program record count. If they disagree it means that the program and tape are no longer synchronized. To guard against a read error causing the disagreement, the program backspaces and reads the record again. If they still disagree then the program computes the number of records to be spaced over in order to reach the desired record and moves to that point. It reads the new record and again checks the first word. If this word disagrees with the record count and a second read attempt does not correct the disagreement then the program aborts the read pass and outputs the appropriate message. If a tape mark or the load point is encountered while spacing to the correct position the pass is aborted without further read attempts.

2. 3 END OF FILE

If the program should detect the buffer ready after the first word is read then a check for end of file is made. If the ready condition was caused by the reading of a tape mark then the read pass is complete and appropriate messages are output. If there is no tape mark character then the program assumes that the tape mark was read erroneously and terminates the read pass anyway and outputs an END OF FILE READ ERROR message.

METHOD: (Cont)

3.0 BCD MODE

In the BCD mode random numbers are generated and written the same as in binary. However, on the read pass all non compares between the generated number and the number from tape are checked to see if they are caused by the 12 to 00 conversion. This occurs because both the character 00 and the character 12 will be written on tape as a 12 but this character will always be read into memory as a 00.

```

CONTROL =
CONTROL =
CONTROL =
  SAMPE
  SAMPE
  SAMPE
CONTROL =
  SAMPE
  SAMPE
CONTROL =
  SAMPE
  SAMPE
CONTROL =
  SAMPE
  SAMPE
CONTROL =
CONTROL =
CONTROL =
  UPDATE 1-1223
  DELETE 2
  REPLACE 74, 134, 227
  BRU CLR
  LDB EIGHT
  SKG EIGHT
  REPLACE 617, 729-31/6
  PAGE
  LDA T1
  REPLACE 990
  MIW EFREM+6,2
  INSERT 1048/2, 1049
  RSH 6
  MIW T2
  ENDUPDATE
  FINISH
  EXIT
  010
  IS SPECIFIED MAX > 3
  GET (BUFFER) AT EOR.

```


910/920/925/930 MULTI-MAGNETIC TAPE SYSTEM EXERCISER
W OR Y BUFFER. NO INTERLACE REQUIRED

00200	C	76	00252	MCO0	LDA	68MCO1
00201	C	95	00001	CLR	STA	1
00202	C	46	00003	MCO1	CLR	ACCJM
00203	C	35	00245		STA	
00204	C	02	00004		DIR	
00205	C	02	00100		DISY	
00206	C	02	02001		RKEW	1.1
00207	C	32	00012		WIM	TI
00210	C	75	00012		LDR	TI
00211	C	66	00011		RCY	9
00212	C	75	02152		LDR	CI
00213	C	71	02171		LDR	CI8
00214	2	70	00237		LDR	CTE.2
00215	C	41	00214		SKM	*-1
00216	C	02	00000		BRX	
00217	2	01	40237		DISW	CTE.2
00220	C	22	01307		BRU*	
00221	C	23	00246		B	800
00222	C	24	01305		C	000
00223	C	43	01323		D	000
00224	C	44	01302		L	000
00225	C	45	01277		M	M00
00226	C	46	01170		N	N00
00227	C	47	01264		O	000
00230	C	51	01327		P	P00
00231	C	62	00476		R	R00
00232	C	63	01251		S	S00
00233	C	64	00254		T	T00
00234	C	52	00202		U	U00
00235	C	12	00204		CR	CLK
00236	C	72	00204		SF	MCO1
					TAB	MCO1

-15

CONTROL CHARACTER TABLE

	CTE	PZE	DIGIT	CONTROL TABLE END
00237	*			
00240	*			
00241	DIGIT	LCY	6	ACCUMULATE DIGIT
00242		LDB	ACCUM	
00243		LCY	3	
00244		STR	ACCUM	
00245		BRU	MCOI	
00246	*			
00247	ACCUM	PZE		

50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88					
		00246	00247		00250	00251	00252	00253			00254	00255	00256	00257	00260	00261	00262	00263	00264	00265	00266	00267	00270		00271	00272	00273	00274	00275	00276	00277		00300	00301	00302	00303							
	*	C00	C51		C00	C40	C01	C51			C76	C35	C02	C46	C35	C75	C32	C76	C70	C01	C76	C35	C01		C70	C01	C76	C14	C35	C61	C01		C66	C76	C67	C01							
		DISW	STOP		PZE	BPT	BRU			U00	LDA	STA	RKSW	CLA	STA	LDB	WIM	LDA	SKW	BRU	LDA	STA	BRU		SKM	BRU	LDA	ETR	STA*	MIN	BRU		RSH	LDA	LSH	BRU							

RESET UNIT NO. TABLE LIMIT

READ CHAR

CHARACTER = C/R

NO

YES

SET UNIT NO. TABLE INDEX

EXIT

COMMA

NO

YES

107

SAVE UNIT NO.

ADVANCE LIMIT

PACK CHARACTER

=673

UNIT NUMBER	UNIT NO.	TABLE BEGINNING	UNIT NO.	TABLE INDEX	UNIT NO.	TABLE LIMIT	UNIT NO.	TABLE
00304	C 00	00000	UN	PZE	UNT		32	
00305	C 00	00310	UNT	PZE	UNT			
00306	C 00	00310	UNTI	PZE	UNT			
00307	C 00	00310	UNTL	PZE	UNT			
00310		00040	* UN	BSS				
00350	C 00	00000	* UN					
00351	C 76	00307	* SU00	PZE	UNTL			
00352	C 73	00306		LDA	UNTI			
00353	C 01	00436		SKG	SU01			
00354	C 61	00350		BRU	SU00			
00355	C 76	40306		MIN	UNTI			
00356	C 35	00304	SU02	LDA*	UN			
00357	C 71	00475		STA	UN			
00360	2 76	00475		LDX	UBSTL			
00361	C 14	02201		LDA	UBSTL*2			
00362	C 16	00304		ETR	C26 =077777670			
00363	2 35	00475		MRC	UN			
00364	C 41	00360		STA	UBSTL*2			
00365	C 76	00304		BRX	*-4			
00366	C 14	02176		LDA	UN			
00367	C 35	00012		ETR	C23			
00370	C 75	02176		STA	T1			
00371	C 70	00460		LDB	C23			
00372	C 01	00374		SKM	RTS			
00373	C 01	00434		BRU	*+2			
00374	C 76	00460		BRU	SU99			
00375	C 14	02202		LDA	T0P			
00376	C 16	00012		ETR	C27 =077777677			
00377	C 35	00460		MRC	T1			
00400	C 46	00003		STA	T0P			
00401	C 76	00012		CLR	T1			
00402	C 17	02176		LDA	C23			
00403	C 67	00012		EOR	10			
00404	C 35	00013		LSH	T2			
00405	C 71	00457		STA	BMTL			
00406	2 76	40457		LDX	BMTL*2			

UNIT NO. TABLE BEGINNING
 UNIT NO. TABLE INDEX
 UNIT NO. TABLE LIMIT
 UNIT NO. TABLE
 STEP UNIT NO. SUBR.
 END OF TABLE
 YES
 NO
 UPDATE ALL EOM'S AND SKS'S WHICH REQUIRE BOTH A UNIT ADDRESS AS WELL AS A BUFFER SELECTION.
 0100
 0100
 SEE IF BUFFER SELECTION HAS CHANGED
 YES
 NO
 UPDATE ANY EOM'S AND SKS'S WHICH REQUIRE ONLY BUFFER SELECTION IN BIT POSITION 17.
 0100 CHANGE BIT FOR MIB. BIM SELECT
 UPDATE ALL BIM'S AND MIB'S TO

00407	C 14	02203	128	ETR	C28	=077577777	OPERATE 6N EITHER CHANNEL
00410	C 16	00013	129	MRG	T2		
00411	2 35	40457	130	STA*	BMTL.2		
00412	0 41	00406	131	BRX	*-4		
00413	0 76	00012	132	LDA	T1		010
00414	0 25	02216	133	LDB	EIGHT		Y BUFFER
00415	0 72	02176	134	SKA	C23		YES
00416	0 67	00001	135	LSH	1		NO. SAVE CONST. FOR BET
00417	0 36	00012	136	STR	T1		SAVE CONST. FOR BRT
00420	0 67	00006	137	LSH	6		UPDATE THE BET INSTRUCTION
00421	0 36	00013	138	STR	T2		77770000
00422	0 76	00441	139	LDA	BET		
00423	0 14	02200	140	ETR	C25		
00424	0 16	00012	141	MRG	T1		
00425	0 35	00441	142	STA	BET		
00426	0 71	00447	143	LDX	BRTL		
00427	2 76	40447	144	LDA*	BRTL.2		UPDATE ALL BRT INSTRUCTIONS.
00430	0 14	02200	145	ETR	C25		77770000
00431	0 16	00013	146	MRG	T2		
00432	2 35	40447	147	STA*	BRTL.2		
00433	0 41	00427	148	BRX	*-4		
00434	0 61	00306	149	MIN	UNITI		ADVANCE UNIT NO. TABLE INDEX
00435	0 51	00350	150	BRR	SU00		EXIT
			151				
00436	0 76	00305	152	LDA	UNT3		END OF TABLE
00437	0 35	00306	153	STA	UNITI		RESTORE INDEX
00440	0 01	00355	154	BRU	SU02		
			155				
			156				
00441	0 40	20010	157	BET	BETW		BUFFER ERROR TEST
			158				
			159				
			160				
			161				
00442	0 00	00641	162	BRT	BRT1		THIS TABLE CONTAINS THE ADDRESSES
00443	0 00	01057	163		BRT2		OF ALL THE BRT INSTRUCTIONS USED IN
00444	0 00	01361	164		BRT3		THE PROGRAM
00445	0 00	01365	165		BRT4		
00446	0 00	01367	166		BRT5		

THIS TABLE CONTAINS SELECTION TABLE.

BUFFER READY SELECTION TABLE.

THIS TABLE CONTAINS THE ADDRESSES
OF ALL THE BIM AND MIA INSTRUCTIONS
USED IN THE PROGRAM

Address	Code	Instruction	Register	Mode	Other
167	00447	BRTL	PZE	C 00	77773
168		* W/YIM AND MIW/Y SELECTION TABLE.			
169		* OF ALL THE BIM AND MIA INSTRUCTIONS			
170		* USED IN THE PROGRAM			
171		* BMT			
172	00450	PZE	BMT1	C 00	30645
173	00451	PZE	BMT2	C 00	30655
174	00452	PZE	BMT3	C 00	30703
175	00453	PZE	BMT4	C 00	31360
176	00454	PZE	BMT5	C 00	31364
177	00455	PZE	BMT6	C 00	31375
178	00456	PZE	BMT7	C 00	31663
179	00457	PZE	BMT--*	C 00	77771
180		* BMTL			
181		* BUFFER SELECTABLE ONLY TABLE			
182		* RTS	RTSW		
183	00460	TOP	RTS	C 02	14000
184		* EQU			
185		* UNIT AND BUFFER SELECTABLE TABLE			
186		* UBST	EQU		
187		WT	WTBW	C 02	30461
188	00461	RT	RTBW	C 02	33650
189	00462	WEDF	WTDW	C 02	33610
190	00463	ET	ETW	C 02	32050
191	00464	ETR	ETRW	C 02	33670
192	00465	SF	SFBW	C 02	37670
193	00466	SR	SRAW	C 02	33630
194	00467	REW	REWW	C 02	37630
195	00470	TRT	TRTW	C 02	14010
196	00471	FPT	FPTW	C 40	10410
197	00472	BTT	BTTW	C 40	14010
198	00473	ETT	ETTW	C 40	12010
199	00474	UBSTL	PZE	C 40	11010
200	00475	* UBST--*		C 00	77764
201		* S00	CLR		
202		* LDX	ECTL		
203		* START			
204	00476	CLEAR	COUNTERS	C 46	30003
205	00477			C 71	32127

00500	2	35	02127	206	STA	ECTL*2
00501	C	41	00500	207	BRX	**1
00502	C	76	02101	208	LDA	IRN
00503	C	35	02102	209	STA	IRN
00504	C	71	00027	210	LDX	ADRMSK
00505	C	76	00026	211	LDA	ONES
00506	2	35	00000	212	STA	0*2
00507	2	72	00000	213	SKA	0*2
00510	C	01	00513	214	BRU	S02
00511	2	77	34000	215	EAX	-2048*2
00512	C	01	00506	216	BRU	S01
				217		
				218	STX	T1
00513	C	37	00012	218	LDA	T1
00514	C	76	00012	219	SUB	IMAGC
00515	C	54	00564	220	STA	MMRL
00516	C	35	00556	221	SKG	SMRL
00517	C	73	00557	222	STA	SMRL
00520	C	35	00557	229	ABC	
00521	C	46	20005	224	LDA	SMKL
00522	C	76	00557	225	SKG	EIGHT
00523	C	73	02216	226	XAB	
00524	C	46	00014	227	STA	MRL
00525	C	35	00560	228	BRU	W00
00526	C	01	00573	229	BRU	W00
00527	C	01	00573	230		

COMPUTE MEMORY SIZE

SAVE MEMORY MAX RECORD LENGTH
 IS MEMORY MAX > SPECIFIED MAX
 NO, DROP SPECIFIED
 YES

IS SPECIFIED MAX > 8
 NO, USE MEMORY MAX
 SAVE MAXIMUM RECORD LENGTH

```

231          *          *          *          *          *          *          *          *          *          *
232          *          *          *          *          *          *          *          *          *          *
233          *          *          *          *          *          *          *          *          *          *
234          *          *          *          *          *          *          *          *          *          *
235          *          *          *          *          *          *          *          *          *          *
236          *          *          *          *          *          *          *          *          *          *
237          *          *          *          *          *          *          *          *          *          *
238          *          *          *          *          *          *          *          *          *          *
239          *          *          *          *          *          *          *          *          *          *
240          *          *          *          *          *          *          *          *          *          *
241          *          *          *          *          *          *          *          *          *          *
242          *          *          *          *          *          *          *          *          *          *
243          *          *          *          *          *          *          *          *          *          *
244          *          *          *          *          *          *          *          *          *          *
245          *          *          *          *          *          *          *          *          *          *
246          *          *          *          *          *          *          *          *          *          *
247          *          *          *          *          *          *          *          *          *          *
248          *          *          *          *          *          *          *          *          *          *
249          *          *          *          *          *          *          *          *          *          *
250          *          *          *          *          *          *          *          *          *          *
251          *          *          *          *          *          *          *          *          *          *
252          *          *          *          *          *          *          *          *          *          *
253          *          *          *          *          *          *          *          *          *          *
254          *          *          *          *          *          *          *          *          *          *
255          *          *          *          *          *          *          *          *          *          *
256          *          *          *          *          *          *          *          *          *          *
257          *          *          *          *          *          *          *          *          *          *
258          *          *          *          *          *          *          *          *          *          *
259          *          *          *          *          *          *          *          *          *          *
260          *          *          *          *          *          *          *          *          *          *
261          *          *          *          *          *          *          *          *          *          *
262          *          *          *          *          *          *          *          *          *          *
263          *          *          *          *          *          *          *          *          *          *
264          *          *          *          *          *          *          *          *          *          *
265          *          *          *          *          *          *          *          *          *          *
266          *          *          *          *          *          *          *          *          *          *
267          *          *          *          *          *          *          *          *          *          *
268          *          *          *          *          *          *          *          *          *          *
269          *          *          *          *          *          *          *          *          *          *
00530      C 00 00000
00531      C 76 02104
00532      C 14 00027
00533      C 73 00560
00534      C 01 00537
00535      C 54 00560
00536      C 01 00532
00537      C 73 02215
00540      C 55 02215
00541      C 35 00511
00542      C 55 00511
00543      C 35 00553
00544      C 46 30003
00545      C 54 00561
00546      C 35 00562
00547      C 71 00572
00550      Z 76 40572
00551      C 14 02206
00552      C 16 00563
00553      Z 35 40572
00554      C 41 00550
00555      C 51 00530

00556      C 00 00000
00557      C 00 00000
00560      C 00 00000
00561      C 00 00000
00562      C 00 00000
00563      C 00 00000
00564      C 00 02234

00565      C 00 00612

```

COMPUTE RECORD LENGTH SUBROUTINE.

PAGE

```

PZE
LDA
ETR
SKG
BRU
SUB
BRU
SKG
ADD
STA
ADD
STA
CLR
SUB
STA
LDX
LDA*
ETR
MRG
STA*
BRX
BRP

```

CRLS

```

SAVE RECORD LENGTH
SAVE RECORD END ADDRESS

```

77740000

```

MEMORY MAX RECORD LENGTH
SPECIFIED MAX RECORD LENGTH
MAXIMUM RECORD LENGTH
RECORD LENGTH
NEGATIVE RECORD LENGTH
RECORD END ADDRESS
IMAGE CONSTANT

```

RECORD END ADDRESS TABLE.

W043

00566	C	00	00695	270	PZE	BMT2
00567	C	00	01360	271	PZE	BMT4
00570	C	00	01364	272	PZE	BMT5
00571	C	00	01430	273	PZE	R12A
00572	C	00	77773	274	REATL	REAT--*

00573	1 76 00203	RPF	RPPF	START WRITE PASS.	R(RPPF)	
00574	0 43 01036	BRM	RWAL		REWIND ALL UNITS	
00575	1 77 00200	SPF	SBF			
00576	1 76 00201	RPF	ETF			
00577	0 46 00003	CLR			CLEAR WRITE RECORD COUNT	
00600	0 35 02107	STA	WKC			
00601	0 76 02102	LDA	IRN			
00602	0 35 02104	STA	RRN			
00603	0 43 00530	BRM	CRLS		GET RECORD LENGTH	
00604	0 76 02107	LDA	WKC			
00605	0 35 02294	STA	IMAG			
00606	0 46 00003	CLR				
00607	0 71 00562	LDX	NRL		LOAD NEGATIVE RECORD LENGTH	
00610	0 76 02104	LDA	RRN		GENERATE RANDOM NUMBERS	
00611	0 41 00612	BRX	**1			
00612	2 35 00000	STA	**2			
00613	0 67 00013	LSH	11			
00614	0 55 40612	ADD*	W04A			
00615	0 55 02105	ADD	KK			
00616	0 41 00612	BRX	W04A			
00617	0 35 02104	STA	RNR			
00620	1 76 00212	RPF	WEF		R(WRITE ERROR FLAG)	
00621	1 76 00204	RPF	SWI		R(SWI)	
00622	0 43 01062	BRM	TRSUBR		TAPE READY	
00623	0 23 00472	EXU	FPT		FILE PROTECT ON	
00624	0 01 01021	BRU	FPE		YES	
00625	0 33 00212	SKN	WEF		NO. PREVIOUS WRITE ERROR	
00626	0 53 00200	SKN	SBF		NO. IS THIS THE FIRST BLOCK	
00627	0 01 00652	BRU	W06		YES, NO	
00630	0 23 00473	EXU	BTT		YES. LOAD POINT	
00631	0 01 00634	BRU	**3		YES	
00632	0 23 00470	EXU	KEW		NO	
00633	0 01 00622	BRU	W05			
00634	0 71 02172	LDX	C19			
00635	0 76 00000	LDA	**			

040000
WAIT 400 MILLISECNDs

00636	C 41	00635	314	BRX	**1	DETERMINE TYPE OF TAPE UNIT
00637	C 23	00470	315	EXU	REW	-600
00640	C 71	02173	316	LDX	C20	
00641	C 40	21000	317	BRTX		
00642	C 71	02174	318	LDX	C21	-7200
00643	C 43	01092	319	BRM	TKSUBR	
00644	C 23	00464	320	EXU	ET	ERASE STARTING LEADER
00645	C 12	00000	321	MIB	**	
00646	C 41	00645	322	BRX	**1	
00647	C 23	00460	323	EXU	T0P	
00650	C 43	01056	324	BRM	BRSUBR	
00651	C 01	00652	325	BRU	W06	GO TO WRITE

00652	C 43	01062	BRM	PAGE	BRM	TRSUBR	WRITE RECORD
00653	C 71	00562	LDX	* W06	NRL		
00654	C 23	00461	EXU		WT		
00655	2 12	00000	MIB	BMT2	**+2		
00656	C 41	00655	BRX		*-1		
00657	C 29	00460	EXU		TOP		WAIT FOR TAPE TO STOP
00660	C 43	01056	BRM		BRSUBR		END OF TAPE
00661	C 23	00474	EXU		ETT		YES
00662	1 77	00201	SPF		ETF		
00663	C 23	00441	EXU		BET		YES
00664	C 01	00722	BRU		W01		NO
00665	C 43	00250	BRM		STOP		STEP UNIT NO.
00666	C 43	00350	BRM	W07	SU00		DONE
00667	C 01	00671	BRU		**+2		CONTINUE
00670	C 01	00620	BRU		W04B		R(STARTING BLOCK FLAG)
00671	1 76	00200	RPF		S9F		
00672	C 61	02107	MIN	W03	WKC		
00673	C 76	02106	LDA		MRC		
00674	C 53	00201	SKN		ETF		END OF TAPE FLAG
00675	C 73	02107	SKG		WKC		RESET, ENOUGH RECORDS
00676	C 01	00700	BRU		**+2		SET, YES
00677	C 01	00603	BRU		W04		NO
00700	C 43	00250	BRM		STOP		
00701	C 43	01062	BRM	W03A	TRSUBR		WRITE EOF'S
00702	C 23	00463	EXU		WEOF		17
00703	C 12	02177	MIB	BMT3	C24		
00704	C 23	00460	EXU		TOP		
00705	C 43	01056	BRM		BRSUBR		
00706	C 43	01062	BRM		TRSUBR		
00707	C 23	00470	EXU		REW		REWIND
00710	C 43	00350	BRM		SU00		STEP UNIT NO.
00711	C 01	00713	BRU		**+2		
00712	C -4	L0701	BRU		W03A		
00713	C 61	02111	MIN		WPC		
00714	C 43	00250	BRM		STOP		
00715	C 40	02000	BPT		?		
00716	C 01	00720	BRU		**+2		

OUTPUT PASS COUNTERS
TO START READ

6PCS
STOP
ROO

BRM
BRM
BRU

365
366
367
368

00717 C 43 01100
00720 C 43 00290
00721 C 01 01327

*

00765	C	23	00460	408	TSP
00766	C	43	01056	409	BKSJBA
00767	C	23	00474	410	ETT
00770	C	01	00772	411	**2
00771	C	01	00652	412	W06
00772	1	77	00201	413	ETF
00773	C	01	00666	414	W07
					EXU
					BRM
					EXU
					BRU
					BRU
					SFF
					BRU

LINE NO	ADDRESS	OPERATION	DATA	COMMENT
415		PAGE		
416		* W01A		S(SWJ)
417	00774	SWI	1 77 00204	
418	00775	WEC	C 61 02113	
419	00776	WOS	C 01 00622	
420		SPF		
421		MIN		
422		BRU		
		BCI		13.1 WRITE PASS RECORO NO. WRITE ERRS REWRITE ERRS
		WEM		
423		NEW		
424		PZE		WPC
425		PZE		WRC
426		PZE		WEC
427		PZE		RWEC
428		OCR		S2121212
429		* FPE		FILE PROTECT ERROR
430		EXU		OUT4
431		LDX		CS
432		MIW		FPM+5.2
433		BRX		*-1
434		BRM		0MAUN
435		T0PW		W0R5ER
436		BRM		MCO1
437		BRU		
438		BCI		S.1 FILE PROTECT ON
		FPM		
01000	00777		52121266	
01001	01000		51316325	
01002	01001		12472162	
01003	01002		62121251	
01004	01003		25234651	
01005	01004		24124546	
01006	01005		33121266	
01007	01006		51316325	
01008	01007		12255151	
01009	01008		62121251	
01010	01009		25665131	
01011	01010		63251225	
01012	01011		51516212	
01013	01012		C 00 02111	
01014	01013		C 00 02107	
01015	01014		C 00 02113	
01016	01015		C 00 02114	
01017	01016		52121212	
01018	01017		C 23 01276	
01019	01018		C 71 02154	
01020	01019		2 12 01036	
01021	01020		C 41 01023	
01022	01021		C 43 02050	
01023	01022		C 02 14000	
01024	01023		C 43 01066	
01025	01024		C 01 00204	
01026	01025		52121226	
01027	01026		31432512	
01028	01027		47514653	
01029	01028		25236312	

01035 46451212

439				PAGE			
440	*				REWIND ALL UNITS		
441	*						
442	*						
443		RWAU		PZE			
444				LDA		0214107	
445				LDX		-8	
446		RL00P		ADD		GENERATE REWIND INSTRUCTIONS	
447				ERR		100	
448				STA	RWAU1		
449				ERR	C23	0100	
450				STA	RWAU2		
451		RWAU1		REWW	**		
452		RWAU2		REWY	**		
453				BRX	RL00P		
454				LDA	UNTA	RESET UNIT NUMBER TABLE INDEXER	
455				STA	UNTI	SET UP FIRST UNIT.	
456				BRM	SU00		
457				NOP			
458				BRR	RWAU		
459	*						
460	*				BUFFER READY SUBROUTINE.		
461	*						
462		RSUBR		PZE			
463		BRT2		BRTX			
464				BRU	*-1		
465				BRR	RSUBR		
466	*						
467	*				TAPE UNIT READY SUBROUTINE.		
468	*						
469		TRSUBR		PZE			
470				EXU	TKT		
471				BRR	TRSUBR		
472				BRU	*-2		
473	*						
474	*				W BUFFER READY SUBROUTINE.		
475	*						
476		WRSBR		PZE			
477				BRTW			
01036			C 00	00000			
01037			C 76	02175			
01040			C 71	02153			
01041			C 55	00024			
01042			C 17	02176			
01043			C 35	01046			
01044			C 17	02176			
01045			C 35	01047			
01046			C 02	14010			
01047			C 02	14110			
01050			C 41	01041			
01051			C 76	00305			
01052			C 35	00306			
01053			C 43	00350			
01054			C 20	00000			
01055			C 51	01036			
01056			C 00	00000			
01057			C 40	21000			
01060			C 01	01057			
01061			C 51	01056			
01062			C 00	00000			
01063			C 23	00471			
01064			C 51	01062			
01065			C 01	01063			
01066			C 00	00000			
01067			C 40	21000			

```

01070 C 01 01067
01071 C 51 01066

*
*
*
CECS
478
479
480
481
482
483
484
485
486
487
488

BRU
BRR

PZE
CLR
LDX
STA
BRX
BRR

*-1
WBR, BR

CLEAR ERROR COUNTERS SUBROUTINE.

C15
ECTL, 2
*-1
CECS

```

-6

PAGE	ADDRESS	OPERATION	OPERAND	COMMENT
489				
*				
*				
*				
OPCS				
493	000	PZE		
494	029	EXU		
495	053	SKN		
496	001	BRU		
497	012	MIW		
498	012	MIW		
499	001	BRU		
500	012	MIW		
501	012	MIW		
502	071	LDX		
503	012	MIW		
504	041	BRX		
505	002	TOPW		
506	043	BRM		
507	023	EXU		
508	071	LDX		
509	076	LDA		
510	075	LDE		
511	043	BRM		
512	041	BRX		
513	012	MIW		
514	002	TOPW		
515	043	BRM		
516	051	BRR		
517				
*				
*				
PDM				
519	12472162	ACI		
519	62122446			
519	45251212			
519	52121266			
519	51316325			
519	52121212			
519	51252124			
519	52121266			
519	51316325			

OUTPUT PASS COUNTERS SUBROUTINE.

OUT4
 RPPF
 *+4
 SCRC
 PDM+6
 *+3
 PDM+3
 PDM+4
 C18
 PDM+15.2
 *-1
 WBR55K
 OUT1
 C5
 OPCL+5.2
 KEY1
 WBS
 OPC31
 SCRC
 WBR55K
 OPC3

PZE
 EXU
 SKN
 BRU
 MIW
 MIW
 BRU
 MIW
 MIW
 LDX
 MIW
 BRX
 TOPW
 BRM
 EXU
 LDX
 LDA
 LDE
 BRM
 BRX
 MIW
 TOPW
 BRM
 BRR

OPCS
 PDM
 ACI

READ PASS
 NO
 YES
 READ
 WRITE
 -15
 PASS DONE

WRITE ERK REWRITES PAD RE

01141 12255151
01142 12512566
01143 51316325
01144 62122221
01145 24125125
01146 21246252

S20

BCI

I-ADS!

```

521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541

*
*
*
W0S

01147 C 00 00000
01150 C 35 00015
01151 C 46 00014
01152 C 54 00024
01153 C 72 00025
01154 C 01 01157
01155 C 12 01607
01156 C 01 01152
01157 C 76 40015
01158 C 75 02153
01161 C 66 20003
01162 C 35 00015
01163 C 12 00015
01164 C 67 00006
01165 C 72 00024
01166 C 01 01161
01167 C 51 01147

PZE
STA
XAB
SUR
SKA
BRU
MIW
BRU
LDA*
LDR
RCY
STA
MIW
LSH
SKA
BRU
BRF

T4
ONE
SIGN
*+3
SPCHAR
*--4
T4
C4
3
T4
T4
6
ONE
*--5
W0S

OCTAL WORD OUTPUT SUBROUTINE.

77777770

```

```

542 *
543 *
544 *
545 *
546 000
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570

01170 C 02 02641
01171 C 12 01020
01172 C 53 00203
01173 C 01 01176
01174 C 12 01136
01175 C 01 01200
01176 C 12 01133
01177 C 12 01134
01200 C 43 02030
01201 C 71 02167
01202 C 12 01020
01203 C 02 14000
01204 C 43 01066
01205 C 02 02641
01206 2 12 01243
01207 C 02 14000
01210 C 43 01066
01211 2 76 02152
01212 C 75 02213
01213 C 02 02041
01214 C 43 01147
01215 C 41 01202
01216 C 02 14000
01217 C 43 01066
01220 C 01 00204

PAGE OPERATOR REQUESTED OUTPUT ROUTINE.
TYPW 1.4
MIW SCRC
SKN RPPF PASS
BRU **3 WRITE
MIW PDM+6 READ
BRU **3
MIW PDM+3
MIW PDM+4
BRM 0MAUN
LDX C16
MIW SCRC
TOPW WBR5BR
BRM 1.4
MIW 0T+18.2
TOPW WBR5BR
BRM CLL+18.2
LDA TWO
LDR 1.1
TYPW W05
BRM 001
BRX WBR5BR
TOPW MCO1
BRM
BRU

```

-18

			PAGE	OUTPUT TABLE IDENTIFIERS.
571	*			
572	*			
573	*			
574	*			
575	OT		BCI	1.MRC
576		01221 44512312	BCI	1.MRL
577		01222 44514312	BCI	1.WRC
578		01223 66512312	BCI	1.RRC
579		01224 51512312	BCI	1.WPC
580		01225 66472312	BCI	1.RPC
581		01226 51472312	BCI	1.WEC
582		01227 66252312	BCI	1.RWEC
583		01230 51662523	BCI	1.PREC
584		01231 47512523	BCI	1.CPEC
585		01232 23472523	BCI	1.LPEC
586		01233 43472523	BCI	1.WCEC
587		01234 66232523	BCI	1.CH1
588		01235 23300112	BCI	1.CH2
589		01236 23300212	BCI	1.CH3
590		01237 23300312	BCI	1.CH4
591		01240 23300412	BCI	1.CH5
592		01241 23300512	BCI	1.CH6
		01242 23300612	BCI	

593									
594	*								
595	*								
596	*								
597	SPF	POP	17700000						SET PROGRAM FLAG
598		STA	FT1						
599		LDA*	0						
600		MRC	SIGV						
601		STA*	0						
602		LDA	FT1						
603		BRR	0						
604	*								
605	*								
606	RPF	POP	17600000						RESET PROGRAM FLAG
607		STA	FT1						
608		LDA*	0						
609		ETR	FC1						
610		STA*	0						
611		LDA	FT1						
612		BRR	0						
613	*								
614	FT1	PZE							
615	FC1	0CT	37777777						
01243		C 35	01257						
01244		C 76	40000						
01245		C 16	00025						
01246		C 35	40000						
01247		C 76	01257						
01250		C 51	00000						
01251		C 35	01257						
01252		C 76	40000						
01253		C 14	01260						
01254		C 35	40000						
01255		C 76	01257						
01256		C 51	00000						
01257		C 00	00000						
01260		37777777							

PAGE	SET PUNCH OR TYPE.	SET TYPE	SET PUNCH
616	*		
617	*		
618	*		
619	*		
620	T00	TOUT1	
621		TOUT4	
622		P00+2	
623	P00	POUT1	
624		POUT4	
625		OUT1	
626		OUT4	
627		MCO1	
628	*		
629	TOUT1	1.1	
630	TOUT4	1.4	
631	POUT1	1.1	
632	POUT4	1.4	
633	*		
634	OUT1	1.1	PRESET TO TYPE OUT MODE
635	OUT4	1.4	
636	*		
637	*		SET INITIAL RANDOM NUMBER.
638	*		
639	N00	ACCUM	
640		IKN	
641		CLR	
642	*		
643	*		SET MAXIMUM NUMBER OF RECORDS.
644	*		
645	M00	ACCUM	
646		MRC	
647		CLR	
648	*		
649	*		SET BCD OR BINARY MODE.
650	*		
651	D00	BCDF	SET BCD FLAG
652		*+2	
653	B00	BCDF	RESET BCD FLAG
654		RT	
01261	C 76	01271	
01262	C 75	01272	
01263	C 01	01266	
01264	C 76	01273	
01265	C 75	01274	
01266	C 35	01275	
01267	C 36	01276	
01270	C 01	00204	
01271	C 02	02041	
01272	C 02	02641	
01273	C 02	02044	
01274	C 02	02644	
01275	C 02	02041	
01276	C 02	02641	
01277	C 76	00245	
01300	C 35	02101	
01301	C 01	00202	
01302	C 76	00245	
01303	C 35	02106	
01304	C 01	00202	
01305	I 77	00210	
01306	C 01	01310	
01307	I 76	00210	
01310	C 76	00462	

01311	C 14 01320	655	BB1	ETR	BB1
01312	C 53 00210	656	BCDF	SKN	BCDF
01313	C 16 01321	657	BB2	MRC	BB2
01314	C 35 00462	658	RT	STA	RT
01315	C 16 01322	659	BB3	MRC	BB3
01316	C 35 00461	660	WT	STA	WT
01317	C 01 00204	661	MC01	BRU	MC01
		662			
01320	77776777	663	77776777	0CT	77776777
01321	0001000	664	1000	0CT	1000
01322	00000040	665	40	0CT	40
		666			
		667			SET MAXIMUM LENGTH RECORD
		668			
01323	C 76 00245	669	ACCUM	LDA	ACCUM
01324	C 14 00027	670	AURMSK	ETR	AURMSK
01325	C 35 00557	671	SMRL	STA	SMRL
01326	C 01 00202	672	CLR	BRU	CLR

SAVE SPECIFIED MAXIMUM RECORD LENGTH

ADDRESS	OPERATION	DATA	STATUS	PAGE	START READ PASS.	DESCRIPTION
673						
674	*					
675	*					
676	*					
677	R00					START READ PASS.
678						
679						
680						
681						
682						
683						
684	R07					
685						
686						
687	R08					
688						
689						
690						
691						
692						
693	R01					
694						
695						
696						
697						
698						
699						
700	R01A					
701						
702	BMT4					
703	BRT3					
704						
705	BMT5					
706	BRT4					
707						
708						
709	BRT5					
710	BRU					
711	SPF					

SIREAD PASS IN PROGRESS FLAG)
 1ST RANDOM NUMBER TO
 RANDOM NUMBER HOLD.
 REWIND ALL UNITS
 S(STARTING BLOCK FLAG)

R(SW1,SW2)
 R(SYNC FLAG)
 R(SW3,REF)

R(CHARACTER PARITY ERROR FLAG)
 MOVE RANDOM NUMBER FROM
 HOLD TO RUN.
 COMPUTE RECORD LENGTH

STARTING BLOCK
 NO
 YES. LOAD POINT
 YES
 NO. REWIND

START READ
 INPUT FIRST WORD
 CHECK FOR SHORT RECORD

GO CHECK FOR EOF

IF BUFFER READY NOW RECORD TOO SHORT
 O.K.
 SHORT. S(SWITCH 3) WORD COUNT ERROR

01372	C	01	01410	712		BRU	RO1D	
01373	C	23	00441	713	*	EXU	BET	
01374	I	77	00211	714	RO1B	SPF	CPEF	
01375	C	32	00012	715	BMT6	BIM	T1	
01376	C	23	01367	716		EXU	BRTS	IF BUFFER NOT READY. RECORD TOO LONG
01377	C	01	01416	717		BRU	RO1C	TOO LONG
01400	C	53	00211	718		SKN	CPEF	O.K.. IF NO CHAR. PARITY CHECK LONG.
01401	C	01	01404	719		BRU	**3	
01402	C	61	02116	720		MIN	CPEC	COUNT CHAR. PARITY
01403	C	01	01410	721		BRU	RO1D	
01404	C	23	00441	722		EXU	BET	LONG. PARITY
01405	C	01	01407	723		BRU	**2	YES
01406	C	01	01411	724		BRU	RO1D+1	NO
01407	C	61	02117	725		MIN	LPEC	COUNT LONG. ERROR
01410	I	77	00202	726	RO1D	SPF	REF	S(READ ERROR)
01411	C	76	00012	727		LDA	T1	GET (BUFFER) AT EOR.
01412	C	53	00206	728		SKN	SW3	PREVIOUS WORD COUNT ERROR?
01413	C	72	00026	729		SKA	ONES	NO. (BUFFER) = 0
01414	C	01	01416	730		BRU	RO1C	YES. NO: WORD COUNT ERROR PRESENT
01415	C	01	01420	731		BRU	RU3A	NO WORD COUNT ERROR
01416	C	61	02120	732	RO1C	MIN	WCEC	COUNT ERROR
01417	I	77	00202	733		SPF	REF	S(READ ERROR)
01420	C	76	02110	734	*	LDA	RRC	
01421	C	75	00026	735	RO3A	LDB	ONES	1ST WORD:RECORD COUNT
01422	C	70	02234	736		SKM	IMAG	NOT EQUAL
01423	C	01	01612	737		BRU	RO5	EQUAL. CHECK NUMBERS
01424	C	71	00562	738	R12	LDX	NRL	
01425	C	46	00003	739		CLP	RRN	
01426	C	76	02104	740		LDA	**1	COMPARE WORDS
01427	C	41	01430	741	R12A	BRX	**+2	CORRECT
01430	2	17	00000	742		EOR	ONES	NO
01431	C	72	00026	743		SKA	R12B	YES. GENERATE NEXT NUMBER
01432	C	01	01445	744		BRU	RRN	
01433	C	Z6	02104	745		LDA	11	
01434	C	67	00013	746		LSH	RKN	
01435	C	55	02104	747		ADD	KK	
01436	C	55	02105	748				
01436	C	55	02105	749				
01436	C	55	02105	750				

01497	0	35	02104	751	RRN
01440	0	41	01430	752	R12A

STA
BRX

01441	01442	01443	01444	01445	01446	01447	01450	01451	01452	01453	01454	01455	01456	01457	01460	01461	01462	01463	01464	01465	01466	01467	01470	01471	01472	01473	01474	01475	01476						
C 43	C 53	C 01	C 01	C 72	C 01	C 01	C 53	C 01	C 75	C 70	C 01	C 01	C 77	C 72	C 61	C 72	C 61	C 72	C 61	C 72	C 61	C 72	C 61	C 72	C 61	C 46	C 66	C 46	C 01						
01056	00204	01477	01525	02210	01450	01473	00210	01456	02210	02191	01456	01473	00202	00024	02126	02213	02125	02215	02124	02216	02123	02217	02122	02220	02121	20005	20006	10012	01491						
753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786		

WAIT FOR TAPE TO STOP
 NO. TEST SW1
 RESET
 SET

CHARACTER CORRECT
 NO
 YES
 IN BCD MODE
 NO
 YES. WAS ERROR DUE TO 0
 TO 12 CONVERSION
 NO
 YES

TEST LSB ERROR

TEST MSB ERROR

SHIFT CHARACTER

PAGE

BRM
 SKN
 BRU
 BRU

SKA
 BRU
 BRU
 SKN
 BRU
 LDB
 SKM
 BRU
 BRU
 SPF
 SKA
 MIN
 SKA
 MIN
 SKA
 MIN
 SKA
 MIN
 SKA
 MIN
 SKA
 MIN
 SKA
 MIN
 ABC
 RCY
 BAC
 BRU

C77
 *+2
 R12D
 BCDF
 R12C
 C77
 C10
 *+2
 R12D
 REF
 ONE
 CH6
 TWO
 CH5
 FOUR
 CH4
 EIGHT
 CH3
 ZA
 CH2
 ZB
 CH1
 6
 R12A+1

*

*

*

R12B

R12C

R12D

787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825
01477	01500	01501	01502	01503	01504	01505	01506	01507	01510	01511			01512	01513	01514	01515	01516	01517	01520	01521	01522	01523	01524			01525	01526	01527	01530	01531	01532	01533	01534	01535	01536	01537	01540	
	C 01	C 76	C 35	C 35	I 77	C 43	C 23	C 43	C 43	C 01			C 43	C 01	C 43	C 01	C 61	C 76	C 35	C 53	C 01	I 76	C 01			C 46	C 76	C 67	C 35	C 53	C 01	C 16	C 35	C 72	C 01	C 01	C 76	
	00202	01512	00024	01610	01611	00204	01062	00467	01056	00250	01341		00350	01516	00250	01336	02110	02104	02103	00200	01514	00200	01514			30003	01611	00001	01611	00202	01535	01610	01610	02157	01540	01505	02160	
	SKN	BRU	LDA	STA	STA	SPF	BRM	EXU	BRM	BRM	BRU		BRM	BRU	BRM	BRU	MIN	LDA	STA	SKN	BKU	RPF	BRU			CLR	LDA	LSH	STA	SKN	BRU	MRG	STA	SKA	BRU	BRU	LDA	
	R04						R10						R11		R11A											R09												
	*												*		*										*	*												
	REF	R11	ONE	RTEM	RTC	SW1	TRSUBR	SR	BNSUBR	STOP	R08		SU00	**3	STOP	R07	RKC	RKN	RKNH	SBF	R11A	SBF	R11A			RTC	I	RTC	REF	**3	RTEM	C6	**2	R10	C9			
	WAS THERE A READ ERROR	NO	YES				BACKSPACE RECORD						STEP UNIT NUMBER	DONE	CONTINUE	READ RECORD COUNT + 1				IF STARTING BLOCK FLAG	SET RESET IT					READ ERROR	NO	YES, MARK ERROR THIS TRY				TEN TRIES COMPLETE	YES	NO				

01541	01542	01543	01544	01545	01546	01547	01550	01551	01552	01553
C 73	C 61	C 40	C 01	C 43	C 23	C 71	2 12	C 41	C 02	C 43
01610	02115	20200	01600	02030	01276	02155	01605	01550	14000	01066
826	827	828	829	830	831	832	833	834	835	836
SKG	MIN	BPT	BRU	BRM	EXU	LDX	MIW	BRX	TOPW	BRM
RTEM	PREC	2	R09A	R50	OUT4	C6	REM+3.2	*-1	WBR5BR	
ANY GOOD READS	NO	YES, OUTPUT	NO	YES, OUTPUT READ STATUS		CR READ ERROR CR				

01657	0 95 00013	910	ROSE	STA	T2	SAVE COUNT
01660	0 75 02163	911		LDB	C12	07777
01661	0 43 01062	912	ROSE	BRM	TRSUBR	GREATER, SPACE FORWARD
01662	0 23 00466	913		EXU	SF	
01663	0 32 00012	914	BMT7	BIM	T1	
01664	0 76 00012	915		LDA	T1	END OF FILE?
01665	0 70 02177	916		SKM	C24	1717
01666	0 01 01670	917		BRU	**2	NO
01667	0 01 01712	918		BRU	R15	YES
01670	0 61 00013	919		MIN	T2	
01671	0 59 00013	920		SKN	T2	DONE
01672	0 01 01704	921		BRU	R05F	YES
01673	0 01 01662	922		BRU	ROSE+1	NO

01756	52434621	978	LPM	BCI	3..JLOAD POINT
01757	24124746				
01760	31456312				
01761	52512521	979	RPAM	BCI	8..JREAD PASS ABORT. OUT OF SYNC..J
01762	24124721				
01763	62621221				
01764	22465163				
01765	73124664				
01766	63124626				
01767	12627046				
01770	23336212				

PAGE	CHECK FOR END OF FILE	IMAG	PICK UP FIRST WORD OF IMAGE
980			
981	*		
982	*		
983	*		
984	R12	LDA	
985		LDB	07770000
986		SKM	END OF FILE
987		BPT	NO
988		BRU	YES
989		BRM	OUTPUT READ STATUS
990		EXU	
991		LDX	-6
992		MIW	
993		BRX	
994		TOPW	
995		BRM	
996	R14	BRM	REWIND ALL UNITS
997		MIN	COUNT READ PASS
998		BPT	
999		BRU	
1000		BRM	OUTPUT PASS COUNTERS
1001		BPT	HALT
1002		HLT	YES
1003		BRM	NO
1004		BPT	REREAD
1005		BRU	YES
1006		LDA	NO
1007		STA	GO TO WRITE
1008		BRU	
1009	*		
1010	*		
1011	EFREM	BCI	6. JEND OF FILE READ ERROR
02022			
02023			
02024			
02025			
02026			
02027			

	PAGE	READ STATUS OUTPUT SUBROUTINE.
02030	1012	OUT4
02031	1013	C15
02032	1014	R56M1+6.2
02033	1015	*-1
02034	1016	0MAUN
02035	1017	RPCL
02036	1018	KEY1
02037	1019	W05
02040	1020	RRCL
02041	1021	KEY
02042	1022	W05
02043	1023	SCRC
02044	1024	
02045	1025	
02046	1026	
02047	1027	
02050	1028	
02051	1029	
02052	1030	
02053	1031	
02054	1032	
02055	1033	
02056	1034	
02057	1035	
02060	1036	
02061	1037	
02062	1038	
02063	1039	
02064	1040	
02065	1041	
02066	1042	
02067	1043	
02070	1044	
02071	1045	
	1046	
	1047	
	1048	
	1049	
	1050	

-6

OUTPUT MODE AND UNIT NO. SUBR
 BCD MODE
 NO
 YES

IF ENTRANCE FROM OPERATOR REQUESTED
 OUTPUT ROUTINE. ALWAYS TYPE.

02072	0	66	00006	1051	RSH	6		
02073	0	36	00013	1052	STB	T2		
02074	0	12	01607	1053	MIW	SPCHAR		SPACE
02075	0	12	00013	1054	MIW	T2		
02076	0	12	00012	1055	MIW	T1		
02077	0	12	01020	1056	MIW	SCRC		CR
02100	0	51	02050	1057	BRR	0MAJN		
				1058				
				1059				
		00023		1060	ZERO		23	00000000
		00024		1061	ONE		24	00000001
		00025		1062	SIGN		25	40000000
		00026		1063	ONES		26	77777777
		00027		1064	ADRMSK		27	00037777

Page	Address	Label	Value	Unit	Description
1065					FLAG AND SWITCH ASSIGNMENTS.
1066					
1067					
1068					
1069	00200	MC00		EQU	STARTING BLOCK FLAG
1070	00201	MC00+1		EQU	END OF TAPE FLAG
1071	00202	MC00+2		EQU	READ ERROR FLAG
1072	00203	MC00+3		EQU	READ PASS IN PROGRESS FLAG
1073	00204	MC00+4		EQU	SWITCH 1
1074	00205	MC00+5		EQU	SWITCH 2
1075	00206	MC00+6		EQU	SWITCH 3
1076	00207	MC00+7		EQU	SWITCH 4
1077	00210	MC00+8		EQU	BCD FLAG
1078	00211	MC00+9		EQU	CHARACTER PARITY ERROR FLAG
1079	00212	MC00+10		EQU	WRITE ERRJR FLAG
1080	00213	MC00+11		EQU	SYNC. FLAG
1081					
1082					RANDOM NUMBER STORAGE.
1083					
1084	02101	IRN	C 00	PZE	INITIAL RANDOM NUMBER
1085	02102	IRN	C 00	PZE	FIRST RANDOM NUMBER
1086	02103	RRNH	C 00	PZE	RUNNING RANDOM NUMBER HOLD
1087	02104	RRN	C 00	PZE	RUNNING RANDOM NUMBER
1088	02105	KK	23146555	0CT	KLUGE CONSTANTS
1089					
1090					RECORD COUNTERS.
1091					
1092	02106	MRC	C 00	PZE	MAXIMUM RECORD COUNT
1093	02107	WRC	C 00	PZE	WRITE RECORD COUNT
1094	02110	RRC	C 00	PZE	READ RECORD COUNT
1095					
1096					PASS COUNTERS
1097					
1098	02111	WPC	C 00	PZE	WRITE PASS COUNT
1099	02112	RPC	C 00	PZE	READ PASS COUNT
1100					
1101					ERROR COUNTERS.
1102	02113	WEC	C 00	PZE	WRITE ERROR COUNT
1103	02114	RWEC	C 00	PZE	REWRITE ERROR COUNT

02115	C 00 00000	1104	PREC	PZE	PERMANENT READ ERROR COUNT
02116	C 00 00000	1105	CPEC	PZE	CHARACTER PARITY ERROR COUNT
02117	C 00 00000	1106	LPEC	PZE	LONGITUDINAL PARITY ERROR COUNT
02120	C 00 00000	1107	WCEC	PZE	WORD COUNT ERROR COUNT
02121	C 00 00000	1108	CH1	PZE	READ ERRORS IN CHANNEL 1
02122	C 00 00000	1109	CH2	PZE	READ ERRORS IN CHANNEL 2
02123	C 00 00000	1110	CH3	PZE	READ ERRORS IN CHANNEL 3
02124	C 00 00000	1111	CH4	PZE	READ ERRORS IN CHANNEL 4
02125	C 00 00000	1112	CH5	PZE	READ ERRORS IN CHANNEL 5
02126	C 00 00000	1113	CH6	PZE	READ ERRORS IN CHANNEL 6
02127	C 00 77762	1114	ECTL	PZE*	END OF COUNTER TABLE AND LENGTH

WPC--*

	PAGE	COUNTER LOCATIONS.
1115		
1116		
1117		
1118		
1119	PZE	MRC
1120	PZE	MRL
1121	PZE	WRC
1122	PZE	PRC
1123		
1124	PZF	WPC
1125	PZE	RPC
1126	PZF	WEC
1127	PZE	RWEC
1128	PZE	PREC
1129		
1130	PZE	CPEC
1131	PZE	LPEC
1132	PZE	WCEC
1133	PZE	CH1
1134	PZE	CH2
1135	PZE	CH3
1136	PZF	CH4
1137	PZE	CH5
1138	PZE	CH6
1139		
02130	C 00	02106
02131	C 00	00560
02132	C 00	02107
02133	C 00	02110
02134	C 00	02111
02135	C 00	02112
02136	C 00	02113
02137	C 00	02114
02140	C 00	02115
02141	C 00	02116
02142	C 00	02117
02143	C 00	02120
02144	C 00	02121
02145	C 00	02122
02146	C 00	02123
02147	C 00	02124
02150	C 00	02125
02151	C 00	02126

				PAGE	GENERAL CONSTANTS.	
1139						
1140						
1141	*					
1142	*					
1143		C1		0CT	07700000	
1144		C3		DEC	-8	
1145		C4		EOU	C3	0CT 77777770
1146		C5		DEC	-5	
1147		C6		DEC	-3	
1148		C7		0CT	7	
1149		C8		0CT	1000	
1150		C9		0CT	1777	
1151		C10		0CT	12	
1152		C11		DEC	-9	
1153		C12		0CT	7777	
1154		C13		DEC	-10	
1155		C14		DEC	-4	
1156		C15		DEC	-6	
1157		C16		DEC	-18	
1158		C17		DEC	-13	
1159		C18		DEC	-15	
1160		C19		0CT	40000	
1161		C20		DEC	-600	
1162		C21		DEC	-7200	
1163		C22		0CT	214107	
1164		C23		0CT	100	
1165		C24		0CT	17171717	
1166		C25		0CT	77770000	
1167		C26		0CT	77777670	
1168		C27		0CT	77777677	
1169		C28		0CT	77577777	
1170		C29		0CT	73	
1171		C30		0CT	107	
1172		C31		0CT	77770000	
1173		C52		0CT	52	
1174		C77		0CT	77	
1175		C200		0CT	37777600	
1176	*					
1177		E0RN		E0P	IMA0.2	
02152	07700000					
02153	77777770					
	02155					
02154	77777773					
02155	77777775					
02156	00000007					
02157	00001000					
02160	00001777					
02161	00000012					
02162	77777757					
02163	00007777					
02164	77777756					
02165	77777774					
02166	77777772					
02167	77777756					
02170	77777763					
02171	77777751					
02172	00040000					
02173	77776650					
02174	77761740					
02175	00214107					
02176	00000100					
02177	17171717					
02200	77770000					
02201	77777670					
02202	77777677					
02203	77577777					
02204	00000073					
02205	00000107					
02206	77770000					
02207	00000052					
02210	00000077					
02211	37777600					
02212	2 17 02254					

02213	00000002	1178	*	TWO	DEC	2
02214	00000003	1179		THREE	DEC	3
02215	00000004	1180		FOUR	DEC	4
02216	00000010	1181		EIGHT	DEC	8
02217	00000020	1182		ZA	OCT	20
02220	00000040	1184		ZB	OCT	40
		1185	*			
	00012	1186		T1	BOOL	12
	00013	1187		T2	BOOL	13
	00014	1188		T3	BOOL	14
	00015	1189		T4	BOOL	15
		1190	*			
	02215	1191		KEY	EOU	FOUR
	00024	1192		KEY1	EOU	ONE
		1193	*			
02221	52512521	1194		RS0M1	BCI	6. JREAD PASS
02222	24124721					RECORD NO.
02223	62621212					
02224	12512523					
02225	46512412					
02226	45469312					
02227	12222324	1195		RS0M2	BCI	1. BCD
02230	12223145	1196		RS0M3	BCI	2. BINARY
02231	21517012					
02232	12644531	1197		RS0M4	BCI	3. UNIT NO
02235	63124546					

PAGE	CONTROL CHARACTER DEFINITIONS.
1198	
1199	
1200	
1201	
1202	2200000
1203	2300000
1204	2400000
1205	4300000
1206	4400000
1207	4500000
1208	4600000
1209	4700000
1210	5100000
1211	6200000
1212	6300000
1213	6400000
1214	5200000
1215	1200000
1216	7200000
1217	
1218	
1219	01200000
1220	03200000
1221	04021000
1222	
1223	
1224	4095
1225	
1226	
1227	LOAD
1228	END
	MC00
022J4	07777
	00200

ADRMSK	C002Z	BRSUBR	01056	GOMCO1	00252	SPCHAR	J1607
TRSUBR	C1062	WRSBR	01066	ACCUM	00245	BCHAR	J1606
DIGIT	C0240	EFREM	02022	EIGHT	02216	GCHAR	J1605
IMAGC	C0564	IMAGL	01644	QMAUN	02050	GPCSI	J1120
PBUTI	C1278	PBUTA	01274	REATL	00572	RL00P	J1041
RS0M1	C2221	RS0M2	02227	KS0M3	02230	RS0M4	02232
RWAUI	C1046	RWAU2	01047	SAVEL	01645	SYNCF	00213
THREE	C2214	TBUTI	01271	TBUTA	01272	UBSTL	00475
BCDF	C0210	BMT1	00645	BMT2	00655	BMT3	J0703
BMT4	C1360	BMT5	01364	BMT6	01375	BMT7	01663
BMTL	C0457	BRT1	00641	BRT2	01057	BRT3	J1361
BRT4	C1365	BRT5	01367	BRTL	00447	BRTX	02234
C200	C2211	CECS	01072	CPEC	02116	CPEF	J0211
CKLS	C0530	ECTL	02127	EMRN	02212	FBJR	02215
IMAG	C2234	KEY1	00024	LPEC	02117	MCOO	00200
MCO1	C0204	MMRL	00556	ONES	00026	OPCL	J2134
OPCS	C1100	OUT1	01275	OUT4	01276	PREC	02115
RO1A	C1356	RO1B	01373	KO1C	01416	RO1D	J1410
RO3A	C1420	RO5A	01616	KO5S	01635	RO5C	J1651
RO5D	C1674	KO5E	01661	RO5F	01704	RO5G	J1706
RO9A	C1600	R11A	01514	R12A	01430	R12B	J1445
R12C	C1456	R12D	01473	R15A	01720	REAT	00565
RECL	C2141	RPAM	01761	KPCL	02135	RPPF	J0203
RRCL	C2133	RRNH	02103	KTEM	01610	RWAU	J1036
RWEC	C2114	SAVE	01711	SCRC	01020	SIGN	00025
SMRL	C0557	STOP	U0250	SU00	00350	SU01	00436
SU02	C0355	SU99	00434	JBST	00461	UNTB	00305
UNTI	C0306	UNTL	00307	W01A	00774	W01B	00754
W03A	C0701	W04A	00612	W04B	00620	WCEC	02120
W03F	C0463	ZER0	00023	1RN	J2102	B00	J1307
BB1	C1320	BB2	01321	BB3	01322	BET	00441
BIM	C2234	BMT	00450	BRT	00442	BTT	J0473
COU	C0246	C10	02161	C11	02162	C12	02163
C13	C2164	C14	02165	C15	02166	C16	02167
C17	C2170	C16	02171	C19	02172	C20	02173
C21	C2174	C22	02175	C23	02176	C24	02177
C25	C2200	C26	02201	C27	02202	C28	02203
C29	C2204	C30	02205	C31	02206	C52	J2207
C77	C2210	CH1	02121	CH2	02122	CH3	J2123

IDENTIFICATION: Buffered Line Printer Memory Dump

AUTHOR: R. Wilborn, SDS

ACCEPTED: January 11, 1964

COMPUTER CONFIGURATION: Any SDS 910 or SDS 920 with an SDS Model 9173 buffered line printer.

PURPOSE: To provide a method of printing the contents of memory via the line printer.

PROGRAMMED OPERATORS: None.

STORAGE: 204 including output buffers.

TIMING: Will print at the maximum rate of the line printer.

USE:

1. The Line Printer Memory Dump Program is in relocatable format with a relocating loader. To load the program at Location L, enter L in the A register and follow the normal fill procedure.
2. After loading, the program will halt. The area to be dumped is defined by loading the A and B registers.

A = Starting Location

B = End Location
3. Following the dump, the paper in the printer is restored to the home position. Another dump may be initiated at this time.

METHOD: Data is printed 8 memory locations per line, 50 lines per page. The address of the first word is displayed at the left of each line. If the entire line is zero, a line of blanks will be printed.

SDS 900 SERIES PROGRAM LIBRARY

LISTING

Buffered Line Printer Memory Dump

Page 1 of 5

Catalog No. 060003

			1	*				
			2	*	MEMORY DUMP ON THE LINE PRINTER		R WILBORN	5
			3	*				
			4		REL		RELOCATABLE FORMAT	
00000	0 00	00000	5	MC00	HLT			
00001	4 35	00224	6		STA	START.4		
00002	4 36	00221	7		STR	FINISH.4		
00003	0 40	12060	8		PRTW	1		
00004	4 01	37777	9		BRU	*-1.4		
00005	0 46	30003	10		CLP			
00006	4 35	00216	11		STA	SKIP.4		
00007	4 71	00204	12	MC10	LDX	M8.4		
00010	4 76	00215	13		LDA	START.4		
00011	4 35	00317	14		STA	TEMP.4		
00012	4 76	00175	15		LDA	C3.4		
00013	4 35	00206	16		STA	COUNT1.4		
00014	4 76	00173	17		LDA	C0.4		
00015	4 75	00201	18		LDR	OM23.4		
00016	4 70	40312	19	MC14	SKM*	TEMP.4		
00017	4 01	00024	20		BRU	MC16.4		
00020	4 61	00310	21		MIN	TEMP.4		
00021	4 41	37775	22		BRY	MC14.4		
00022	4 76	00167	23		LDA	C7.4	ZERO LINE	
00023	4 55	00202	24		ADD	START.4		
00024	4 35	00201	25		STA	START.4	ADVANCE COUNTER	
00025	4 43	00115	26		BRM	DONE.4	CHECK FOR FINISH	
00026	4 53	00176	27		SKM	SKIP.4	WAS LAST LINE ZERO	
00027	4 01	00002	28		BRU	*+2.4	NO	
00030	4 01	37757	29		BRU	MC10.4	YES	
00031	4 76	00162	30		LDA	M8.4		
00032	4 35	00172	31		STA	SKIP.4	SET FLAG	
00033	0 40	12060	32		SKS	READY		
00034	4 01	37777	33		BRU	*-1.4		
00035	0 02	02660	34		PLPW	1.4		
00036	0 02	14000	35		TOPW			
00037	0 40	12060	36		SKS	READY		
00040	4 01	37777	37		BRU	*-1.4		
00041	0 02	10450	38		ECM	STEP		
00042	4 01	37745	39		BRU	MC10.4		
00043	0 46	30003	40	MC16	CLP		SET FLAG	
00044	4 35	00160	41		STA	SKIP.4		
00045	4 71	00142	42		LDX	C0.4		
00046	4 77	00225	43		EAX	BUFFER+4.4		
00047	4 37	00153	44		STX	DATA.4	SET INDIRECT CELL	
00050	4 71	00144	45		LDX	M33.4		
00051	6 76	00216	46		LDA	IMAGE+33.6	SET OUTPUT IMAGE	
00052	6 35	00256	47		STA	BUFFER+33.6		
00053	4 41	37776	48		BRY	*-2.4		
00054	4 75	00151	49		LDR	START.4	CONVERT TO OCTAL	
00055	4 43	00116	50		BRM	MC00.4		
00056	0 67	20014	51		LCY	12		
00057	4 16	00212	52		MRC	BUFFER+2.4		
00060	4 35	00211	53		STA	BUFFER+2.4		
00061	0 46	00014	54		XAB			

00062	4	16	00206	55	MRG	BUFFER+1.4	STORE LOCATION
00063	4	35	00205	56	STA	BUFFER+1.4	
00064	4	76	00124	57	LDA	C3.4	LOOP COUNTER
00065	4	35	00134	58	STA	COUNT1.4	
00066	4	75	40137	59	MC20 LDR*	START.4	EVEN WORD
00067	4	43	00104	60	BRM	0C00.4	
00070	0	46	00014	61	XAR		
00071	4	35	40131	62	STA*	DATA.4	
00072	4	61	00130	63	MIN	DATA.4	
00073	0	46	00014	64	XAR		
00074	4	35	40126	65	STA*	DATA.4	
00075	4	61	00125	66	MIN	DATA.4	
00076	4	61	00124	67	MIN	DATA.4	
00077	4	43	00043	68	BRM	DONE.4	CHECK FOR FINISH
00100	4	75	40125	69	LDR*	START.4	SPLIT WORD
00101	4	43	00072	70	BRM	0C00.4	
00102	0	56	20014	71	RCY	12	
00103	0	46	00014	72	XAR		
00104	4	35	00224	73	STA	TEMP.4	
00105	4	14	00112	74	ETR	12M23.4	
00106	4	16	40114	75	MRG*	DATA.4	
00107	4	35	40113	76	STA*	DATA.4	
00110	4	61	00112	77	MIN	DATA.4	
00111	0	46	10012	78	BAC		
00112	4	35	40110	79	STA*	DATA.4	
00113	4	61	00107	80	MIN	DATA.4	
00114	4	76	00214	81	LDA	TEMP.4	
00115	4	14	00100	82	ETR	0M17.4	
00116	4	16	40104	83	MRG*	DATA.4	
00117	4	35	40103	84	STA*	DATA.4	
00120	4	61	00102	85	MIN	DATA.4	
00121	4	61	00101	86	MIN	DATA.4	
00122	4	43	00020	87	BRM	DONE.4	CHECK FOR FINISH
00123	4	60	00076	88	REDUCE	COUNT1.4	
00124	0	20	00000	89	N&P		
00125	4	53	00074	90	SKN	COUNT1.4	
00126	4	01	37740	91	BRU	MC20.4	NOT DONE
00127	0	40	12060	92	SKS	READY	
00130	4	01	37777	93	BRU	*-1.4	
00131	4	71	00063	94	LDY	M33.4	
00132	0	02	02660	95	MC30 PLPW	1.4	
00133	6	12	00175	96	MIW	BUFFER+33.6	
00134	4	41	37777	97	BRX	*-1.4	
00135	0	02	14000	98	T&PW		
00136	0	40	12060	99	SKS	READY	
00137	4	01	37777	100	BRU	*-1.4	
00140	0	02	10460	101	EBM	STEP	
00141	4	01	37646	102	BRU	MC10.4	

			103	PAGE	
			104	*	
			105	* S/R TO CHECK FOR FINISH	
			106	*	
00142	0 00 00000		107	DONE PZF	**
00143	4 61 00062		108	MIN	START.4
00144	4 76 00061		109	LDA	START.4
00145	4 73 00056		110	SKG	FINISH.4
00146	4 61 37774		111	BRR	DONE.4
00147	4 76 00061		112	LDA	BLANK.4
00150	4 71 00042		113	DONE? LDX	M7.4
00151	4 35 40051		114	STA*	DATA.4
00152	4 61 00050		115	MIN	DATA.4
00153	4 41 37776		116	BRX	*-2.4
00154	4 60 00045		117	REDUCE	COUNT1.4
00155	0 20 00000		118	NOP	
00156	4 53 00043		119	SKN	COUNT1.4
00157	4 01 37771		120	BRU	DONE2.4
00160	0 40 12060		121	SKS	READY
00161	4 01 37777		122	BRU	*-1.4
00162	4 71 00032		123	LDX	M33.4
00163	0 02 02660		124	PLPW	1.4
00164	6 12 00144		125	MIW	BUFFER+33.6
00165	4 41 37777		126	BRX	*-1.4
00166	0 02 14000		127	TOPW	
00167	0 40 12060		128	SKS	READY
00170	4 01 37777		129	BRU	*-1.4
00171	0 02 11460		130	ERM	TSP
00172	4 01 37606		131	BRU	MCOO.4

NOT DONE

		132		PAGE	
		133	*		
		134	*	OCTAL CONVERT	
		135	*		
		136	*		
00173	0 00 00000	137	0C00	PZE	**
00174	4 71 00017	138		LDX	M8.4
00175	4 76 00012	139		LDA	CO.4
00176	0 67 00003	140		LSH	3
00177	6 35 00141	141		STA	TEMP+8.6
00200	4 41 37775	142		BRX	*-3.4
00201	4 71 00012	143		LDX	M8.4
00202	0 46 30003	144		CLR	
00203	0 67 20006	145		LCY	6
00204	6 16 00134	146		MRG	TEMP+8.6
00205	4 41 37776	147		BRX	*-2.4
00206	4 51 37765	148		BRR	0C00.4

OCTAL CONVERT

		149	PAGE					
		150	*					
		151	* PROGRAM CONSTANTS AND PARAMETERS					
		152	*					
		153	REDUCE	OPD	06000000			
00207	00000000	154	CO	DEC	0			
00210	00000003	155	C3	DEC	3			
00211	00000007	156	C7	DEC	7			
00212	77777771	157	M7	DEC	-7			
00213	77777770	158	M8	DEC	-8			
00214	77777737	159	M33	DEC	-33			
00215	77770000	160	OM17	OCT	77770000			
00216	77777777	161	OM23	OCT	77777777			
00217	00007777	162	12M23	OCT	7777			
00220	12121212	163	BLANK	BCI	1.			
00221	0 00 00000	164	COUNT1	PZE	**			
00222	0 00 00000	165	DATA	PZE	**			
00223	0 00 00000	166	FINISH	PZE	**			
	12060	167	READY	BOOL	12060			
00224	0 00 00000	168	SKIP	PZE	**	LINE SKIP FLAG		
00225	0 00 00000	169	START	PZE	**			
	10460	170	STEP	BOOL	10460			
	11460	171	TOP	BOOL	11460			
00226	12121212	172	IMAGE	BCI	11.	00000	00000000	00000000
00241	00000000	173		BCI	11.00000000	00000000	00000000	0
00254	00000000	174		BCI	11.000000	00000000	00000000	
00267	00041	175	BUFFER	BSS	33			
00330	00010	176	TEMP	BSS	8			
	00000	177	END	END	MCOO			

IDENTIFICATION: Line Printer Test Program

AUTHOR: R. Wilborn, SDS

ACCEPTED: 19 June 1963

COMPUTER
CONFIGURATION: Any SDS 920 or SDS 910 with an SDS Model 9170 line printer.

PURPOSE: To provide an acceptance test for the SDS Model 9170 line printer.

PROGRAMMED
OPERATORS: None

STORAGE: Octal locations 200-3000 (1408 words)

TIMING: The printer is driven at its maximum rate:

300 lines per minute printing, or

120 lines per second while slewing.

USE: The Line Printer Test Program is on a self-loading paper tape.

1. Load the program by the normal Fill procedure. When the program is loaded, the computer will halt.
2. The paper should be adjusted in the printer such that the perforation between sheets is directly over the hammers. After the initial setting, the program will maintain form control and the page will be restored after each test.
3. Select the functions to be tested before clearing the halt.
 - BP 1 Set: No action.
 - Reset: Each character is printed in every print position (Figure 1).
 - BP 2 Set: No action.
 - Reset: Tab and backspace features are utilized (Figure 2).

USE: (cont.)

BP 3 Set: No action.

Reset: Slew 1 page (Figure 3).

BP 4 Set: No action.

Reset: Vertical and horizontal control are checked by printing a checkerboard of E's (Figure 4).

Testing will continue as long as the particular test is called for by the breakpoints being reset. If all the breakpoints are set the program will loop until a test is called for.

METHOD:

Not applicable.

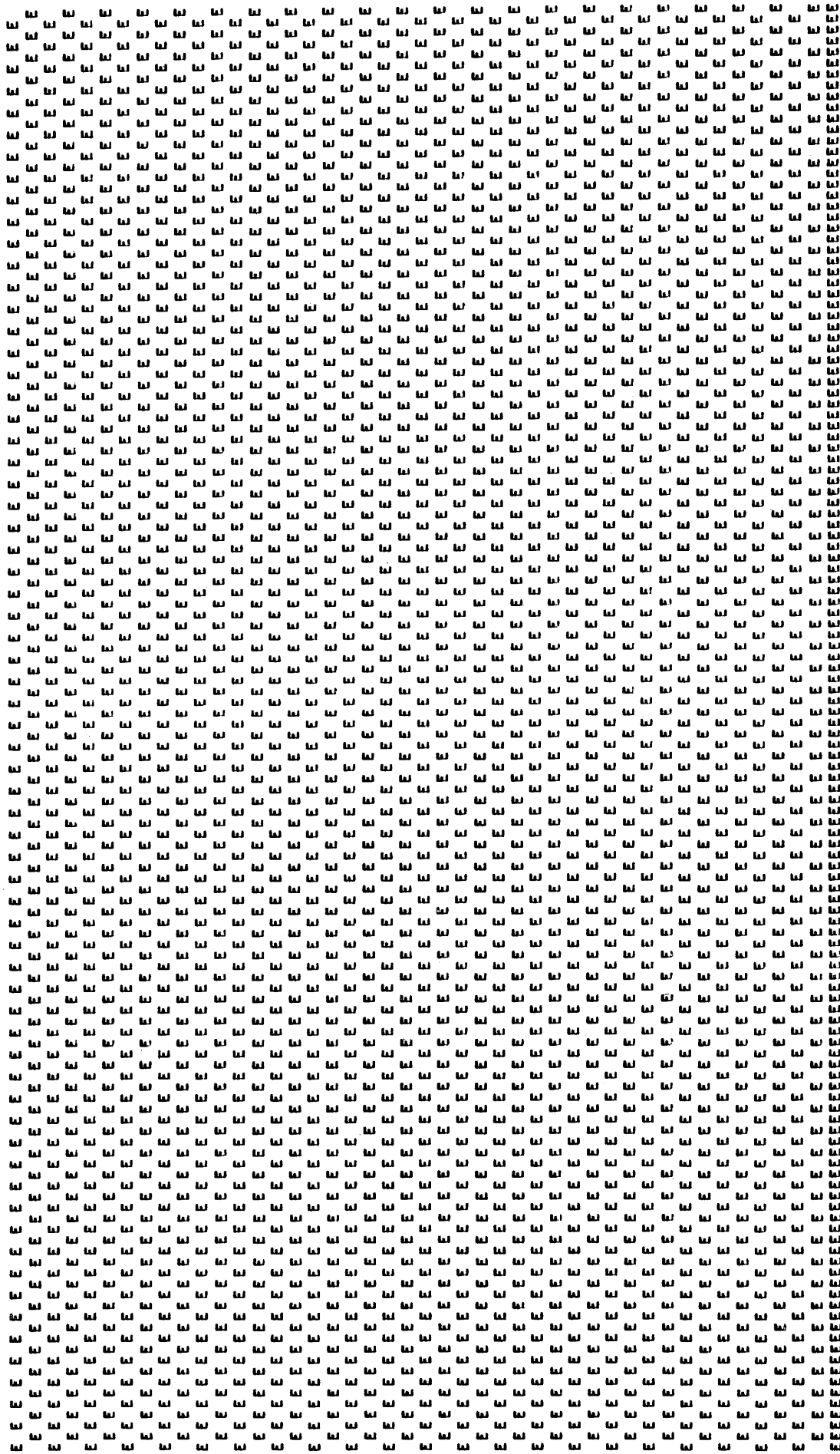
- * THE FOLLOWING TEST WILL PRINT A GROUP OF LINES WITH AND WITHOUT TAB/BACKSPACE CONTROL. AFTER THE FIRST GROUP HAS BEEN
- * PRINTED A HALT WILL OCCUR AND THE POSITION OF THE CONSOLE TAB/BACKSPACE SWITCH SHOULD BE REVERSED. THEN CLEAR THE HALT

THIS IS A TEST OF THE TAB AND BACKSPACE FEATURE OF THE SDS LINE PRINTER.
 THIS IS A TEST OF THE TAB AND BACKSPACE FEATURE OF THE SDS LINE PRINTER.
 THIS IS A TEST OF THE TAB AND BACKSPACE FEATURE OF THE SDS LINE PRINTER.
 THIS IS A TEST OF THE TAB AND BACKSPACE FEATURE OF THE SDS LINE PRINTER.

OACE FEATURE OF THE SDS LINE PRINTER. STAB AND BACKSP)THIS IS A TEST OF THE
 OACE FEATURE OF THE SDS LINE PRINTER. STAB AND BACKSP)THIS IS A TEST OF THE
 OACE FEATURE OF THE SDS LINE PRINTER. STAB AND BACKSP)THIS IS A TEST OF THE
 OACE FEATURE OF THE SDS LINE PRINTER. STAB AND BACKSP)THIS IS A TEST OF THE

* THE FOLLOWING TEST WILL SLEW 1 PAGE.

THE FOLLOWING TEST WILL CHECK VERTICAL AND HORIZONTAL CONTROL.



SDS 900 SERIES PROGRAM LIBRARY

PROGRAM LISTING

Line Printer Test Program

Page 1 of 10

Catalog No. 064001

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*
* LINE PRINTER TESTER           R WILBORN           4-1-63
*
00200  0 00 00000  MC00  HLT
00201  0 40 10060                PRTW           PRINTER READY TEST
00202  0 01 00201                BRU            *-1
00203  0 02 10060                SLPW           SKIP LINE
00204  0 13 00635                POT            4LNE
00205  0 71 00631                LDX            M56
00206  0 02 42660  MC02  PLPW           PRINT LINE
00207  0 13 00657                POT            OMSG
00210  0 40 21000                BRTW
00211  0 01 00210                BRU            *-1
00212  0 41 00206                BRX            MC02
00213  0 02 10060                SLPW           SKIP LINE
00214  0 13 00635                POT            4LNE
00215  0 46 30003  MC04  CLR
00216  0 35 00475                STA            CT90           SET COUNT TO ZERO
00217  0 40 20400                BPT            1             CHAR PRINT WANTED
00220  0 01 00302                BRU            MC20           NO
00221  0 71 00630                LDX            M4             SET OUTPUT CELLS
00222  2 76 00653                LDA            OUTPTA&4,2
00223  2 35 00657                STA            OUTPT1&4,2
00224  0 41 00222                BRX            *-2
00225  0 71 00631                LDX            M56
00226  0 02 42660  MC04M PLPW           PRINT CHAR TEST TITLE
00227  0 13 00663                POT            OMSG4
00230  0 40 21000                BRTW
00231  0 01 00230                BRU            *-1
00232  0 41 00226                BRX            MC04M
00233  0 02 10060                SLPW           SKIP LINE
00234  0 13 00636                POT            5LNE
00235  0 76 00623                LDA            C5             ADVANCE LINE COUNTER
00236  0 55 00475                ADD            CT90
00237  0 35 00475                STA            CT90
00240  0 76 00627                LDA            C131
00241  0 35 00633                STA            COUNT1
00242  0 76 00646  MC04R LDA            OUTPUT           SET INTERLACE POT
00243  0 35 00250                STA            MC05&1
00244  0 76 00621                LDA            C3             SET COUNTER
00245  0 35 00671                STA            TEMP&1
00246  0 71 00631                LDX            M56
00247  0 02 42660  MC05  PLPW           OUTPUT LINE OF DATA
00250  0 00 00000                PZE            **           POT SET AT START
00251  0 40 21000                BRTW
00252  0 01 00251                BRU            *-1
00253  0 41 00247                BRX            MC05
00254  0 02 10060                SLPW           SKIP A LINE
00255  0 13 00634                POT            1LNE
00256  0 43 00460                BRM            CT00           LINE COUNT
    
```


00257	1	00	00633		REDUCE	COUNT1	DONE WITH 132 LINES
00260	0	01	00272		BRU	MC10	NO
00261	0	76	00626		LDA	C66	YES
00262	0	54	00475		SUB	CT90	
00263	0	35	00645		STA	XLNE	
00264	0	40	10060		PRTW		PRINTER READY TEST
00265	0	01	00264		BRU	*-1	
00266	0	43	00476		BRM	KLUGE	
00267	0	02	10060		SLPW		SKIP A LINE
00270	0	13	00645		POT	XLNE	
00271	0	01	00302		BRU	MC20	
00272	0	61	00250	MC10	MIN	MC05&1	
00273	1	00	00671		REDUCE	TEMP&1	DONE 4 LOOPS
00274	0	01	00246		BRU	MC05-1	NO
00275	0	61	00653		MIN	OUTPT1	YES
00276	0	61	00654		MIN	OUTPT2	
00277	0	61	00655		MIN	OUTPT3	
00300	0	61	00656		MIN	OUTPT4	
00301	0	01	00242		BRU	MC04R	
00302	0	40	20200	MC20	BPT	2	BACKSPACE/TAB TEST
00303	0	01	00366		BRU	MC40	NO
00304	0	40	10060		PRTW		PRINTER READY TEST
00305	0	01	00304		BRU	*-1	
00306	0	43	00476		BRM	KLUGE	
00307	0	02	10060		SLPW		SKIP A LINE
00310	0	13	00640		POT	10LNE	
00311	0	71	00631		LDX	M56	
00312	0	02	42660	MC22	PLPW		
00313	0	13	00660		POT	OMSG1	
00314	0	40	21000		BRTW		
00315	0	01	00314		BRU	*-1	
00316	0	41	00312		BRX	MC22	
00317	0	02	10060		SLPW		SKIP LINE
00320	0	13	00634		POT	1LNE	
00321	0	71	00631		LDX	M56	
00322	0	02	42660	MC24	PLPW		
00323	0	13	00661		POT	OMSG2	
00324	0	40	21000		BRTW		
00325	0	01	00324		BRU	*-1	
00326	0	41	00322		BRX	MC24	
00327	0	02	10060		SLPW		SKIP LINE
00330	0	13	00641		POT	11LNE	
00331	0	76	00620		LDA	C1	
00332	0	35	00670		STA	TEMP	MAJOR LOOP
00333	0	76	00622	MC24M	LDA	C4	
00334	0	35	00671		STA	TEMP&1	MINOR LOOP
00335	0	71	00631		LDX	M56	
00336	0	02	42660	MC25	PLPW		
00337	0	13	00662		POT	OMSG3	
00340	0	40	21000		BRTW		

00341	0	01	00340	BRU	*-1	
00342	0	41	00336	BRX	MC25	
00343	0	02	10060	SLPW		SKIP LINE
00344	0	13	00634	POT	1LNE	
00345	1	00	00671	REDUCE	TEMP&1	DONE WITH MINOR LOOP
00346	0	01	00335	BRU	MC25-1	NO
00347	1	00	00670	REDUCE	TEMP	DONE WITH MAJOR LOOP
00350	0	01	00352	BRU	*&2	
00351	0	01	00361	BRU	MC27	YES
00352	0	40	10060	PRTW		PRINTER READY TEST
00353	0	01	00352	BRU	*-1	
00354	0	43	00476	BRM	KLUGE	
00355	0	02	10060	SLPW		SKIP LINE
00356	0	13	00636	POT	5LNE	
00357	0	00	00000	HLT		
00360	0	01	00333	BRU	MC24M	
00361	0	40	10060	PRTW		PRINTER READY TEST
00362	0	01	00361	BRU	*-1	
00363	0	43	00476	BRM	KLUGE	
00364	0	02	10060	SLPW		STEP A LINE
00365	0	13	00643	POT	29LNE	
00366	0	40	20100	BPT	3	IS A SLEW TEST WANTED
00367	0	01	00400	BRU	MC50	
00370	0	71	00631	LDX	M56	
00371	0	02	42660	PLPW		PRINT SLEW TEST MSG
00372	0	13	00664	POT	OMSG5	
00373	0	40	21000	BRTW		
00374	0	01	00373	BRU	*-1	
00375	0	41	00371	BRX	MC42	
00376	0	02	10060	SLPW		SKIP LINE
00377	0	13	00644	POT	66LNE	
00400	0	40	20040	BPT	4	
00401	0	01	00215	BRU	MC04	
00402	0	71	00631	LDX	M56	
00403	0	02	42660	PLPW		PRINT THE TITLE
00404	0	13	00667	POT	OMSG8	
00405	0	40	21000	BRTW		
00406	0	01	00405	BRU	*-1	
00407	0	41	00403	BRX	MC51	
00410	0	02	10060	SLPW		
00411	0	13	00636	POT	5LNE	
00412	0	76	00624	LDA	C21	
00413	0	35	00670	STA	TEMP	
00414	0	71	00631	LDX	M56	
00415	0	02	42660	PLPW		
00416	0	13	00665	POT	OMSG6	
00417	0	40	21000	BRTW		
00420	0	01	00417	BRU	*-1	
00421	0	41	00415	BRX	MC52	
00422	0	02	10060	SLPW		

00423	0	13	00634		POT	1LNE
00424	0	71	00631		LDX	M56
00425	0	02	42660	MC55	PLPW	
00426	0	13	00666		POT	OMSG7
00427	0	40	21000		BRTW	
00430	0	01	00427		BRU	*-1
00431	0	41	00425		BRX	MC55
00432	0	02	10060		SLPW	
00433	0	13	00634		POT	1LNE
00434	1	00	00670		REDUCE	TEMP
00435	0	01	00414		BRU	MC52-1
00436	0	71	00631		LDX	M56
00437	0	02	42660	MC56	PLPW	
00440	0	13	00665		POT	OMSG6
00441	0	40	21000		BRTW	
00442	0	01	00441		BRU	*-1
00443	0	41	00437		BRX	MC56
00444	0	71	00631		LDX	M56
00445	0	02	42660	MC57	PLPW	
00446	0	13	00666		POT	OMSG7
00447	0	40	21000		BRTW	
00450	0	01	00447		BRU	*-1
00451	0	41	00445		BRX	MC57
00452	0	02	10060		SLPW	
00453	0	13	00634		POT	1LNE
00454	0	43	00476		BRM	KLUGE
00455	0	02	10060		SLPW	
00456	0	13	00642		POT	16LNE
00457	0	01	00215		BRU	MC04

PAGE

*
* S/R TO COUNT THE NUMBER OF LINES PRINTED.
*

00460	0 00 00000	CT00	PZE	**
00461	0 61 00475		MIN	CT90
00462	0 76 00475		LDA	CT90
00463	1 01 00625		EQUAL	C50
00464	0 51 00460		BRR	CT00
00465	0 40 10060		PRTW	
00466	0 01 00465		BRU	*-1
00467	0 43 00476		BRM	KLUGE
00470	0 02 10060		EOM	10060
00471	0 13 00642		POT	16LNE
00472	0 46 30003		CLR	
00473	0 35 00475		STA	CT90
00474	0 51 00460		BRR	CT00
00475	0 00 00000	CT90	PZE	**
00476	0 00 00000	KLUGE	PZE	
00477	0 02 42660		EOM	42660
00500	0 13 00504		POT	KLUGE1
00501	0 40 21000		BRTW	
00502	0 01 00501		BRU	*-1
00503	0 51 00476		BRR	KLUGE
00504	00040600	KLUGE1	OCT	40600
	00600	KLUGE2	BOOL	600
	00600		ORG	KLUGE2
00600	60606060		OCT	60606060
		REDUCE	OPD	10000000
00601	06040000		OCT	06040000
00602	0 20 00000		NOP	
00603	0 53 40000		SKN*	0
00604	0 51 00000		BRR	0
00605	0 61 00000		MIN	0
00606	0 51 00000		BRR	0
		EQUAL	OPD	10100000
00607	0 36 00616		STB	EQUAL1
00610	0 75 00632		LDB	0M23
00611	0 70 40000		SKM*	0
00612	0 01 00614		BRU	*&2
00613	0 61 00000		MIN	0
00614	0 75 00616		LDB	EQUAL1
00615	0 51 00000		BRR	0
00616	0 00 00000	EQUAL1	PZE	**

NOT A FULL PAGE
PRINTER READY TEST

SLEW 16 LINES

PAGE COUNT TO ZERO

PRINTED LINE COUNT

PAGE

*
* PROGRAM CONSTANTS AND PARAMETERS
*

		PLPW	OPD	00242660	
		PRTW	OPD	04010060	
		SLPW	OPD	00210060	
00617	00000000	C0	DEC	0	
00620	00000001	C1	DEC	1	
00621	00000003	C3	DEC	3	
00622	00000004	C4	DEC	4	
00623	00000005	C5	DEC	5	
00624	00000025	C21	DEC	21	
00625	00000062	C50	DEC	50	
00626	00000102	C66	DEC	66	
00627	00000203	C131	DEC	131	
00630	77777774	M4	DEC	-4	
00631	77777710	M56	DEC	-56	
00632	77777777	0M23	OCT	77777777	
00633	0 00 00000	COUNT1	PZE	**	132 LINE COUNT
00634	00000001	1LNE	DEC	1	1 LINE SPACE
00635	00000004	4LNE	DEC	4	4 LINE SPACES
00636	00000005	5LNE	DEC	5	5 LINE SPACES
00637	00000010	8LNE	DEC	8	8 LINE SPACES
00640	00000012	10LNE	DEC	10	10 LINE SPACES
00641	00000013	11LNE	DEC	11	11 LINE SPACES
00642	00000020	16LNE	DEC	16	16 LINE SPACES
00643	00000035	29LNE	DEC	29	29 LINE SPACES
00644	00000102	66LNE	DEC	66	SLEW 66 LINES
00645	0 00 00000	XLNE	PZE	**	N LINE SPACES
00646	0 13 00653	OUTPUT	POT	OUTPT1	
00647	02041000	OUTPTA	OCT	2041000	
00650	02041200	OUTPTB	OCT	2041200	
00651	02041400	OUTPTC	OCT	2041400	
00652	02041600	OUTPTD	OCT	2041600	
00653	0 00 00000	OUTPT1	PZE	**	
00654	0 00 00000	OUTPT2	PZE	**	
00655	0 00 00000	OUTPT3	PZE	**	
00656	0 00 00000	OUTPT4	PZE	**	
00657	01242000	OMSG	OCT	1242000	
00660	02042100	OMSG1	OCT	2042100	
00661	02042141	OMSG2	OCT	2042141	
00662	01202300	OMSG3	OCT	1202300	
00663	01102400	OMSG4	OCT	1102400	
00664	00542500	OMSG5	OCT	542500	
00665	02042600	OMSG6	OCT	2042600	
00666	02042700	OMSG7	OCT	2042700	
00667	01102750	OMSG8	OCT	1102750	
00670	00012	TEMP	BSS	10	
	00100		ORG	64	

00100	0 01 00601		BRU	REDUCE
00101	0 01 00607		BRU	EQUAL
	01000		ORG	512
				OCTAL 1000
01000	21222324	PRINT1	BCI	9, ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
01011	12131415		OCT	12131415
01012	16172033		OCT	16172033
01013	34353640		OCT	34353640
01014	53545556		OCT	53545556
01015	57606174		OCT	57606174
01016	76212223		OCT	76212223
01017	24252627		BCI	8, DEFGHIJKLMNOPQRSTUVWXYZ012345678
01027	11121314		OCT	11121314
01030	15161720		OCT	15161720
01031	33343536		OCT	33343536
01032	40535455		OCT	40535455
01033	56576061		OCT	56576061
01034	73747621		OCT	73747621
01035	22232425		BCI	4, BCDEFGHIJKLMNOPQ
01041	21222324		BCI	9, ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
01052	12131415		OCT	12131415
01053	16172033		OCT	16172033
01054	34353640		OCT	34353640
01055	53545556		OCT	53545556
01056	57606174		OCT	57606174
01057	76212223		OCT	76212223
01060	24252627		BCI	8, DEFGHIJKLMNOPQRSTUVWXYZ012345678
01070	11121314		OCT	11121314
01071	15161720		OCT	15161720
01072	33343536		OCT	33343536
01073	40535455		OCT	40535455
01074	56576061		OCT	56576061
01075	73747621		OCT	73747621
01076	22232425		BCI	4, BCDEFGHIJKLMNOPQ
	01200		ORG	640
				OCTAL 1200
01200	22232425	PRINT2	BCI	9, BCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
01211	13141516		OCT	13141516
01212	17203334		OCT	17203334
01213	35364053		OCT	35364053
01214	54555657		OCT	54555657
01215	60617476		OCT	60617476
01216	21222324		BCI	9, ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
01227	12131415		OCT	12131415
01230	16172033		OCT	16172033
01231	34353640		OCT	34353640
01232	53545556		OCT	53545556
01233	57606173		OCT	57606173
01234	74762122		OCT	74762122
01235	23242526		BCI	4, CDEFGHIJKLMNOPQR
01241	22232425		BCI	9, BCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
01252	13141516		OCT	13141516

Ø1253	172Ø3334		OCT	172Ø3334
Ø1254	35364Ø53		OCT	35364Ø53
Ø1255	54555657		OCT	54555657
Ø1256	6Ø617476		OCT	6Ø617476
Ø1257	21222324		BCI	9, ABCDEFGHIJKLMNOPQRSTUVWXYZØ123456789
Ø127Ø	12131415		OCT	12131415
Ø1271	16172Ø33		OCT	16172Ø33
Ø1272	3435364Ø		OCT	3435364Ø
Ø1273	53545556		OCT	53545556
Ø1274	576Ø6173		OCT	576Ø6173
Ø1275	74762122		OCT	74762122
Ø1276	23242526		BCI	4, CDEFGHIJKLMNOPQR
	Ø14ØØ		ORG	768
Ø14ØØ	23242526	PRINT3	BCI	9, CDEFGHIJKLMNOPQRSTUVWXYZØ123456789 #
Ø1411	14151617		OCT	14151617
Ø1412	2Ø333435		OCT	2Ø333435
Ø1413	364Ø5354		OCT	364Ø5354
Ø1414	5556576Ø		OCT	5556576Ø
Ø1415	61747621		OCT	61747621
Ø1416	22232425		BCI	9, BCDEFGHIJKLMNOPQRSTUVWXYZØ123456789
Ø1427	13141516		OCT	13141516
Ø143Ø	172Ø3334		OCT	172Ø3334
Ø1431	35364Ø53		OCT	35364Ø53
Ø1432	54555657		OCT	54555657
Ø1433	6Ø617374		OCT	6Ø617374
Ø1434	76212223		OCT	76212223
Ø1435	24252627		BCI	4, DEFGHIJKLMNOPQRS
Ø1441	23242526		BCI	9, CDEFGHIJKLMNOPQRSTUVWXYZØ123456789 #
Ø1452	14151617		OCT	14151617
Ø1453	2Ø333435		OCT	2Ø333435
Ø1454	364Ø5354		OCT	364Ø5354
Ø1455	5556576Ø		OCT	5556576Ø
Ø1456	61747621		OCT	61747621
Ø1457	22232425		BCI	9, BCDEFGHIJKLMNOPQRSTUVWXYZØ123456789
Ø147Ø	13141516		OCT	13141516
Ø1471	172Ø3334		OCT	172Ø3334
Ø1472	35364Ø53		OCT	35364Ø53
Ø1473	54555657		OCT	54555657
Ø1474	6Ø617374		OCT	6Ø617374
Ø1475	76212223		OCT	76212223
Ø1476	24252627		BCI	4, DEFGHIJKLMNOPQRS
	Ø16ØØ		ORG	896
Ø16ØØ	24252627	PRINT4	BCI	9, DEFGHIJKLMNOPQRSTUVWXYZØ123456789 #@
Ø1611	1516172Ø		OCT	1516172Ø
Ø1612	33343536		OCT	33343536
Ø1613	4Ø535455		OCT	4Ø535455
Ø1614	56576Ø61		OCT	56576Ø61
Ø1615	74762122		OCT	74762122
Ø1616	23242526		BCI	9, CDEFGHIJKLMNOPQRSTUVWXYZØ123456789 #
Ø1627	14151617		OCT	14151617

01630	20333435		OCT	20333435
01631	36405354		OCT	36405354
01632	55565760		OCT	55565760
01633	61737476		OCT	61737476
01634	21222324		BCI	5, ABCDEFGHIJKLMNOPQRST
01641	24252627		BCI	9, DEFGHIJKLMNOPQRSTUVWXYZ0123456789 #@
01652	15161720		OCT	15161720
01653	33343536		OCT	33343536
01654	40535455		OCT	40535455
01655	56576061		OCT	56576061
01656	74762122		OCT	74762122
01657	23242526		BCI	9, CDEFGHIJKLMNOPQRSTUVWXYZ0123456789 #
01670	14151617		OCT	14151617
01671	20333435		OCT	20333435
01672	36405354		OCT	36405354
01673	55565760		OCT	55565760
01674	61737476		OCT	61737476
01675	21222324		BCI	5, ABCDEFGHIJKLMNOPQRST
	02000		ORG	1024
02000	54121212	MSG	BCI	13,*
02015	54541262		BCI	8,** SDS ON-LINE PRINTER TESTER **
	02100		ORG	1088 OCTAL 2100
02100	54121212	MSG1	BCI	11,* THE FOLLOWING TEST WILL PRINT
		A GROU		
02113	47124626		BCI	11,P OF LINES WITH AND WITHOUT TAB/BACKSP
		ACE CO		
02126	45635146		BCI	11,NTROL. AFTER THE FIRST GROUP HAS BEEN
02141	54121212	MSG2	BCI	11,* PRINTED A HALT WILL OCCUR AND THE
		POSITI		
02154	46451246		BCI	11,ON OF THE CONSOLE TAB/BACKSPACE SWITCH
		SHOUL		
02167	24122225		BCI	11,D BE REVERSED. THEN CLEAR THE HALT
	02300		ORG	1216 OCTAL 2300
02300	72002123	MSG3	OCT	72002123
02301	25122625		BCI	9,E FEATURE OF THE SDS LINE PRINTER.
02312	32626321		OCT	32626321
02313	22122145		BCI	3,B AND BACKSP
02316	32346330		OCT	32346330
02317	31621231		BCI	5,IS IS A TEST OF THE
	02400		ORG	1280 OCTAL 2400
02400	54121212	MSG4	BCI	9,* THE FOLLOWING TEST WILL PRIN
02411	63122565		BCI	9,T EVERY CHARACTER IN EVERY POSITION.
	02500		ORG	1344 OCTAL 2500
02500	54121212	MSG5	BCI	11,* THE FOLLOWING TEST WILL SLEW 1
		PAGE.		
	02600	XXX	BOOL	2600
	02600		ORG	XXX
02600	25122512	MSG6	BCI	11,E E E E E E E E E E E E E E E E E E
		E E E		


```

02613 25122512      E E E   BCI   11,E E E E E E E E E E E E E E E E E E E E E E
02626 25122512      E E E   BCI   11,E E E E E E E E E E E E E E E E E E E E E E
                02700 XXXX  BOOL   2700
                02700      ORG   XXXX
02700 12251225      MSG7  BCI   11, E E E E E E E E E E E E E E E E E E E E E E
                E E E
02713 12251225      BCI   11, E E E E E E E E E E E E E E E E E E E E E E
                E E E
02726 12251225      BCI   11, E E E E E E E E E E E E E E E E E E E E E E
                E E E
                02750      ORG   1512
02750 54121212      MSG8  BCI   11,*      OCTAL 2750
                VERTIC THE FOLLOWING TEST WILL CHECK
02763 21431221      BCI   7,AL AND HORIZONTAL CONTROL.
                00200      END   MC00

```

DONE PASS 2

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 2

Catalog No. 064002B

IDENTIFICATION: Buffered Line Printer Test Program

AUTHOR: M. R. Mulholland, SDS

ACCEPTED: 22 May 1964

COMPUTER
CONFIGURATION: Any SDS 910 or SDS 920 computer with an SDS buffered line printer.

PROGRAMMED
OPERATORS: None

STORAGE: Locations 100_g and 150_g-2336_g (1144 locations).

TIMING: The printer is driven at both its normal rate (300 lines per minute) and its maximum rate (1080 lines per minute, or 120 lines per second, while slewing).

USE: The Buffered Line Printer Test Program is on a self-loading paper tape.

1. Load the program by the normal FILL procedure. When the program is loaded, the computer will halt.
2. The paper should be adjusted in the printer such that the perforation between sheets is directly over the hammers. After the initial setting, the program will maintain form control and the page will be restored after each test.
3. Select the functions to be tested before clearing the halt.

BP 1 Reset: No action.
 Set: Each character is printed in every print position (Figure 1)

BP 2 Reset: No action.
 Set: Vertical format channels and vertical spacing is tested (Figure 2)

USE: (Cont)

- BP 3 Reset: No action.
 Set: Vertical and horizontal control are checked by printing a checkerboard of E's (Figure 3).
- BP 4 Reset: No action.
 Set: Maximum speed is attained in printing by printing the same character in the left most 64 character positions on a line, with each successive line printing the character which lies at an interval of approximately one-third of the distance around the printing drum from the preceding character (Figure 4).

Testing will continue as long as the particular test is called for by the breakpoints being set. If all the breakpoints are reset, the program will loop until a test is called for. If the breakpoints are all reset (upon completion of any test), the printer will slew the paper to the top of the next page.

METHOD: Not applicable.

* CHANNEL TESTS

CHANNEL 0 TEST
CHANNEL 1 TEST

CHANNEL 2 TEST

CHANNEL 3 TEST

CHANNEL 4 TEST

CHANNEL 5 TEST

CHANNEL 6 TEST

CHANNEL 7 TEST

CHANNEL SEVEN TRUE

* PAPER SPACE TESTS

NO SPACE

NO SPACE

NO SPACE

SINGLE SPACE

SINGLE SPACE

SINGLE SPACE

DOUBLE SPACE

DOUBLE SPACE

DOUBLE SPACE

TRIPLE SPACE

TRIPLE SPACE

TRIPLE SPACE

SPACE 4 LINES

SPACE 4 LINES

SPACE 4 LINES

SPACE 5 LINES

SPACE 5 LINES

SPACE 6 LINES

SPACE 6 LINES

SPACE 6 LINES

SPACE 7 LINES

SPACE 7 LINES

SPACE 7 LINES

Line #	Code	Operation	Address	Comments
1	*	BUFFERED LINE PRINTER TESTER		M. MULHOLLAND
2	*			
3	*			
4		ORG	104	
5	00150	LDA	=0100150	
6	00151	STA	1	
7	00152	HLT		
8		MACRO	A	
9		SKS	14050	
10		ENDM		
11		MACRO	A,B	
12		VFD	012/21.3/B.06/66.3/A-1	
13		ENDM		
14		MACRO	A	
15		SKS	12060	
16		ENDM		
17		MACRO	A,B	
18		VFD	012/21.3/B.06/46.3/A-1	
19		ENDM		
20		PRTW	1	
21		SKS	12060	
22		BRU	*-1	
23		PSCW	1.1	TOP OF PAGE
24		VFD	012/21.3/B.06/46.3/A-1	
25		LDA	LIST+1	
26		STA	TITLE	
27		LDA	C22	
28		STA	TEMPCT	
29		PLPW	1.4	
30		MIN*	TITLE	PRINT
31		MIN	TITLE	PROGRAM
32		REDUCE	TEMPCT	TITLE
33		BRU	BPO1	
34		TOPW		
35		BRTW		
36		BRU	*-1	
37		PRTW	1	
38		SKS	12060	
39		BRU	*-1	

LINE	CODE	STATION	DESCRIPTION	TEST / OPERATIONS	STATUS / NOTES
00174	C 40	11060	1	PFTW	
00175	C 43	01141		ERRR PSPW 1.4	SPACE 4 LINES
00176	C 021	4660		VFD 012/21.3/3.06/66.3/A-1	
00177	C 40	20400		BPT 1	TEST 1 WANTED
00200	C 01	02210		BRU BP02A	YES
00201	C 40	20200		BPT 2	TEST 2 WANTED
00202	C 01	03227		BRU BP10	YES
00203	C 40	20100		BPT 3	TEST 3 WANTED
00204	C 01	01004		BRU BP20	YES
00205	C 40	20040		BPT 4	TEST 4 WANTED
00206	C 01	01067		BRU BP30	YES
00207	C 01	00177		BRU BP02	RECHECK BREAKPOINTS
00210	C 76	01210		LDA LIST+2	
00211	C 35	01201		STA TITLE+1	
00212	C 76	01157		LDA CI7	
00213	C 35	02113		STA TEMPCT+1	
00214	C 02	02660		PLPW 1.4	
00215	C 12	41201		MIN* TITLE+1	PRINT
00216	C 61	01201		MIN TITLE+1	FIRST
00217	1 00	02113		REDUCE TEMPCT+1	TEST
00220	C 01	00215		BRU BP02M	TITLE
00221	C 02	14000		TOPW	
00222	C 40	21000		BRTW	
00223	C 01	00222		BRU *-1	
				PRTW 1	
				SKS 12060	
00224	C 40	12060		BRU *-1	
00225	C 01	00224		PFTW 1	
00226	C 40	11060		BRM ERRR	
00227	C 43	01141		PSPW 1.5	SPACE 5 LINES
00230	C 021	5660		VFD 012/21.3/3.06/66.3/A-1	
00231	C 02	02660		PLPW 1.4	
00232	C 02	14000		TOPW	
00233	C 40	21000		BRTW	
00234	C 01	00233		BRU *-1	
				PRTW 1	
				SKS 12060	
00235	C 40	12060		BRU *-1	
00236	C 01	00235			

00237	C	76	01165		LDA	C131			
00240	C	35	01175	72	STA	COUNT1			
00241	C	76	01236	73	LDA	OUTPT1			
00242	C	35	01234	74	STA	OUTPUT			
00243	C	76	01237	75	LDA	6PMIN1			
00244	C	35	01235	76	STA	6PMIN			
00245	C	76	01221	77	LDA	K1	PRESET		
00246	C	35	01211	78	STA	LIST+3	FIRST		
00247	C	76	01222	79	LDA	K1+1	FOUR		
00250	C	35	01212	80	STA	LIST+4	LINES		
00251	C	76	01223	81	LDA	K1+2	OF		
00252	C	35	01213	82	STA	LIST+5	DATA		
00253	C	76	01224	83	LDA	K1+3			
00254	C	35	01214	84	STA	LIST+6			
00255	C	76	01211	85	LDA	LIST+3			
00256	C	35	01230	86	STA	DATA			
00257	C	76	01212	87	LDA	LIST+4			
00260	C	35	01231	88	STA	DATA+1			
00261	C	76	01213	89	LDA	LIST+5			
00262	C	35	01232	90	STA	DATA+2			
00263	C	76	01214	91	LDA	LIST+5			
00264	C	35	01233	92	STA	DATA+3			
00265	C	76	01234	93	LDA	OUTPUT			
00266	C	35	00277	94	STA	BPO3			
00267	C	76	01235	95	LDA	6PMIN	PRESET LOOP COUNTER		
00270	C	35	00300	96	STA	BPO3+1			
00271	C	76	01153	97	LDA	C3			
00272	C	35	02123	98	STA	TEMP			
00273	C	76	01163	99	LDA	C32	PRESET LOOP COUNTER		
00274	C	35	02114	100	STA	TEMPCT+2			
00275	C	02	02660	101	PLPW	1+4			
				102	PSCW	1+0			
				103	VFD	012/21.3/B.06/46.3/A-1			
00276	C	02	010460						
00277	C	00	00000	104	PZE	**	PRINT LINE OF TEST 1		
00300	C	00	00000	105	PZE	**			
00301	C	00	02114	106	REDUCE	TEMPCT+2	DONE 33 WORDS		
00302	C	01	00277	107	BRU	BPO3	N6		
00303	C	02	14000	108	TOPW		YES		
00304	C	40	21000	109	BRTW				

00305	C	01	00304	110	BRU	*-1	012/21.3/8.06/46.9/A-1	DONE WITH 132 LINES
				111	PRTW	1		NO
00306	C	40	12060		SKS	12060		YES
00307	C	01	00306	112	BRU	*-1		
00310	C	40	11060	113	PFTW	1		
00311	C	43	01141	114	BRM	ERROR		
00312	1	00	01175	115	REDUCE	COUNT1		
00313	C	01	00316	116	BRU	BP04		
				117	PSCW	1.1		
00314	C	02	11460		VFD			
00315	C	01	00201	118	BRU	BP02+2	TEST BREAKPOINT 2	
00316	C	61	00277	119	MIN	BP03		
00317	C	61	00300	120	MIN	BP03+1		
00320	1	00	02123	121	REDUCE	TEMP	DONE 4 LOOPS	
00321	C	01	00273	122	BRU	BP03-4	NO	
00322	C	61	01211	123	MIN	LIST+3	YES	
00323	C	61	01212	124	MIN	LIST+4		
00324	C	61	01213	125	MIN	LIST+5		
00325	C	61	01214	126	MIN	LIST+6		
00326	C	01	00255	127	BRU	BP02R	DC NEXT SET OF 4	
00327	C	76	01215	128	LDA	LIST+7	SECOND TEST	
00330	C	35	01202	129	STA	TITLE+2	MSG6	
00331	C	76	01154	130	LDA	C4		
00332	C	35	02115	131	STA	TEMPCT+3		
00333	C	02	02660	132	PLPW	1.4		
00334	C	12	41202	133	MIN*	TITLE+2	PRINT	
00335	C	61	01202	134	MIN	TITLE+2	SECOND	
00336	1	00	02115	135	REDUCE	TEMPCT+3	TEST	
00337	C	01	00334	136	BRU	BP11	TITLE	
00340	C	02	14000	137	TOPW			
00341	C	40	21000	138	BRTW			
00342	C	01	00341	139	BRU	*-1		
				140	PRTW	1		
00343	C	40	12060		SKS	12060		
00344	C	01	00343	141	BRU	*-1		
00345	C	40	11060	142	PFTW	1		
00346	C	43	01141	143	BRM	ERROR	SPACE 4 LINES	
				144	PSPW	1.4		
00347	C	02	14660		VFD		012/21.3/8.06/66.3/A-1	

							CHANNEL 0 TITLE
00350	C	76	02230	145	LDA	LISTI	
00351	C	35	02240	145	STA	CHATIT	
00352	C	76	01153	147	LDA	C3	
00353	C	35	02115	148	STA	TEMPCT+3	
00354	C	02	02660	149	PLPW	1.4	
00355	C	12	42240	150	MIW*	CHATIT	BPI2
00356	C	61	02240	151	MIN	CHATIT	
00357	I	00	02115	152	REDUCE	TEMPCT+3	
00360	C	01	00355	153	BRU	BPI2	
00361	C	02	14000	154	TOPW		
00362	C	40	21000	155	BRTW		
00363	C	01	00352	156	BRU	**1	
00364	C	40	12060	157	PRTW	I	
00365	C	01	00364	158	SKS	12060	
00366	C	40	11060	159	BRU	**1	
00367	C	43	01141	160	PFTW	I	
				160	BRM	ERROR	
				161	PSCW	1.0	
00370	C	02	10460		VFD	012/21.3/3.56/45.3/A-1	
00371	C	76	02231	162	LDA	LISTI+1	
00372	C	35	02241	163	STA	CHATIT+1	
00373	C	76	01153	164	LDA	C3	
00374	C	35	02115	165	STA	TEMPCT+3	
00375	C	02	02660	166	PLPW	1.4	
00376	C	12	42241	167	MIW*	CHATIT+1	BPI3
00377	C	61	02241	168	MIN	CHATIT+1	
00400	I	00	02115	169	REDUCE	TEMPCT+3	
00401	C	01	00376	170	BRU	BPI3	
00402	C	02	14000	171	TOPW		
00403	C	40	21000	172	BRTW		
00404	C	01	00403	173	BRU	**1	
00405	C	40	12060	174	PRTW	I	
00406	C	01	00405	175	SKS	12060	
00407	C	40	11060	176	BRU	**1	
00410	C	43	01141	177	PFTW	I	
				177	BRM	ERROR	
00411	C	40	14060	179	EPTW	I	
00412	C	43	00642	179	SKS	14060	
					BRM	BPI9A	CHANNEL 7 TRUE

									CHANNEL 2 TITLE
00413	00211460	180	PSCW	1.1					
00414	0 76 02232	181	VFD	012/21.3/B.06/46.3/A-1					
00415	0 35 02242	182	LDA	LIST1+2					
00416	0 76 01153	183	STA	CHATIT+2					
00417	0 35 02115	184	LDA	C3					
00420	0 02 02660	185	STA	TEMPCT+3					
00421	0 12 42242	186	PLPW	1.4					
00422	0 61 02242	187	MIW*	CHATIT+2					
00423	1 00 02115	188	MIN	CHATIT+2					
00424	0 01 00421	189	REDUCE	TEMPCT+3					
00425	0 02 14000	190	BRU	BP14					
00426	0 40 21000	191	TOPW						
00427	0 01 00426	192	BRTW						
		193	BRU	*-1					
			PRTW	1					
00430	0 40 12060		SKS	12060					
00431	0 01 00430	194	BRU	*-1					
00432	0 40 11060	195	PFTW	1					
00433	0 43 01141	196	BRM	ERROR					
		197	EPTW	1					
00434	0 40 14060		SKS	14060					
00435	0 43 00642	198	BRM	BP19A					CHANNEL 7 TRUE
		199	PSCW	1.2					
00436	00212460		VFD	012/21.3/B.06/46.3/A-1					
00437	0 76 02233	200	LDA	LIST1+3					
00440	0 35 02243	201	STA	CHATIT+3					
00441	0 76 01153	202	LDA	C3					
00442	0 35 02115	203	STA	TEMPCT+3					
00443	0 02 02660	204	PLPW	1.4					
00444	0 12 42243	205	MIW*	CHATIT+3					CHANNEL 3 TITLE
00445	0 61 02243	206	MIN	CHATIT+3					
00446	1 00 02115	207	REDUCE	TEMPCT+3					
00447	0 01 00444	208	BRU	BP15					
00450	0 02 14000	209	TOPW						
00451	0 40 21000	210	BRTW						
00452	0 01 00451	211	BRU	*-1					
		212	PRTW	1					
00453	0 40 12060		SKS	12060					
00454	0 01 00453	213	BRU	*-1					

00455	C	40	11060	214	PFTW	1		
00456	C	43	01141	215	BRM	ERROR		
				215	EPTW	1		
00457	C	40	14060		SKS	14060		
00460	C	43	00642	217	BRM	BP19A		CHANNEL 7 TRUE
				218	PSCW	1.3		
00461	C	02	13460		VFD	012/21.3/9.06/46.3/A-1		
00462	C	76	02234	219	LDA	LISTI+4		
00463	C	35	02244	220	STA	CHATIIT+4		
00464	C	76	01153	221	LDA	C3		
00465	C	35	02115	222	STA	TEMPCT+3		
00466	C	02	02660	223	PLPW	1.4		
00467	C	12	42244	224	MIW*	CHATIIT+4		CHANNEL 4 TITLE
00470	C	61	02244	225	MIN	CHATIIT+4		
00471	1	00	02115	226	REDUCE	TEMPCT+3		
00472	C	01	00467	227	BRU	BP16		
00473	C	02	14000	228	TOPW			
00474	C	40	21000	229	BRTW			
00475	C	01	00474	230	BRU	**1		
				231	PRTW	1		
00476	C	40	12060		SKS	12060		
00477	C	01	00476	232	BRU	**1		
00500	C	40	11060	233	PFTW	1		
00501	C	43	01141	234	BRM	ERROR		
				235	EPTW	1		
00502	C	40	14060		SKS	14060		
00503	C	43	00642	236	BRM	BP19A		CHANNEL 7 TRUE
				237	PSCW	1.4		
00504	C	02	14460		VFD	012/21.3/9.06/46.3/A-1		
00505	C	76	02235	238	LDA	LISTI+5		
00506	C	35	02245	239	STA	CHATIIT+5		
00507	C	76	01153	240	LDA	C3		
00510	C	35	02115	241	STA	TEMPCT+3		
00511	C	02	02660	242	PLPW	1.4		
00512	C	12	42245	243	MIW*	CHATIIT+5		CHANNEL 5 TITLE
00513	C	61	02245	244	MIN	CHATIIT+5		
00514	1	00	02115	245	REDUCE	TEMPCT+3		
00515	C	01	00512	246	BRU	BP17		
00516	C	02	14000	247	TOPW			

00517	C	40	21000	248	BRTW		
00520	C	01	00517	249	BRU	**1	
				250	PRTW	1	
00521	C	40	12060		SKS	12060	
00522	C	01	00521	251	BRU	**1	
00523	C	40	11060	252	PFTW	1	
00524	C	43	01141	253	BRM	ERROR	
				254	EPTW	1	
00525	C	40	14060		SKS	14060	
00526	C	43	00642	255	BRM	BP19A	CHANNEL 7 TRUE
				256	PSCW	1.6	
00527	C	02	16460		VFD	012/21.3/8.06/46.3/A-1	
00530	C	76	02236	257	LDA	LISTI+6	
00531	C	35	02246	258	STA	CHATIT+6	
00532	C	76	01153	259	LDA	C3	
00533	C	35	02115	260	STA	TEMPCT+3	
00534	C	02	02660	261	PLPW	1.4	
00535	C	12	42246	262	MIW*	BP18	CHANNEL 6 TITLE
00536	C	61	02246	263	MIN	CHATIT+6	
00537	I	00	02115	264	REDUCE	TEMPCT+3	
00540	C	01	00535	265	BRU	BP18	
00541	C	02	14000	266	TOPW		
00542	C	40	21000	267	BRTW		
00543	C	01	00542	268	BRU	**1	
				269	PRTW	1	
00544	C	40	12060		SKS	12060	
00545	C	01	00544	270	BRU	**1	
00546	C	40	11060	271	PFTW	1	
00547	C	43	01141	272	BRM	ERROR	
				273	EPTW	1	
00550	C	40	14060		SKS	14060	
00551	C	43	00642	274	BRM	BP19A	CHANNEL 7 TRUE
				275	PSCW	1.6	
00552	C	02	16460		VFD	012/21.3/8.06/46.3/A-1	
00553	C	76	02237	276	LDA	LISTI+7	
00554	C	35	02247	277	STA	CHATIT+7	
00555	C	76	01153	278	LDA	C3	
00556	C	35	02115	279	STA	TEMPCT+3	
00557	C	02	02660	280	PLPW	1.4	

CHANNEL 7 TITLE

CHATIT+7
CHATIT+7
TEMPCT+3

MIN*
MIN
REDUCE

BP19

281
282
283

00560 C 12 42247
00561 C 6: 02247
00562 I 00 02115

BP19

BRU
TOPW
BRTW

284
285
286

00563 C 0: 00560
00564 C 02 14000
00565 C 40 21000

**1

BRU
PRTW
SKS

287
288

00566 C 0: 00565
00567 C 40 12060

12060

BRU
PFTW
BRM

289
290
291

00570 C 0: 00567
00571 C 40 11060
00572 C 43 01141

ERROR

EPTW
SKS
BRM

292
293

00573 C 40 14060
00574 C 43 00542

14060

BP19A
PSCW

294

00575 C 02 17460
00576 C 02 02660

1.7
012/21.3/8.66/46.3/A-1

VFD
PLPW
TOPW

295
296

00577 C 02 14000
00600 C 40 21000

**1

BRU
PRTW
SKS

298
299

00601 C 01 00600
00602 C 40 12060

12060

BRU
PLPW
EPTW

300
301
302

00603 C 01 00602
00604 C 02 02660
00605 C 40 14060

1.4

14060
**5
MS
CHA7F

303
304
305

00606 C 01 00613
00607 C 71 01170
00610 C 12 41327

**1

BRX
BRU
LDX

306
307
308

00611 C 41 00610
00612 C 01 00616
00613 C 71 01170

MS

MIN*
BRX
TOPW

309
310
311

00614 C 12 41335
00615 C 41 00614
00616 C 02 14000

**1

CHA7T
BRX
BRTW
BRU
PRTW

312
313
314

00617 C 40 21000
00620 C 0: 00617

**1

Code	Category	Sub-Category	Item ID	Item Description	Item Type	Item Code	Item Title
00621	C	40	12060	SKS	12060		
00622	C	01	00621	BRU	*-1	315	
				PSCW	1.0	316	
00623	C	02	0210460	VFD	012/21.3/8.06/46.3/A-1		
00624	C	02	02660	PLPW	1.4	317	
00625	C	02	14000	TOPW		318	
				PRTW	1	319	
00626	C	40	12060	SKS	12060		
00627	C	01	00626	BRU	*-1	320	
00630	C	02	02641	TYPW	1.4	321	
00631	C	71	01171	LDX	M5	322	
00632	C	12	42323	MIW*	CHAM	323	
00633	C	41	00632	BRX	*-1	324	
00634	C	12	01166	MIW	CR4	325	
00635	C	02	14000	TOPW		326	
00636	C	40	21000	BRTW		327	
00637	C	01	00636	BRU	*-1	328	
00640	C	00	00000	HLT		329	
00641	C	01	00655	BRU	BP19B	330	
00642	C	00	00000	PZE		331	
00643	C	02	02660	PLPW	1.4	332	
00644	C	71	01172	LDX	M12	333	
00645	C	12	41352	MIW*	CH7T	334	
00646	C	41	00645	BRX	*-1	335	
00647	C	02	14000	TOPW		336	
00650	C	40	21000	BRTW		337	
00651	C	01	00650	BRU	*-1	338	
				PRTW		339	
00652	C	40	12060	SKS	12060		
00653	C	01	00652	BRU	*-1	340	
00654	C	51	00642	BRR	BP19A	341	
00655	C	76	01220	LDA	LIST+10	342	
00656	C	35	01205	STA	TITLE+5	343	
00657	C	76	01155	LDA	C5	344	
00660	C	35	02122	STA	TEMPCT+8	345	
				PSCW	1.1	346	
00661	C	02	11460	VFD	012/21.3/8.06/46.3/A-1		
00662	C	02	02660	PLPW	1.4	347	
00663	C	12	41205	MIW*	TITLE+5	348	

CHANNEL MESSAGE

6F
PAPER
SPACE
TEST

TITLE+S
TEMPCT+S
BRU
BP19C

MIN
REDUCE
BRU
TBPW
BRTW
BRU
PRTW
SKS
BRU
PFTW
BRM
LDA
STA
LDA*
STA
STA
LDA*
STA
PSPW
VFD
PLPW
LDX
MIW*
BRX
TBPW
BKTW
BRU
PRTW
SKS
BRU
PFTW
BRM
PZE
PLPW
LDX
MIW
BRX
LDX

349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
365
367
369
369
370
371
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382
383
384

00664 C 61 01205
00665 I 00 02122
00666 C 01 00662
00667 C 02 14000
00670 C 40 21000
00671 C 01 00670
00672 C 40 12060
00673 C 01 00672
00674 C 40 11000
00675 C 43 01141
00676 C 76 01156
00677 C 35 02122
00700 C 76 41240
00701 C 35 00722
00702 C 35 00741
00703 C 35 00760
00704 C 76 41251
00705 C 35 01227
00706 C 0214660
00707 C 02 02660
00710 C 71 01167
00711 C 12 41227
00712 C 41 00711
00713 C 02 14000
00714 C 40 21000
00715 C 01 00714
00716 C 40 12060
00717 C 01 00716
00720 C 40 11060
00721 C 43 01141
00722 C 00 00000
00723 C 02 02660
00724 C 71 01171
00725 C 12 02064
00726 C 41 00725
00727 C 71 01157

BP19D
*--1
1
12060
*--1
1
ERROR
C7
TEMPCT+S
SPACE
SP15E
BP19F
BP19G
SPN9G
MSPACE
1.4
012/21.3/5.06/00.3/A-1
1.4
M4
MSPACE
*--1
*--1
1
12060
*--1
1
ERROR
**
1.4
M6
MSG+1
*--1
M4

SPACE 4 LINES

FIRST
PAPER
SPACE
TITLE

SECOND
PAPER
SPACE
TITLE

MSPACE

MIW*

385

00730 C 12 41227

BRX

386

00731 C 41 00730

TOPW

387

00732 C 02 14000

BRTW

388

00733 C 40 21000

BRU

389

00734 C 01 00733

PRTW

390

00735 C 40 12060

SKS

391

00736 C 01 00735

BRU

392

00737 C 40 11060

PFTW

393

00740 C 43 01141

BRM

394

00741 C 00 00000

PZE

395

00742 C 02 02660

PLPW

396

00743 C 71 01172

LDX

397

00744 C 12 02064

MIW

398

00745 C 41 00744

BRX

399

00746 C 71 01167

LDX

400

00747 C 12 41227

MIW*

401

00750 C 41 00747

BRX

402

00751 C 02 14000

TOPW

403

00752 C 40 21000

BRTW

404

00753 C 01 00752

BRU

405

00754 C 40 12060

PRTW

406

00755 C 01 00754

SKS

407

00756 C 40 11060

BRU

408

00757 C 43 01141

PFTW

409

00760 C 00 00000

BRM

410

00761 C 02 02060

PZE

411

00762 C 12 02064

PLPW

412

00763 C 02 14000

MIW

413

00764 C 40 21000

TOPW

414

00765 C 01 00764

BRTW

415

00766 C 40 12060

BRU

416

00767 C 01 00766

MIN

417

00770 C 61 01240

LDX

418

00771 C 71 01170

MIN

419

00772 C 61 01251

BRX

420

00773 C 41 00772

THIRD
PAPER
SPACE
TITLE

MSPACE

MIW*

420

00751 C 02 14000

BRTW

403

00752 C 40 21000

BRU

404

00753 C 01 00752

PRTW

405

00754 C 40 12060

SKS

406

00755 C 01 00754

BRU

407

00756 C 40 11060

PFTW

408

00757 C 43 01141

BRM

409

00760 C 00 00000

PZE

410

00761 C 02 02060

PLPW

411

00762 C 12 02064

MIW

412

00763 C 02 14000

TOPW

413

00764 C 40 21000

BRTW

414

00765 C 01 00764

BRU

415

00766 C 40 12060

PRTW

416

00767 C 01 00766

SKS

417

00770 C 61 01240

BRU

418

00771 C 71 01170

MIN

419

00772 C 61 01251

LDX

420

00773 C 41 00772

MIN

420

00773 C 41 00772

BRX

420

00773 C 41 00772

MS

420

00773 C 41 00772

SPMSG

420

00773 C 41 00772

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420

00773 C 41 00772

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420

00773 C 41 00772

**

420

00773 C 41 00772

DONE ALL 9 TESTS

TEMPCT+8

REDUCE

00774 1 00 02122 421

BRU BPI9D

00775 0 01 00700 422

LDA K2

00776 0 76 01225 423

STA SPACE

00777 0 35 01240 424

LDA K2+1

01000 0 76 01225 425

STA SPMSG

01001 0 35 01251 426

PSCW 1.1

01002 00211450 427

VFD 012/21.3/8.06/46.3/A-1

01003 0 01 00203 428

BRU 8P02+4

01004 0 76 01218 429

LDA LIST+8

01005 0 35 01203 430

STA TITLE+3

01006 0 76 01157 431

LDA C17

01007 0 35 02116 432

STA TEMPCT+4

01010 0 02 02600 433

PLPW 1.4

01011 0 12 41203 434

MIN* SP21

01012 0 61 01203 435

MIN TITLE+3

01013 1 00 02116 436

REDUCE TITLE+3

01014 0 01 01011 437

BRU TEMPCT+4

01015 0 02 14000 438

TBPW BP21

01016 0 40 21000 439

BRTW *-1

01017 0 01 01016 440

BRU 1

01020 0 40 12000 441

PRTW 12060

01021 0 01 01020 442

SKS *-1

01022 0 40 11060 443

BRU 1

01023 0 43 01141 444

PFTW 2K00R

01024 00214650 445

BRW 1.4

01025 0 76 01161 446

PSPW 012/21.3/8.06/50.3/A-1

01026 0 35 02117 447

VFD C21

01027 0 71 01174 448

LDA STA TEMPCT+5

01030 0 02 02600 449

LDA M33

01031 0 12 02164 450

PLPW 1.4

01032 0 41 01031 451

MIW M050

01033 0 02 14000 452

BRX *-1

01034 0 40 21000 453

TBPW EVEN

01035 0 01 01034 454

BRTW NUMBERED

01036 0 40 12060 455

BKU 1

01036 0 40 12060 455

PRTW 12060

01036 0 40 12060 455

SKS

01036 0 40 12060 455

PRINT
THRU
TEST
TITLE

SPACE 4 LINES

EVEN
NUMBERED
LINES
OF
TEST

01037	C 01 01036	456	BRU	*-1	
01040	C 40 11060	457	PFTW	1	
01041	C 43 01141	458	BRM	ERRR	
01042	C 02 0210450	459	PSCW	1.0	
01043	C 71 01174	460	VFD	012/21.3/8.06/46.3/A-1	0DD
01044	C 02 02660	461	LDX	M33	NUMBERED
01045	C 12 02155	462	PLPW	1.4	LINES
01046	C 41 01045	463	MIW	MSG7	OF
01047	C 02 14000	464	BRX	*-1	TEST
01050	C 40 21000	465	TOPW		
01051	C 01 01050	466	BRTW		
01052	C 40 12060	467	BRU	*-1	
01053	C 01 01052	468	PRTW	1	
01054	C 40 11060	469	SKS	12060	
01055	C 43 01141	470	BRU	*-1	
01056	C 02 02660	471	PFTW	1	
01057	I 00 02117	472	BRM	ERRR	
01060	C 01 01027	473	PSCW	1.0	
01061	C 02 02660	474	VFD	012/21.3/5.06/46.3/A-1	
01062	C 02 14000	475	REDUCE	TEMPCT+5	
01063	C 40 12060	476	BRU	BP22	
01064	C 01 01063	477	PLPW	1.4	
01065	C 02 02660	478	TOPW		
01066	C 01 00205	479	PRTW	1	
01067	C 76 01217	480	SKS	12060	
01070	C 35 01204	481	BRU	*-1	
01071	C 76 01157	482	PSCW	1.1	
01072	C 35 02120	483	VFD	012/21.3/3.06/45.3/A-1	
01073	C 02 02660	484	BRU	BP02+6	
01074	C 12 41204	485	LDA	LIST+9	
01075	C 61 01204	486	STA	TITLE+4	
01076	I 00 02120	487	LDA	C17	
01077	C 01 01074	488	STA	TEMPCT+6	
01100	C 02 14000	489	PLPW	1.4	PRINT
			MIW*	TITLE+4	FOURTH
			MIN	TITLE+4	TEST
			REDUCE	TEMPCT+6	TITLE
			BRU	BP31	
			T9PW		

Item No.	Code	Quantity	Description	Unit	Price	Ext. Price	Notes
01101	C 40	21000	BRTW	490			
01102	C 01	01101	BRU	491			*-1
			PRTW	492			1
01103	C 40	12060	SKS				12060
01104	C 01	01103	BRU	493			*-1
01105	C 40	11060	PFTW	494			1
01106	C 43	01141	BRM	495			ERKSR
			PSPW	496			1.4
01107	C02	14650	VFD				012/21.3/5.06/46.3/A-1
01110	C 76	01206	LDA	497			L16T
01111	C 35	01177	STA	498			CHAR
01112	C 76	01164	LDA	499			C63
01113	C 35	02121	STA	500			TEMPCT+7
01114	C 02	02660	PLFW	501			1.4
01115	C 71	01173	LDX	502			M15
01116	C 12	41177	M1W*	503			PRINT
01117	C 41	01116	BRX	504			CHARACTERS
01120	C 02	14000	TOPW	505			*-1
01121	C 40	21000	BRTW	506			
01122	C 01	01121	BRU	507			*-1
			PRTW	508			1
01123	C 40	12060	SKS				12060
01124	C 01	01123	BRU	509			*-1
01125	C 40	11060	PFTW	510			1
01126	C 43	01141	BRM	511			ERRSR
01127	C 61	01177	MIN	512			CHAR
			PSCW	513			1.0
01130	C02	10460	VFD				012/21.3/5.06/46.3/A-1
01131	1 00	02121	REDUCE	514			TEMPCT+7
01132	C 01	01114	BRU	515			BP32-1
01133	C 02	02660	PLPW	516			1.4
01134	C 02	14000	TOPW	517			
			PRTW	518			1
01135	C 40	12060	SKS				12060
01136	C 01	01135	BRU	519			*-1
			PSCW	520			1.0
01137	C02	11460	VFD				012/21.3/5.06/46.3/A-1
01140	C 01	00177	BRU	521			BP02
01141	C 00	00000	PZE	522			**

01142	C 02 02641	523	TYPW	1.4
01143	C 71 01167	524	LDX	M4
01144	C 12 42314	525	MIW*	PFM
01145	C 41 01144	526	BRX	*-1
01146	C 12 01166	527	MIW	CR4
01147	C 02 14000	528	T0PW	
01150	C 40 21000	529	BRTW	
01151	C 01 01150	530	BRU	*-1
01152	C 51 01141	531	BRR	ERR0R

PAGE

* * PROGRAM CONSTANTS AND PARAMETERS

532

533

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01153 C0000003

01154 C0000004

01155 C0000005

01156 C0000007

01157 C0000021

01160 C0000024

01161 C0000025

01162 C0000026

01163 C0000040

01164 C0000077

01165 C0000203

01166 12121252

01167 77777774

01170 77777773

01171 77777772

01172 77777754

01173 77777760

01174 77777737

01175 C 00 00000

01176 00001

01177 00001

01200 00006

01206 C 00 01753

01207 C 00 02063

01210 C 00 02125

01211 C 00 01353

01212 C 00 01455

01213 C 00 01557

01214 C 00 01661

01215 C 00 02147

01216 C 00 02156

01217 C 00 02200

01220 C 00 02222

01221 C 00 01353

01222 C 00 01455

DEC 3

DEC 4

DEC 5

DEC 7

DEC 17

DEC 20

DEC 21

DEC 22

DEC 32

DEC 63

DEC 131

DEC 12121252

DEC -4

DEC -5

DEC -6

DEC -12

DEC -16

DEC -33

PZE **

BSS 1

BSS 1

BSS 6

PZE PRINT5

PZE MSG

PZE MSG4

PZE PRINT1

PZE PRINT2

PZE PRINT3

PZE PRINT4

PZE MSG5

PZE MSG8

PZE MSG9

PZE MSG10

PZE PRINT1

PZE PRINT2

23 W6KD MESSAGE

18 W6KD MESSAGE

5 W6RU MESSAGE

18 W6KD MESSAGE

18 W6KD MESSAGE

01223	C 00 01557	571	PZE	PRINT3
01224	C 00 01661	572	PZE	PRINT4
01225	C 00 01241	573	PZE	PSPACE
01226	C 00 01256	574	PZE	SPO
01227	00001	575	BSS	1
01230	00004	576	BSS	4
01234	00001	577	BSS	1
01235	00001	578	BSS	1
01236	C 12 41230	579	MIW*	DATA
01237	C 61 01230	580	MIN	DATA
01240	C 00 01241	581	PZE	PSPACE
01241	00210660	582	PSPW	1.0
01241	00210660	583	VFD	012/21.3/8.06/66.3/A-1
01242	00211660	584	PSPW	1.1
01242	00211660	584	VFD	012/21.3/8.06/66.3/A-1
01243	00212660	585	PSPW	1.2
01243	00212660	585	VFD	012/21.3/8.06/66.3/A-1
01244	00213660	586	PSPW	1.3
01244	00213660	586	VFD	012/21.3/8.06/66.3/A-1
01245	00214660	587	PSPW	1.4
01245	00214660	587	VFD	012/21.3/8.06/66.3/A-1
01246	00215660	588	PSPW	1.5
01246	00215660	588	VFD	012/21.3/8.06/66.3/A-1
01247	00216660	589	PSPW	1.6
01247	00216660	589	VFD	012/21.3/8.06/66.3/A-1
01250	00217660	590	PSPW	1.7
01250	00217660	590	VFD	012/21.3/8.06/66.3/A-1
01251	C 00 01256	591	PZE	SPU
01252	45461262	591	BCI	4.06 SPACE
01253	47212325	592	SPO	0SPACE+4.2
01254	12121212	593	1SPACE	4.9 SINGLE SPACE
01255	12121212	593	BCI	
01256	2 00 01256	594	SPI	1SPACE+4.2
01257	62914527	595	2SPACE	4.00 DOUBLE SPACE
01260	43251262		BCI	
01261	47212325			
01262	12121212			
01263	2 00 01263			
01264	24456422			

01265	43251262								
01266	47212325								
01267	12121212								
01270	2 00 01270	596	SP2	PZE	2SPACE+4,2				
01271	63513147	597	3SPACE	BCI	4,TRIPLE SPACE				
01272	43251252								
01273	47212325								
01274	12121212								
01275	2 00 01275	598	SP3	PZE	3SPACE+4,2				
01276	62472123	599	4SPACE	BCI	4,SPACE 4 LINES				
01277	25120412								
01300	43314525								
01301	62121212								
01302	2 00 01302	600	SP4	PZE	4SPACE+4,2				
01303	62472123	601	5SPACE	BCI	4,SPACE 5 LINES				
01304	25120512								
01305	43314525								
01306	62121212								
01307	2 00 01307	602	SP5	PZE	5SPACE+4,2				
01310	62472123	603	6SPACE	BCI	4,SPACE 6 LINES				
01311	25120612								
01312	43314525								
01313	62121212								
01314	2 00 01314	604	SP6	PZE	6SPACE+4,2				
01315	62472123	605	7SPACE	BCI	4,SPACE 7 LINES				
01316	25120712								
01317	43314525								
01320	62121212								
01321	2 00 01321	606	SP7	PZE	7SPACE+4,2				
01322	45466312	607	CHA7FM	BCI	5,NOT AT CHANNEL SEVEN				
01323	21631223								
01324	30214545								
01325	25431262								
01326	25652545								
01327	2 00 01327	608	CHA7F	PZE	CHA7FM+5,2				
01330	23302145	609	CHA7TM	BCI	5,CHANNEL SEVEN TRUE				
01331	45254312								
01332	62256525								
01333	45126351								

		CHANNEL SEVEN ALSO TRUE			
01334	64251212	610	CHA7T PZE	CHA7TM+5.2	
01335	2 00 01335	611	CH7TM BCI	12.	
01336	12121212				
01337	12121212				
01340	12121212				
01341	12121212				
01342	12121212				
01343	12121212				
01344	23302145				
01345	45254312				
01346	62256525				
01347	45122143				
01350	62461263				
01351	51642512				
01352	2 00 01352	612	CH7T	CH7TM+12.2	
	00000	613	0	0	
	00001	614	1	1	
	00002	615	2	2	
	00003	616	3	3	
	00004	617	4	4	
	00005	618	5	5	
	00006	619	6	6	
	00007	620	7	7	
01353	12600001	621	PRINT1 0CT	12600001	
01354	02030405	622	0CT	02030405	
01355	06071011	623	0CT	06071011	
01356	20403373	624	0CT	20403373	
01357	54212223	625	0CT	54212223	
01360	24252627	626	BCI	5.DEFGHIJKLMN0PQRSTJUV	
01361	30314142				
01362	43444546				
01363	47505162				
01364	63646566				
01365	67707113	627	0CT	67707113	
01366	14743461	628	0CT	14743461	
01367	16365615	629	0CT	16365615	
01370	53325535	630	0CT	53325535	
01371	52175776	631	0CT	52175776	
01372	75723777	632	0CT	75723777	

01373	12600001	633	0CT	12600001	
01374	02030405	634	0CT	02030405	
01375	06071011	635	0CT	06071011	
01376	20403373	636	0CT	20403373	
01377	54212223	637	0CT	54212223	
01400	24252627	638	0CI	5. DEFGHIJKLMNPQRSTJUV	
01401	30314142				
01402	43444546				
01403	47505162				
01404	63646566				
01405	67707113	639	0CT	67707113	
01406	14743461	640	0CT	14743461	
01407	16365615	641	0CT	16365615	
01410	53325535	642	0CT	53325535	
01411	52175776	643	0CT	52175776	
01412	75723777	644	0CT	75723777	
01413	12600001	645	0CT	12600001	
01414	02030405	646	0CT	02030405	
01415	06071011	647	0CT	06071011	
01416	20403373	648	0CT	20403373	
01417	54212223	649	0CT	54212223	
01420	24252627	650	0CI	5. DEFGHIJKLMNPQRSTJUV	
01421	30314142				
01422	43444546				
01423	47505162				
01424	63646566				
01425	67707113	651	0CT	67707113	
01426	14743461	652	0CT	14743461	
01427	16365615	653	0CT	16365615	
01430	53325535	654	0CT	53325535	
01431	52175776	655	0CT	52175776	
01432	75723777	656	0CT	75723777	
01433	12600001	657	0CT	12600001	
01434	02030405	658	0CT	02030405	
01435	06071011	659	0CT	06071011	
01436	20403373	660	0CT	20403373	
01437	54212223	661	0CT	54212223	
01440	24252627	662	0CI	5. DEFGHIJKLMNPQRSTJUV	
01441	30314142				

01442	43444546									
01443	47505162									
01444	63646566									
01445	67707113	663		0CT		67707113				
01446	14743461	664		0CT		14743461				
01447	16365615	665		0CT		16365615				
01450	53325535	666		0CT		53325535				
01451	52175776	667		0CT		52175776				
01452	75723777	668		0CT		75723777				
01453	12600001	669		0CT		12600001				
01454	02030405	670		0CT		02030405				
01455	60000102	671	PRINT2	0CT		60000102				
01456	03040506	672		0CT		03040506				
01457	07101120	673		0CT		07101120				
01460	40337354	674		0CT		40337354				
01461	21222324	675		BCI		6•ABCDEF	GHIJKL	MNOP	QRSTU	VWX
01462	25262730									
01463	31414243									
01464	44454647									
01465	50516263									
01466	64656667									
01467	70711314	676		0CT		70711314				
01470	74346116	677		0CT		74346116				
01471	36561553	678		0CT		36561553				
01472	32553552	679		0CT		32553552				
01473	17577675	680		0CT		17577675				
01474	72377712	681		0CT		72377712				
01475	60000102	682		0CT		60000102				
01476	03040506	683		0CT		03040506				
01477	07101120	684		0CT		07101120				
01500	40337354	685		0CT		40337354				
01501	21222324	686		BCI		6•ABCDEF	GHIJKL	MNOP	QRSTU	VWX
01502	25262730									
01503	31414243									
01504	44454647									
01505	50516263									
01506	64656667									
01507	70711314	687		0CT		70711314				
01510	74346116	688		0CT		74346116				

01511	36561553	689	0CT	36561553
01512	32553552	690	0CT	32553552
01513	17577675	691	0CT	17577675
01514	72377712	692	0CT	72377712
01515	6000102	693	0CT	6000102
01516	03040506	694	0CT	03040506
01517	07101120	695	0CT	07101120
01520	40337354	695	0CT	40337354
01521	21222324	697	0CI	6, ABCDEFGHIJKLMN0PQRSTUWXA
01522	25262730			
01523	31414243			
01524	44454647			
01525	50516253			
01526	64656657			
01527	70711314	698	0CT	70711314
01530	74346115	699	0CT	74346115
01531	36561553	700	0CT	36561553
01532	32553552	701	0CT	32553552
01533	17577675	702	0CT	17577675
01534	72377712	703	0CT	72377712
01535	6000102	704	0CT	6000102
01536	03040506	705	0CT	03040506
01537	07101120	706	0CT	07101120
01540	40337354	707	0CT	40337354
01541	21222324	708	0CI	6, ABCDEFGHIJKLMN0PQRSTUWXA
01542	25262730			
01543	31414243			
01544	44454647			
01545	50516253			
01546	64656667			
01547	70711314	709	0CT	70711314
01550	74346116	710	0CT	74346115
01551	36561553	711	0CT	36561553
01552	32553552	712	0CT	32553552
01553	17577675	713	0CT	17577675
01554	72377712	714	0CT	72377712
01555	6000102	715	0CT	6000102
01556	03040506	716	0CT	03040506
01557	00010203	717	0CI	2, 01234567

PRINT3

01560	C4050607	718	0CT	10112040
01561	10112040	719	0CT	33735421
01562	33735421	720	BCI	6.BCDEFHIJKLMN0PQRSTUWXYZ
01563	22232425			
01564	26273031			
01565	41424344			
01566	45464750			
01567	51526364			
01570	655666770			
01571	71131474	721	0CT	71131474
01572	34611636	722	0CT	34611636
01573	56155332	723	0CT	56155332
01574	55355217	724	0CT	55355217
01575	57767572	725	0CT	57767572
01576	37771260	725	0CT	37771260
01577	0010203	727	BCI	2.01234567
01600	C4050607			
01601	10112040	728	0CT	10112040
01602	33735421	729	0CT	33735421
01603	22232425	730	BCI	6.BCDEFHIJKLMN0PQRSTUWXYZ
01604	26273031			
01605	41424344			
01606	45464750			
01607	51526364			
01610	655666770			
01611	71131474	731	0CT	71131474
01612	34611636	732	0CT	34611636
01613	56155332	733	0CT	56155332
01614	55355217	734	0CT	55355217
01615	57767572	735	0CT	57767572
01616	37771260	736	0CT	37771260
01617	0010203	737	BCI	2.01234567
01620	C4050607			
01621	10112040	738	0CT	10112040
01622	33735421	739	0CT	33735421
01623	22232425	740	BCI	6.BCDEFHIJKLMN0PQRSTUWXYZ
01624	26273031			
01625	41424344			
01626	45464750			

01627	51626364						
01630	65666770						
01631	71131474	741					71131474
01632	34611636	742					34611636
01633	56155332	743					56155332
01634	55355217	744					55355217
01635	57767572	745					57767572
01636	37771260	746					37771260
01637	00010203	747					2.01234567
01640	04050607						
01641	10112040	748					10112040
01642	33735421	749					33735421
01643	22232425	750					6.0DEFGHIJKLMNQPQRSTUWXYZ
01644	26273031						
01645	41424344						
01646	45464750						
01647	51626354						
01650	65666770						
01651	71131474	751					71131474
01652	34611636	752					34611636
01653	56155332	753					56155332
01654	55355217	754					55355217
01655	57767572	755					57767572
01656	37771260	756					37771260
01657	00010203	757					2.01234567
01660	04050607						
01661	01020304	758	PRINT4	BCI			2.12345678
01662	05060710						
01663	11204033	759					11204033
01664	73542122	760					73542122
01665	23242526	761					6.0DEFGHIJKLMNQPQRSTUWXYZ
01666	27303141						
01667	42434445						
01670	46475051						
01671	62636465						
01672	66677071						
01673	13147434	762					13147434
01674	61163656	763					61163656
01675	15533255	764					15533255

01676	35521757	765	0CT	35521757
01677	76757237	766	0CT	76757237
01700	77126000	767	0CT	77126000
01701	01020304	768	BCI	2.12345678
01702	05060710			
01703	11204033	769	0CT	11204033
01704	73542122	770	0CT	73542122
01705	23242526	771	BCI	6.CDEFGHIJKLMN0PQRSTUWXYZ
01706	27303141			
01707	42434445			
01710	46475051			
01711	62635465			
01712	66677071			
01713	13147434	772	0CT	13147434
01714	61163656	773	0CT	61163656
01715	15533255	774	0CT	15533255
01716	35521757	775	0CT	35521757
01717	76757237	776	0CT	76757237
01720	77126000	777	0CT	77126000
01721	01020304	778	BCI	2.12345678
01722	05060710			
01723	11204033	779	0CT	11204033
01724	73542122	780	0CT	73542122
01725	23242526	781	BCI	6.CDEFGHIJKLMN0PQRSTUWXYZ
01726	27303141			
01727	42434445			
01730	46475051			
01731	62635465			
01732	66677071			
01733	13147434	782	0CT	13147434
01734	61163656	783	0CT	61163656
01735	15533255	784	0CT	15533255
01736	35521757	785	0CT	35521757
01737	76757237	786	0CT	76757237
01740	77126000	787	0CT	77126000
01741	01020304	788	BCI	2.12345678
01742	05060710			
01743	11204033	789	0CT	11204033
01744	73542122	790	0CT	73542122

6.CDEFCHJKLMNPPQRSTUVWXYZ

BCI

791

01745 23242526

01746 27309141

01747 42434445

01750 46475051

01751 62636465

01752 66677071

01753 13147434 792

01754 61163656 793

01755 15533255 794

01756 35521757 795

01757 76757237 796

01760 77126000 797

01761 01020304 798

01762 05060710

01763 12121212 799

01764 25252525 800

01765 71717171 801

01766 77777777 802

01767 24242424 803

01770 70707070 804

01771 37373737 805

01772 23232323 806

01773 67676767 807

01774 72727272 808

01775 22222222 809

01776 66666666 810

01777 75757575 811

02000 21212121 812

02001 65656565 813

02002 76767676 814

02003 54545454 815

02004 64646464 816

02005 57575757 817

02006 73737373 818

02007 63636363 819

02010 17171717 820

02011 33333333 821

02012 62626262 822

02013 52525252 823

PRINTS

13147434

61163656

15533255

35521757

76757237

77126000

2.12345678

12121212

25252525

71717171

77777777

24242424

70707070

37373737

23232323

67676767

72727272

22222222

66666666

75757575

21212121

65656565

76767676

54545454

64646464

57575757

73737373

63636363

17171717

33333333

62626262

52525252

02014	40404040	824	0CT	40404040
02015	51515151	825	0CT	51515151
02016	35353535	826	0CT	35353535
02017	20202020	827	0CT	20202020
02020	50505050	828	0CT	50505050
02021	55555555	829	0CT	55555555
02022	11111111	830	0CT	11111111
02023	47474747	831	0CT	47474747
02024	32323232	832	0CT	32323232
02025	10101010	833	0CT	10101010
02026	46464646	834	0CT	46464646
02027	53535353	835	0CT	53535353
02030	07070707	836	0CT	07070707
02031	45454545	837	0CT	45454545
02032	15151515	838	0CT	15151515
02033	06060606	839	0CT	06060606
02034	44444444	840	0CT	44444444
02035	56565656	841	0CT	56565656
02036	05050505	842	0CT	05050505
02037	43434343	843	0CT	43434343
02040	36363636	844	0CT	36363636
02041	04040404	845	0CT	04040404
02042	42424242	846	0CT	42424242
02043	16161616	847	0CT	16161616
02044	03030303	848	0CT	03030303
02045	41414141	849	0CT	41414141
02046	61616161	850	0CT	61616161
02047	02020202	851	0CT	02020202
02050	31313131	852	0CT	31313131
02051	34343434	853	0CT	34343434
02052	01010101	854	0CT	01010101
02053	30303030	855	0CT	30303030
02054	74747474	856	0CT	74747474
02055	00000000	857	0CT	00000000
02056	27272727	858	0CT	27272727
02057	14141414	859	0CT	14141414
02060	60606060	860	0CT	60606060
02061	26262626	861	0CT	26262626
02062	13131313	862	0CT	13131313

02063	54121212	863	MSG	BCI	12.*	
02064	12121212					
02065	12121212					
02066	12121212					
02067	12121212					
02070	12121212					
02071	12121212					
02072	12121212					
02073	12121212					
02074	12121212					
02075	12121212					
02076	12121212					
02077	54541212	864		BCI	11.** SDS BUFFERED ON-LINE PRINTER TESTER **	
02100	62246212					
02101	22642526					
02102	25512524					
02103	12464540					
02104	43314525					
02105	12475131					
02106	45632551					
02107	12632552					
02110	63255112					
02111	12545412					
02112	00011	965	TEMPCT	885	9	
02123	00002	965	TEMP	886	2	
02125	54121212	967	MSG4	804	9.*	THE FOLLOWING TEST WILL FAIL
02126	12121212					
02127	63302512					
02130	26464343					
02131	46663145					
02132	27126325					
02133	52691256					
02134	31434312					
02135	47513145	868		BCI	9.T EVERY CHARACTER IN EVERY POSITION.	
02136	63122565					
02137	25517012					
02140	23302151					
02141	21236325					
02142	51123145					

Item No.	Part No.	Quantity	Unit	Description	Material	Notes
02143	12256525					
02144	51701247					
02145	46623163					
02146	31464533					
02147	54121212					
02150	12121223					
02151	30214545					
02152	25431263					
02153	25526352					
02154	25122512	870	MSG6	0CT	25122512	
02155	12251225	871	MSG7	0CT	12251225	
02156	54121212	872	MSG8	BCI	11.*	THE FOLLOWING TEST WILL CHECK VERTIC
02157	12121212					
02160	53302512					
02161	26464343					
02162	46663145					
02163	27126325					
02154	62531256					
02165	31434312					
02166	23302523					
02167	42125525					
02170	51539123					
02171	21431221	873	BCI	7.AL AND HORIZONTAL CONTROL.		
02172	45241230					
02173	46513171					
02174	46456321					
02175	43122346					
02176	45635146					
02177	43391212					
02200	54121212	874	MSG9	BCI	11.*	THE FOLLOWING TEST WILL CHECK MAXIMU
02201	12121212					
02202	63302512					
02203	26464343					
02204	46663145					
02205	27126325					
02206	62531256					
02207	31434312					
02210	23302523					
02211	42124421					

Item No.	Part No.	Description	QTY	Unit	Notes
02212	67314464				
02213	44126247				
02214	25252412				
02215	46261247				
02216	51314563				
02217	25511243				
02220	31626331				
02221	45273312				
02222	54121212				
02223	12121247				
02224	21472551				
02225	12624721				
02226	23251253				
02227	25626362				
02230	0 00 02250				
02231	0 00 02254				
02232	0 00 02260				
02233	0 00 02254				
02234	0 00 02270				
02235	0 00 02274				
02236	0 00 02300				
02237	0 00 02304				
02240	00010				
02250	12122330				
02251	21454525				
02252	43120012				
02253	63256263				
02254	12122330				
02255	21454525				
02256	43120112				
02257	63256263				
02260	12122330				
02261	21454525				
02262	43120212				
02263	63256263				
02264	12122330				
02265	21454525				
02266	43120312				
02267	63256263				

7. M SPEED OF PRINTER LISTING.

PAPER SPACE TESTS

4 WORD MESSAGES

4. CHANNEL 0 TEST

4. CHANNEL 1 TEST

4. CHANNEL 2 TEST

4. CHANNEL 3 TEST

02270	12122330	890	CLISTS BCI	4.	CHANNEL 4 TEST
02271	21454525				
02272	43120412				
02273	63256263				
02274	12122330	891	CLIST6 BCI	4.	CHANNEL 5 TEST
02275	21454525				
02276	43120512				
02277	63256263				
02300	12122330	892	CLIST7 BCI	4.	CHANNEL 6 TEST
02301	21454525				
02302	43120612				
02303	63256263				
02304	12122330	893	CLIST8 BCI	4.	CHANNEL 7 TEST
02305	21454525				
02306	43120712				
02307	63256263				
02310	47513145	894	PFML BCI	4.	PRINTER FAULT
02311	63255112				
02312	26216443				
02313	63121212				
02314	2 00 02314	895	PFM PZE		PFML+4.2
02315	62304664	896	CHAML BCI	6.	SHOULD BE AT TOP OF FORM
02316	43241222				
02317	25122163				
02320	12634647				
02321	12462612				
02322	26465144				
02323	2 00 02323	897	CHAM PZE		CHAML+6.2

0SPACE	C1252	1SPACE	01257	2SPACE	01264	3SPACE	01271
4SPACE	C1276	5SPACE	01303	6SPACE	01310	7SPACE	01315
CHA7FM	C1322	CHA7TN	01330	CHATIT	02240	CL1ST1	02250
CL1ST2	02254	CL1ST3	02260	CL1ST4	02264	CL1ST5	02270
CL1ST6	02274	CL1ST7	02300	CL1ST8	02304	COJNT1	01175
MSPACE	C1227	OPMINI	01237	OUTPT1	01236	OUTPUT	01234
PRINT1	C1353	PRINT2	01455	PRINT3	01557	PRINT4	01661
PRINTS	C1763	PSPACE	01241	REDUCE	02324	TEMPCT	02112
BP02A	00210	BP02M	00215	BP02K	00255	BP19A	00542
BP19B	00555	BP19C	00662	BP19J	00700	BP19E	00722
BP19F	00741	BP19G	00760	CH7TM	01335	CHA7F	01327
CHA7T	C1335	CHAML	02315	ERR0R	01141	LIST1	02230
MSG10	C2222	SPMIN	01235	SPACE	01240	SPMSG	01251
TITLE	C1200	SP00	00152	SP01	00163	SP02	00177
BP03	C0277	BP04	00316	BP10	00327	BP11	00334
BP12	C0355	BP13	00376	BP14	00421	BP15	00444
BP16	C0467	BP17	00512	BP18	00535	BP19	00560
BP20	C1004	BP21	01011	BP22	01027	BP30	01067
BP31	C1074	BP32	01115	C131	01165	CH7T	01352
CHAM	C2323	CHAR	01177	DATA	01230	LIST	01206
MSG4	C2125	MSG5	02147	MSG6	02164	MSG7	02155
MSG8	C2156	MSG9	02200	PFML	02310	TEMP	02123
C17	C1157	C20	01150	C21	01161	C22	01162
C32	C1163	C63	01164	CK4	01165	M12	01172
M16	C1173	M33	01174	MSG	02063	PFM	02314
SPO	C1256	SP1	01263	SP2	01270	SP3	01275
SP4	C1302	SP5	01307	SP6	01314	SP7	01321
C3	C1153	C4	01154	C5	01155	C7	01156
K1	C1221	K2	01225	M4	01167	M5	01170
M6	C1171	0	00000	1	00001	2	00002
3	C0003	4	00004	5	00005	6	00006
7	C0007	A	01176				

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 8

Catalog No. 074001

IDENTIFICATION: 42 KC Magnetic Tape Test

AUTHOR: A. W. England, SDS

ACCEPTED: 13 May 1963

COMPUTER
CONFIGURATION: All SDS 920 systems and any 910 with a typewriter which have one or more magnetic tape units connected to the W buffer.

PURPOSE: To provide a simple and easy means for initial checkout and testing of 42 KC magnetic tape units.

PROGRAMMED
OPERATORS: None.

STORAGE: The program occupies 587 words from 400g to 1512g. It uses the HELP Word Output Subroutine located at 200g. The area from the end of the program to the end of memory may be used as input and interlaced output record image.

TIMING: The program is sufficiently fast to keep the tape operating at full speed for all operations.

USE: 1.0 LOADING

To load the program, insert the paper tape in the paper tape reader and follow the normal FILL procedure. When it is loaded, the light on the typewriter will indicate that the program is now under operator control.

1.1 REGAINING OPERATOR CONTROL

If at anytime the operator should lose control of the program he may return it to the keyboard mode by moving the RUN-IDLE-STEP switch to IDLE, pressing START, moving the switch to STEP and then to RUN. If for some reason location 0001 is destroyed he may execute a BRU to location 400 to return control to the keyboard.

2.0 CONTROL FUNCTIONS

The following list contains a call letter for the various control functions the program will perform. These may be typed anytime the light on the typewriter is lit.

USE: (cont.) 2.1 PARAMETER CONTROL

These functions cause the program to set up the various parameters for the tests which will follow.

2.1.1 P, Set Pattern

The previously typed 8 octal digits are set up as the pattern for writing operations.

2.1.2 L, Set Record Length

The previously typed octal number will be established as the record length for all subsequent test operations. For write operations it determines the number of words to be written. For read it determines the maximum number of words which will be stored in memory. The maximum length record is 7777₈ (4095). If a larger number is entered it will be reduced to this maximum.

2.1.3 U, Set Unit Number

The previously typed octal digit is used to identify the logical tape unit number which is to be tested. The program adjusts all tape unit addressing instructions accordingly.

2.1.4 C, Set Record Count

The record counter is incremented by one every time the program passes a record in the forward direction, and decremented by one for the reverse direction. After a rewind it is cleared to zero. This control function with the letter C is provided so that the user can reset this counter whenever he wishes to start a series of operations for which a count is needed. The previously typed 8 octal digits will be saved as the new record count.

2.1.5 Z, Set Parity

If the preceding digit is even the program converts all read and write EOM's to the BCD even parity mode. If the digit is odd it converts all read and write EOM's to the binary odd parity mode.

2.2 TAPE OPERATION CONTROL

2.2.1 Breakpoint Functions

Breakpoints 1, 2 and 4 apply generally to all tape operations. Breakpoint 3 is used when writing.

USE: (cont.)

BP 1 RESET: Continuous operation. The operation will continue as long as this Breakpoint is RESET or until the end of tape is reached.

SET: Stop continuous operation. If initially SET do only one operation.

BP 2 RESET: Perform all operations without stopping between records.

SET: Stop after each record.

BP 3 RESET: Write normally.

SET: Write a continuous record as long as this Breakpoint is set.

BP 4 RESET: Stop if a read or write error occurs.

SET: Do not stop on a read or write error.

2. 2. 2 W, Write

The previously set pattern will be written as a record of length indicated by the L function. Records will be continuously written as long as Breakpoint 1 is RESET. If Breakpoint 3 is SET one long continuous record will be written. If Breakpoint 4 is RESET and a write error occurs, the program will halt and print WRITE ERROR. If Breakpoint 4 is SET the error will not cause a stop. If the tape is situated on the end of tape marker the write routine will write a Tape Mark to signify end of file, then type END OF REEL, and return to keyboard.

2. 2. 3 I, Write with Identification

This function is the same as Write except that the record count number is written as the first word of the record. This provides a unique identification word for each record. The record count word is inserted as the first word of the image so no additional words are added to the record.

2. 2. 4 R, Read

The next record on the selected tape unit will be read into memory. If the record is longer than the preset record length, the program will skip the extra words. If the skip remainder of record operation is not functioning and additional I1 interrupts occur, the program will count these and print the count at the end

USE: (cont.)

of the record. As long as Breakpoint 1 is RESET the program will read records sequentially until an end of file or the end of tape is encountered. If Breakpoint 2 is SET, the program will stop the tape after each record; otherwise the tape will run without stopping.

If a read error occurs and Breakpoint 4 is RESET, the program will stop and type READ ERROR. If BP 4 is SET, the program continues.

2. 2. 5 B, Backspace

If the input number previous to the B is cleared to zero by a carriage return then the selected tape is backspaced one record at a time as long as Breakpoint 1 is RESET or until the load point or an end of file is encountered. If the input number previous to the B is non zero then it is decremented by one after each backspaced record and the backspacing operation is terminated when it reached zero. The counted backspace may also be stopped on Breakpoint 1, the load point, or an end of file. If Breakpoint 2 is reset, the spacing will proceed without stopping between records. If Breakpoint 2 is set, the tape will be stopped after each record spaced and then restarted to continue over the next one.

2. 2. 6 S, Space Forward

Space forward is the same as backspace except that it will also stop when the end of tape is reached.

2. 2. 7 X, Search-Forward

The selected tape is searched forward using the read-scan mode until a record is found whose first word is equal to the previously typed octal number. When the record is found it is read into memory. If an end of file or the end of tape is encountered before the record is found the tape is stopped.

2. 2. 8 Y, Search Reverse

The selected tape is scanned backward until a record is found whose first word (last word scanned over in reverse) is equal to the previously typed octal number. If an end of file or the load point is encountered before the record is found, the tape is stopped.

2. 2. 9 D, Rewind

The selected tape is started in a rewind and the program returns to keyboard control.

USE: (cont.)

2. 2. 10 E, Erase

This function is similar to write except that instead of writing information, it erases tape for a distance equal to the specified record length.

2. 2. 11 F, Write End of File

A tape mark is written on tape to indicate End of File. The record counter is not incremented by the operation. The operation may be executed even though the tape is on the end of tape conductive leader.

2. 3 OUTPUT CONTROL

After the tape has been read or moved by some other operation, the results may be inspected using the following control characters.

2. 3. 1 N, Tape Record Count Number

The program will type the current contents of the record counter.

2. 3. 2 T, Type Record Read

If the number of words read was less than or equal to the preset length, the program will type: RECORD LENGTH < OR = LLLL, where LLLL represents the record length. If the number of words read exceeds the present record length, the program will type: RECORD LENGTH > LLLL.

After typing one of these messages the program will begin to type the record image in octal numbering each eighth word in octal. This output will continue until either Breakpoint 1 is SET or until the entire record is typed.

If Breakpoint 1 is SET when the T key is struck only the record length will be typed.

3. 0 STATUS AND ERROR MESSAGES

The following messages will be typed by the program to inform the operator of the status of the tape operation:

USE: (cont.) 3.1 WRITE ERROR

This indicates that the program detected a write error and Breakpoint 4 was RESET. The tape is stopped and the program returns to keyboard control after typing.

3.2 READ ERROR

This indicates that the program detected a read error and Breakpoint 4 was RESET. The tape is stopped and the program returns to keyboard control after typing.

3.3 SKIP REMAINDER OF RECORD ERRORS: nnnnnnnn

This indicates that the record read was longer than the preset record length and that when the program attempted to ignore the remainder of the record, it still received I1 interrupts. The number of interrupts is indicated by the octal number nnnnnnnn. Control returns to the keyboard after typing. This error stop may not be disabled by Breakpoint 4.

3.4 FILE PROTECT ON

This is typed whenever the user asks for a write or erase operation on a tape which has the file protect ring removed. After typing the program returns to keyboard control.

3.5 END OF REEL

This indicates that a forward operation has reached the end of tape.

3.6 LOAD POINT

This indicates that a reverse operation has reached the beginning of tape.

3.7 TAPE MARK

This indicates that a read, scan, or space operation has encountered an End of File record as indicated by the reading of a Tape Mark.

4.0 FUNCTION SUMMARY

In the calling sequence the small letter d is used to denote an octal digit.

USE: (cont.) 4. FUNCTION SUMMARY (cont.)Function Description

Clear digit accumulator	Carriage Return
Set test pattern word	dddddddP
Set record length	dddL
Set logical tape unit number	dU
Set record count number	dddddddC
Set to even parity (BCD)	øZ
Set to odd parity (Binary)	lZ
Write	W
Write with record count ID	I
Read	R
Backspace	B
Backspace by count	(octal count) B
Space forward	S
Space forward by count	(octal count) S
Search forward and read	dddddddX
Search reverse	dddddddY
Rewind	D
Erase	E
Write end of file	F
Type record count number	N
Type record read	T

OMIT

METHOD:

Each functional routine is essentially independent of the others and attempts to accomplish its operation in a straight forward a manner as possible. The program attempts to prevent the tape from running off the reels in either direction. By using the write end of file operation, sections of the tape can be set off for further test without having to work from the beginning of the reel on every pass.

At the start of every routine, the status of the tape is tested and if the operation obviously cannot be accomplished the program does not attempt it. No reverse operation will be started if the tape is at the load point. No forward operation except write end of file will be started if the tape is on the end of reel marker. No write operation is attempted if the file protect is on.

All reading, spacing and searching operations will be unconditionally terminated when an end of file is encountered.

SDS 900 SERIES PROGRAM LIBRARY
PROGRAM LISTING

42 KC Magnetic Tape Test Program

Page 1 of 24

Catalog No. 074001

* 910 0R 920. W BUFFER ONLY.

* A. W. ENGLAND.

* 00200	00200	BSS	128	WORD OUTPUT SUBROUTINE
* 00400	0 76 00525	LDA	G0C0NA	SET CONTROL RESTORE
* 00401	0 35 00001	STA	1	KEYBOARD CONTROL ENTRY
* 00402	0 02 00000	DISW		
* 00403	0 02 20004	DIR		
* 00404	0 02 02001	RKBW	1.1	
* 00405	0 32 00012	WIM	T1	SCAN FOR CONTROL CHARACTER
* 00406	0 75 00012	LDB	T1	
* 00407	0 66 20011	RCY	9	
* 00410	0 75 00424	LDB	C1	
* 00411	0 71 00425	LDX	C2	
* 00412	2 70 00451	SKM	CTBL+19.2	
* 00413	0 41 00412	BRX	*-1	
* 00414	2 01 40451	BRU*	CTBL+19.2	GO TO CONTROL ROUTINE
* 00415	0 67 20006	DIGIT	6	ACCUMULATE OCTAL DIGITS
* 00416	0 75 00016	LDB	ACCUM	
* 00417	0 67 20003	LCY	3	
* 00420	0 36 00016	STB	ACCUM	
* 00421	0 01 00405	BRU	C0NA1	
* 00422	0 46 30003	CLR	DIGIT+3	CLEAR DIGIT ACCUMULATOR
* 00423	0 01 00420	BRU		
* 00424	07700000	C1	7700000	
* 00425	77777755	C2	-19	

CONTROL ROUTINE LINKAGE TABLE.

			CTBL	B	B00
* 00426	0 22	00705			C00
* 00427	0 23	01203			D00
* 00430	0 24	01107			E00
00431	0 25	01131			F00
00432	0 26	01163			I00
00433	0 31	00452			L00
00434	0 43	01206			N00
00435	0 45	01371			P00
00436	0 47	01200			R00
00437	0 51	00556			S00
00440	0 62	00732			T00
00441	0 63	01271			U00
00442	0 64	01234			W00
00443	0 66	00453			X00
00444	0 67	00770			Y00
00445	0 70	01051			Z00
00446	0 71	01251			CLEAR
00447	0 52	00422		CR	C0NA1
00450	0 12	00405		SP	DIGIT
00451	0 00	00415		PZE	

WRITE ROUTINES.

WRITE RECORD COUNT AS ID FOR EACH RECORD.

00452 0 71 00023 100 LDX ZERO

WRITE RECORDS OF TEST PATTERN ONLY.

00453	0	37	01510	W00	STX	SW2	
00454	0	76	01500		LDA	PATT	
00455	0	71	01503		LDX	NEGLEN	
00456	0	35	41512		STA*	ENDIMG	
00457	0	41	00456		BRX	*-1	
00460	0	43	01120	C0NB	BRM	TRSUBR	
00461	0	23	01477		EXU	ETT	
00462	0	01	01163		BRU	FOO	
00463	0	23	01475		EXU	FPT	
00464	0	01	01160		BRU	C0NU	
00465	0	23	01476		EXU	BTT	
00466	0	43	00541		BRM	ERASE	
00467	0	40	20100	C0NC	BPT	3	
00470	0	01	00526		BRU	W20	
00471	0	76	01506		LDA	RC	
00472	0	53	01510		SKN	SW2	
00473	0	35	01513		STA	IMAGE	
00474	0	02	50000		CIL		
00475	0	23	01504		EXU	SHIB	
00476	0	13	01505		P0T	LDIL	
00477	0	23	01463		EXU	WT	
00500	0	23	01477	W30	EXU	ETT	
00501	0	01	00657		BRU	C0NE	
00502	0	40	12610		TGTW		
00503	0	01	00505		BRU	**2	
00504	0	01	00500		BRU	*-4	
00505	0	61	01506		MIN	RC	
00506	0	40	20010		BETW		
00507	0	40	20040		BPT	4	
00510	0	01	00515		BRU	W10	
00511	0	43	01124		BRM	BRSUBR	
00512	0	76	01427		LDA	EM1L0C	
00513	0	71	01460		LDX	MINUS3	
00514	0	01	01416		BRU	PRTEM	

T0 R[SW2]

S[SW2]
 GENERATE PATTERN
 IN RECORD IMAGE

TAPE READY
 0N END OF TAPE
 YES, WRITE TAPE MARK
 NO, IS FILE PROTECT 0N
 YES

0N BEGINNING OF TAPE
 YES, ERASE LEADER
 NO, WRITE CONSTANT RECORD
 YES

NO
 WRITE WITH ID
 YES

NO, C0CK INTERLACE
 SET HIGH BITS
 LOAD INTERLACE
 START TAPE
 END OF TAPE ENCOUNTERED
 YES

NO, GAP
 YES
 NO

COUNT RECORD
 WRITE ERROR
 YES, IS ERROR STOP ALLOWED
 NO, NO
 YES, BUFFER READY
 PRINT ERROR MESSAGE

NO	OPERATION	CONTINUE	NO	YES, NON STOP	NO	YES	WAIT FOR STOP
00515	0 40 20400	W10	BPT	1	CENZ		
00516	0 01 00524		BRU	2	*+2	CENC	
00517	0 40 20200		BPT		BRSUBR		
00520	0 01 00522		BRU		CENB		
00521	0 01 00467		BRU		BRSUBR		
00522	0 43 01124		BRM		CENB		
00523	0 01 00460		BRU				
00524	0 43 01124	CENZ	BRM		BRSUBR		
00525	0 01 00402	GECENA	BRU		CENA		
00526	0 23 01463	W20	EXU	WT			CONSTANT RECORD WRITE
00527	0 23 01477		EXU	ETT			END OF TAPE
00530	0 01 00536		BRU	W21			YES
00531	0 12 01500		MIW	PATT			NO. OUTPUT PATTERN
00532	0 40 20100		BPT	3			CONTINUE
00533	0 01 00527		BRU	*-4			YES
00534	0 02 14000		TOPW				NO
00535	0 01 00500		BRU	W30			RETURN TO MAIN LOOP
00536	0 02 14000	W21	TOPW				END OF TAPE STOP
00537	0 43 01124		BRM	BRSUBR			WRITE TAPE MARK
00540	0 01 01163		BRU	FOO			
00541	0 00 00000	ERASE	PZE				IS DENSITY 200 BPI
00542	0 76 00555	LDA	LDA	E555			YES
00543	0 23 01472	EXU	EXU	D2T			NO
00544	0 76 00554	LDA	LDA	E200			
00545	0 35 00012	STA	STA	T1			START ERASE
00546	0 02 50000	CIL	CIL	T1			GAP
00547	0 13 00012	POT	POT	ET			YES.EXIT
00550	0 23 01467	EXU	EXU	ERASE			NO
00551	0 40 12610	TGTW	TGTW	*-2			
00552	0 51 00541	BRR	BRR				
00553	0 01 00551	BRU	BRU				
00554	11300000	E200	DEC	15089			STARTING GAP AT 200 BPI
00555	32040000	E555	DEC	41789			STARTING GAP AT 555 BPI

* * * ERASE STARTING LEADER SUBROUTINE. * * *

READ ROUTINE.

*	00556	0 43	01120	ROO	BRM	TRSUBR	TAPE READY
*	00557	0 23	01477		EXU	ETT	AT END OF TAPE
*	00560	0 01	00657		BRU	CONE	YES
	00561	0 76	00677		LDA	GØRI1	NØ. INITIALIZE INTERRUPTS
	00562	0 35	00031		STA	I1W	
	00563	0 76	00700		LDA	GØRI2	
	00564	0 35	00033		STA	I2W	
	00565	0 02	20002		EIR		
	00566	0 02	50000	CØNS	CIL		
	00567	0 23	01504		EXU	SHIB	SET HIGH BITS
	00570	0 13	01505		PØT	LDIL	LOAD INTERLACE
	00571	0 76	00026		LDA	ØNES	
	00572	0 35	01507		STA	SW1	S(SW1)
	00573	0 23	01464		EXU	RT	START READ
	00574	0 23	01477		EXU	ETT	END OF TAPE ENCØUNTERED
	00575	0 01	00657		BRU	CONE	YES
	00576	0 40	12610		TGTW		NØ. GAP
	00577	0 01	00601		BRU	*+2	YES
	00600	0 01	00574		BRU	*-4	NØ
	00601	0 61	01506		MIN	RC	CØUNT RECØRD
	00602	0 53	01507		SKN	SW1	TEST SW1
	00603	0 01	00617		BRU	RO1	RESET
	00604	0 40	20040	RØ2	BPT	4	SET. ERRØR STØP PERMITTED
	00605	0 01	00610		BRU	*+3	NØ
	00606	0 40	20010		BETW		YES. WAS THERE A READ ERRØR
	00607	0 01	00653		BRU	RO3	YES
	00610	0 40	20400		BPT	1	CØNTINUING ØPERATION
	00611	0 01	00524		BRU	CØNZ	NØ
	00612	0 40	20200		BPT	2	YES. STØP BETWEEN RECØRDS
	00613	0 01	00615		BRU	*+2	YES
	00614	0 01	00566		BRU	CØNS	NØ
	00615	0 43	01124		BRM	BRSUBR	WAIT FØR TAPE TØ STØP
	00616	0 01	00556		BRU	ROO	

* 00617	0 76 01507	RO1	LDA	SW1	[SW1]:ZERØ
00620	0 72 00026		SKA	ØNES	NØT EQUAL
00621	0 01 00623		BRU	CØNF	EQUAL
00622	0 01 00604		BRU	RO2	WAIT FØR TAPE TØ STØP
00623	0 43 01124		BRM	BRSUBR	PRINT ERRØR MESSAGE
00624	0 71 01462		LDX	MINUS9	
00625	0 02 02641		TYPW	1.4	
00626	2 12 00651		MIW	SEM+8,2	
00627	0 41 00626		BRX	*-1	
00630	0 02 14000		TØPW		
00631	0 43 01124		BRM	BRSUBR	
00632	0 76 00617		LDA	RO1	SW1 LØCATION
00633	0 75 00651		LDB	RC1	
00634	0 71 00652		LDX	RC2	
00635	0 02 02041		TYPW	1.1	
00636	0 43 00200		BRM	WØS	
00637	0 01 01353		BRU	CØNJ	
* 00640	52121212		ØCT	52121212	
00641	62423147	SEM	BCI	8.SKIP REMAINDER ØF RECØRD ERRØRS:	
* 00651	03777760	RC1	ØCT	03777760	
00652	0 12 00012	RC2	MIW	T1	
* 00653	0 43 01124	RO3	BRM	BRSUBR	READ ERRØR
00654	0 76 01432	CØNY	LDA	EM4LØC	
00655	0 71 01460		LDX	MINUS3	
00656	0 01 01416		BRU	PRTEM	
* 00657	0 02 20004	CØNE	DIR		END ØF REEL STØP
00660	0 02 00000		DISW		
00661	0 76 01430		LDA	EM2LØC	
00662	0 71 01460		LDX	MINUS3	
00663	0 01 01416		BRU	PRTEM	

CATALOG NO. 074001

PAGE 7 OF 24

* 00664	0 00 00000	RI1	PZE		
00665	0 02 13610		SRRW		
00666	0 32 00012		WIM	T1	
00667	0 61 01507		MIN	SW1	
00670	0 01 40664		BRU*	RI1	
* 00671	0 00 00000	RI2	PZE		
00672	0 40 13610		TFTW		
00673	0 01 40675		BRU*	G0C0NM	
00674	0 01 40676		BRU*	G0R03	
* 00675	0 00 00701	G0C0NM	PZE	C0NM	
00676	0 00 00653	G0R03	PZE	R03	
* 00677	0 43 00664	G0R11	BRM	RI1	
00700	0 43 00671	G0R12	BRM	RI2	
* 00701	0 43 01124	C0NM	BRM	BRSUBR	
00702	0 76 01434		LDA	EM6L9C	
00703	0 71 01460		LDX	MINUS3	
00704	0 01 01416		BRU	PRTEM	

TAPE MARK

READ I1 INTERRUPT
SKIP REMAINDER OF RECORD

RISW1J
EXIT

READ I2 INTERRUPT
END OF FILE
YES

NO. ASSUME READ ERROR

		BACKSPACE											
*	00705	0	43	01120	B00	BRM	TRSUBR						
*	00706	0	23	01476		EXU	BTT						TAPE READY
*	00707	0	01	00727		BRU	C0NL						ON BEGINNING OF TAPE
	00710	0	23	01470	B01	EXU	SR						YES
	00711	0	32	00012		WIM	T1						NO. SCAN REVERSE
	00712	0	40	21000		BRTW							BUFFER READY
	00713	0	01	00716		BRU	*+3						NO
	00714	0	23	01476		EXU	BTT						YES. BEGINNING OF TAPE
	00715	0	01	00727		BRU	C0NL						YES
	00716	0	40	13610		TFTW							NO. END OF FILE
	00717	0	01	00701		BRU	C0NM						YES
	00720	0	76	01506		LDA	RC						NO
	00721	0	54	00024		SUB	0NE						DECREMENT RECORD COUNT
	00722	0	35	01506		STA	RC						OPERATION CONTINUE
	00723	0	40	20400		BPT	1						NO
	00724	0	01	00524		BRU	C0NZ						YES. CHECK SPACE STOP
	00725	0	43	00754		BRM	SSSUBR						
	00726	0	01	00710		BRU	B01						
*													
*	00727	0	76	01433	C0NL	LDA	EMSL0C						LOAD POINT
	00730	0	71	01460		LDX	MINUS3						
	00731	0	01	01416		BRU	PRTEM						

SPACE FORWARD SUBROUTINE.

* * *
 00732 0 43 01120 TRSUBR
 00733 0 23 01477 ETT
 00734 0 01 00657 CØNE
 00735 0 23 01465 SF
 00736 0 23 01477 ETT
 00737 0 01 00657 CØNE
 00740 0 40 21000 BRW
 00741 0 40 12610 TGTW
 00742 0 01 00744 BRU
 00743 0 01 00736 BRU
 00744 0 32 00012 WIM
 00745 0 40 13610 TFTW
 00746 0 01 00701 BRU
 00747 0 61 01506 MIN
 00750 0 40 20400 BPT
 00751 0 01 00524 BRU
 00752 0 43 00754 BRM
 00753 0 01 00735 BRU

TAPE READY
 END OF TAPE
 YES
 NO. SCAN FORWARD
 END OF TAPE
 YES
 NO. BUFFER READY
 NO. GAP
 YES. YES
 NO
 END OF FILE
 YES
 NO. COUNT RECORD
 OPERATION CONTINUE
 NO
 YES. CHECK STOP

* *
 00754 0 00 00000 SSSUBR PZE
 00755 0 76 00016 LDA
 00756 0 72 00026 SKA
 00757 0 01 00763 BRU
 00760 0 40 20200 CØNP
 00761 0 43 01124 BPT
 00762 0 51 00754 BRM
 00763 0 54 00024 BRR
 00764 0 35 00016 SUB
 00765 0 72 00026 STA
 00766 0 01 00760 SKA
 00767 0 01 00524 BRU

SPACE STOP SUBROUTINE
 ACCUM:ZERØ
 NOT EQUAL
 EQUAL. STOP BETWEEN RECORDS
 YES
 NO. EXIT
 DECREMENT RECORD COUNT
 ACCUM:ZERØ
 NOT EQUAL
 EQUAL

SEARCH FORWARD.

* * *

00770	0 43	01120	X00	BRM	TRSUBR	TAPE READY
00771	0 23	01477		EXU	ETT	END OF TAPE
00772	0 01	00657		BRU	CONE	YES
00773	0 75	00026		LDB	ONES	NO
00774	0 36	01507		STB	SW1	[SW 1]
00775	0 76	00677		LDA	G0R11	INITIALIZE INTERRUPT
00776	0 35	00031		STA	I1W	
00777	0 76	01050		LDA	G0X12	
01000	0 35	00033		STA	I2W	
01001	0 76	00016		LDA	ACCUM	
01002	0 02	50000	C0NX	CIL		C0CK INTERLACE
01003	0 23	01504		EXU	SHIB	SET HIGH BITS
01004	0 13	01505		P0T	LDIL	L0AD INTERLACE
01005	0 23	01464		EXU	RT	START READ
01006	0 32	00012		WIM	T1	
01007	0 40	13610		TFTW		END OF FILE
01010	0 01	00701		BRU	C0NM	YES
01011	0 70	00012		SKM	T1	N0. 1ST W0RD:ACCUM
01012	0 01	01032		BRU	X01	N0T EQUAL
01013	0 02	20002		EIR		EQUAL
01014	0 61	01506		MIN	RC	C0UNT REC0RD
01015	0 23	01477		EXU	ETT	END OF TAPE
01016	0 01	00657		BRU	CONE	YES
01017	0 40	21000		BRTW		N0. BUFFER READY
01020	0 01	01015		BRU	*-3	NO
01021	0 53	01507		SKN	SW1	YES. TEST SW1
01022	0 01	01024		BRU	*+2	RESET
01023	0 01	01027		BRU	*+4	SET
01024	0 76	01507		LDA	SW1	
01025	0 72	00026		SKA	ONES	[SW 1]:ZER0
01026	0 01	00623		BRU	C0NF	N0T EQUAL
01027	0 40	20010		BETW		EQUAL. BUFFER ERR0R
01030	0 01	00654		BRU	C0NY	YES
01031	0 01	00402		BRU	C0NA	NO

ADDRESS	DATA	DESCRIPTION
* 01032	0 02 50000	CIL
01033	0 13 00023	POT
01034	0 32 00012	WIM
01035	0 02 14000	RTSM
01036	0 61 01506	MIN
01037	0 23 01477	EXU
01040	0 01 00657	BRU
01041	0 40 12610	TGTW
01042	0 01 01044	BRU
01043	0 01 01037	BRU
01044	0 32 00012	WIM
01045	0 01 01002	BRU
* 01046	0 00 00000	PZE
01047	0 01 41046	BRU*
* 01050	0 43 01046	BRM

ZERO
T1

RC
ETT
CONE

**2
*-4
T1
CONX

READ TO SCAN
COUNT RECORD
END OF TAPE
YES
NO, GAP
YES
NO

DUMP LAST WORD

X12

X12

X12

G0X12

X12

SEARCH I2 INTERRUPT

SEARCH REVERSE.

SEARCH REVERSE.	Y00	BRM	TRSUBR	TAPE READY
01051	0 43 01120	EXU	BTT	BEGINNING OF TAPE
01052	0 23 01476	BRU	C0NL	YES
01053	0 01 00727	LDA	ACCUM	NO, REVERSE ACCUM
01054	0 76 00016	LDB	ACCUM	1 2 3 4 1 2 3 4
01055	0 75 00016	LCY	6	2 3 4 1 2 3 4 1
01056	0 67 20006	ETR	YC1	00770077
01057	0 14 01105	STA	T1	0 3 0 1
01060	0 35 00012	LDA	ACCUM	1 2 3 4
01061	0 76 00016	LDB	ACCUM	1 2 3 4 1 2 3 4
01062	0 75 00016	RCY	6	4 1 2 3 4 1 2 3
01063	0 66 20006	ETR	YC2	77007700
01064	0 14 01106	MRG	T1	4 3 2 1
01065	0 16 00012	STA	REVPAT	START SCAN REVERSE
01066	0 35 01501	EXU	SR	END OF FILE
01067	0 23 01470	WIM	T1	YES
01070	0 32 00012	TFTW		NO, BEGINNING OF TAPE
01071	0 40 13610	BRU	C0NM	YES
01072	0 01 00701	EXU	BTT	NO
01073	0 23 01476	BRU	C0NL	DECREMENT RECORD COUNT
01074	0 01 00727	LDA	RC	1ST WORD: REVERSED ID KEY
01075	0 76 01506	SUB	0NE	NOT EQUAL
01076	0 54 00024	STA	RC	EQUAL
01077	0 35 01506	LDA	T1	
01100	0 76 00012	LDB	0NES	
01101	0 75 00026	SKM	REVPAT	
01102	0 70 01501	BRU	C0NT	
01103	0 01 01067	BRU	C0NZ	
01104	0 01 00524	BRU		
01105	00770077	0CT	00770077	
01106	77007700	0CT	77007700	

```

* * *
* REWIND.
* 01107 0 43 01120 D00 TRSUBR
* 01110 0 23 01476 EXU BTT
* 01111 0 01 00727 BRU CONL
* 01112 0 23 01471 EXU REW
* 01113 0 23 01474 EXU TRT
* 01114 0 01 01112 BRU *-2
* 01115 0 46 30003 CLR RC
* 01116 0 35 01506 STA
* 01117 0 01 00402 BRU CONA
* * *

```

```

TAPE READY
ON BEGINNING OF TAPE
YES
NO. START REWIND
TAPE STARTED
NO
YES. CLEAR RECORD COUNT

```

TAPE READY SUBROUTINE.

```

* * *
* 01120 0 00 00000 TRSUBR PZE
* 01121 0 23 01474 EXU TRT
* 01122 0 51 01120 BRR TRSUBR
* 01123 0 01 01121 BRU *-2
* * *

```

```

TAPE READY
YES.EXIT
NO

```

BUFFER READY SUBROUTINE.

```

* * *
* 01124 0 00 00000 BRSUBR PZE
* 01125 0 02 20004 DIR
* 01126 0 40 21000 BRTW
* 01127 0 01 01126 BRU *-1
* 01130 0 51 01124 BRR BRSUBR

```

DISABLE INTERRUPT

EXIT

ERASE ROUTINE.

01131	0	43	01120	BRM	TRSUBR	TAPE READY
01132	0	23	01477	EXU	ETT	END OF TAPE
01133	0	01	00657	BRU	CONE	YES
01134	0	23	01475	EXU	FPT	NO, FILE PROTECT ON
01135	0	01	01160	BRU	CONU	YES
01136	0	23	01476	EXU	BTT	NO, BEGINNING OF TAPE
01137	0	43	00541	BRM	ERASE	YES, ERASE STARTING LEADER
01140	0	02	50000	CIL		NO, SET UP INTERLACE
01141	0	23	01504	EXU	SHIB	
01142	0	13	01505	POT	LDIL	
01143	0	23	01467	EXU	ET	START ERASE
01144	0	23	01477	EXU	ETT	END OF TAPE
01145	0	01	00657	BRU	CONE	YES
01146	0	40	12610	TGTW		NO, GAP
01147	0	01	01151	BRU	**2	YES
01150	0	01	01144	BRU	**4	NO
01151	0	40	20400	BPT	1	CONTINUE OPERATION
01152	0	01	00524	BRU	CENZ	NO
01153	0	40	20200	BPT	2	YES STOP BETWEEN RECORDS
01154	0	01	01156	BRU	**2	YES
01155	0	01	01140	BRU	CENV	NO
01156	0	43	01124	BRM	BRSUBR	WAIT FOR TAPE TO STOP
01157	0	01	01131	BRU	E00	
* * * * *						
01160	0	76	01431	LDA	EM3L0C	FILE PROTECT ON
01161	0	71	01461	LDX	MINUSH	
01162	0	01	01416	BRU	PRTEM	

* 01163	0 43 01120	FOO	BRM	TRSUBR	TAPE READY
* 01164	0 23 01475		EXU	FPT	FILE PROTECT ON
* 01165	0 01 01160		BRU	C0NU	YES
01166	0 23 01476		EXU	BTT	N0. BEGINNING OF TAPE
01167	0 43 00541		BRM	ERASE	YES
01170	0 23 01466		EXU	WE0F	N0
01171	0 12 01177		MIW	TM	
01172	0 02 14000		T0PW		
01173	0 43 01124		BRM	BRSUBR	WAIT FOR TAPE TO STOP
01174	0 23 01477		EXU	ETT	END OF TAPE
01175	0 01 00657		BRU	C0NE	YES
01176	0 01 00402		BRU	C0NA	N0
* 01177	17000000	TM	0CT	17000000	TAPE MARK CONSTANT

SET TEST PATTERN.

* 01200	0 76 00016	P00	LDA	ACCUM
* 01201	0 35 01500		STA	PATT
* 01202	0 01 00422		BRU	CLEAR
* * * * *				
* * * * *				
* * * * *				
* * * * *				
* 01203	0 76 00016	C00	LDA	ACCUM
* 01204	0 35 01506		STA	RC
* 01205	0 01 00422		BRU	CLEAR

SET BLOCK LENGTH.

* 01206	0 76 01232	L00	LDA	LC2	7777
* 01207	0 73 00016		SKG	ACCUM	IF SPECIFIED LENGTH IS > 4095
* 01210	0 01 01212		BRU	*+2	USE 4095 AS LENGTH
01211	0 14 00016		ETR	ACCUM	
01212	0 35 01502		STA	LENGTH	
01213	0 55 01511		ADD	BEGIMG	COMPUTE END OF IMAGE
01214	0 16 01231		MRG	LC1	
01215	0 35 01512		STA	ENDIMG	
01216	0 46 30003		CLR	LENGTH	FORM NEGATIVE LENGTH
01217	0 54 01502		SUB	NEGLEN	
01220	0 35 01503		STA	LENGTH	FORM INTERLACE CONTROL
01221	0 76 01502		LDA	10	WORDS.
01222	0 66 00012		RSH	LC3	
01223	0 16 01233		MRG	SHIB	
01224	0 35 01504		STA	BEGIMG	
01225	0 46 00014		XAB	LDIL	
01226	0 16 01511		MRG	CLEAR	
01227	0 35 01505		STA		
01230	0 01 00422		BRU		
* 01231	20000000	LC1	ECT	20000000	INDEX TAG
* 01232	00007777	LC2	ECT	7777	4095, MAX LENGTH
01233	0 02 10000	LC3	EOM	10000	FOR SHIB

SET TAPE UNIT NUMBER.

* 01234	0 76 00016	U00	LDA	ACCUM
* 01235	0 14 01246		ETR	UC1
* 01236	0 35 00012		STA	T1
01237	0 71 01247		LDX	UC2
01240	2 76 01500		LDA	ETT+1.2
01241	0 14 01250		ETR	UC3
01242	0 16 00012		MRG	T1
01243	2 35 01500		STA	ETT+1.2
01244	0 41 01240		BRX	*-4
01245	0 01 00422		BRU	CLEAR
* 01246	0000007	UC1	θCT	7
01247	77777763	UC2	DEC	-13
01250	77777770	UC3	θCT	77777770

SAVE LAST DIGIT

-LENGTH OF TAPE CONTROL TABLE
INSERT NEW TAPE UNIT
NUMBER IN TAPE COMMANDS

SET PARITY.

* 01251	0 46 30003	Z00	CLR	ACCUM
* 01252	0 76 00016		LDA	θNE
* 01253	0 14 00024		ETR	9
01254	0 67 00011		LSH	T1
01255	0 35 00012		STA	RT
01256	0 76 01464		LDA	ZC1
01257	0 14 01267		ETR	T1
01260	0 16 00012		MRG	RT
01261	0 35 01464		STA	ZC2
01262	0 55 01270		ADD	SF
01263	0 35 01465		STA	ZC2
01264	0 55 01270		ADD	WT
01265	0 35 01463		STA	CLEAR
01266	0 01 00422		BRU	
* 01267	77776777	ZC1	θCT	77776777
01270	00000020	ZC2	θCT	20

SAVE LAST BIT

* * *
 * TYPE RECORD READ.

01271	0	02	02641	TOO	TYPW	1.4	TYPE RECORD LENGTH
01272	0	12	01361	MIW	CRC	MESSAGE.	
01273	0	12	01363	MIW	TRM		
01274	0	12	01364	MIW	TRM+1		
01275	0	12	01365	MIW	TRM+2		
01276	0	53	01507	SKN	SW1		
01277	0	01	01303	BRU	*+4		
01300	0	12	01366	MIW	TRM+3		
01301	0	12	01367	MIW	TRM+4		
01302	0	01	01304	BRU	*+2		
01303	0	12	01370	MIW	TRM+5		
01304	0	02	14000	TOPW			
01305	0	43	01124	BRM	BRSUBR		
01306	0	02	02041	TYPW	1.1		
01307	0	76	01502	LDA	LENGTH		
01310	0	67	00014	LSH	12		
01311	0	35	00012	STA	T1		
01312	0	76	01311	LDA	*-1		
01313	0	75	01355	LDB	TC1		
01314	0	71	01356	LDX	TC2		
01315	0	43	00200	BRM	W0S		
01316	0	76	00026	LDA	0NES		
01317	0	35	00012	STA	T1		
01320	0	76	01511	LDA	BEGIMG		
01321	0	35	00013	STA	T2		
01322	0	12	01361	MIW	CRC		
01323	0	01	01344	BRU	C0NG		

TYPE RECORD LENGTH

NO	ADDRESS	OPERATION	OPERAND	OPERAND ADDRESS	OPERAND LENGTH	OPERAND IMAGE	OPERAND RETURN
* 01324	0 76 01357	CØNH	LDA	TC3			
01325	0 72 00012		SKA	T1			
01326	0 01 01336		BRU	T01			
01327	0 76 00012		LDA	T1			
01330	0 67 00014		LSH	12			
01331	0 35 00014		STA	T3			
01332	0 76 01331		LDA	*-1			
01333	0 75 01355		LDB	TC1			
01334	0 71 01356		LDX	TC2			
01335	0 43 00200		BRM	WØS			
01336	0 12 01362	T01	MIW	TAB			
01337	0 76 00013		LDA	T2			
01340	0 75 01360		LDB	TC4			
01341	0 71 01356		LDX	TC2			
01342	0 43 00200		BRM	WØS			
01343	0 61 00013		MIN	T2			
01344	0 12 01361	CØNG	MIW	CRC			
01345	0 61 00012		MIN	T1			
01346	0 76 00012		LDA	T1			
01347	0 73 01502		SKG	LENGTH			
01350	0 40 20400		BPT	1			
01351	0 01 01353		BRU	CØNJ			
01352	0 01 01324		BRU	CØNH			
* 01353	0 02 14000	CØNJ	TØPW				
01354	0 01 00524		BRU	CØNZ			
* * 01355	17740000	TC1	ØCT	17740000			
01356	0 12 00015	TC2	MIW	T4			
01357	00000007	TC3	ØCT	7			
01360	74747474	TC4	ØCT	74747474			
01361	52521212	CRC	ØCT	52521212			
01362	72000000	TAB	ØCT	72000000			
* 01363	51252346	TRM	BCI	6.RECØRD LENGTH < ØR =H >			

* * * TYPE RECORD COUNT NUMBER.

01371	0 02 02641	N00	TYPW	1,4
01372	0 12 01361		MIW	CRC
01373	0 12 01412		MIW	RCM
01374	0 12 01413		MIW	RCM+1
01375	0 12 01414		MIW	RCM+2
01376	0 12 01415		MIW	RCM+3
01377	0 02 14000		T0PW	
01400	0 43 01124		BRM	BRSUBR
01401	0 02 02041		TYPW	1,1
01402	0 76 01410		LDA	NC1
01403	0 75 01411		LDB	NC2
01404	0 71 01356		LDX	TC2
01405	0 43 00200		BRM	W0S
01406	0 12 01361		MIW	CRC
01407	0 01 01353		BRU	C0NJ

RELOC

RC 77777400

PZE 0CT

NC1 NC2

0 00 01506 77777400

01410 01411

4.RECORD COUNT =

BCI

RCM

51252346

01412

* * * ERROR MESSAGE OUTPUT SUBROUTINE.

01416	0 02 20004	PRTEM	DIR					
01417	0 02 02641	TYPW		1,4				
01420	0 12 01426	MIW		CRS				
01421	0 35 00012	STA		T1				
01422	0 12 40012	MIW*		T1				
01423	0 61 00012	MIN		T1				
01424	0 41 01422	BRX		*-2				
01425	0 01 01353	BRU		C0NJ				
* 01426	12121252	CRS	0CT		12121252			SP SP SP CR
* 01427	0 00 01435	EM1L0C	PZE			EM1		
01430	0 00 01440	EM2L0C	PZE			EM2		
01431	0 00 01443	EM3L0C	PZE			EM3		
01432	0 00 01447	EM4L0C	PZE			EM4		
01433	0 00 01452	EM5L0C	PZE			EM5		
01434	0 00 01455	EM6L0C	PZE			EM6		
* 01435	12665131	EM1	BCI				3. WRITE ERR0R	
01440	12254524	EM2	BCI				3. END 0F REEL	
01443	12263143	EM3	BCI				4. FILE PR0TECT 0N	
01447	12512521	EM4	BCI				3. READ ERR0R	
01452	12434621	EM5	BCI				3. LOAD P0INT	
01455	12632147	EM6	BCI				3. TAPE MARK	
* 01460	77777775	MINUS3	DEC					-3
01461	77777774	MINUS4	DEC					-4
01462	77777767	MINUS9	DEC					-9

CONTROL TABLE FOR ALL MAGNETIC TAPE FUNCTIONS.

BINARY OR BCD SELECTABLE FUNCTIONS.

01463	0 02 03650	WT	WTBW	0.4	WRITE TAPE
01464	0 02 03610	RT	RTBW	0.4	READ TAPE
01465	0 02 03630	SF	SFBW	0.4	SCAN FORWARD

NON SELECTABLE FUNCTIONS

01466	0 02 02050	WEØF	WTDW	0.1	WRITE END OF FILE
01467	0 02 03670	ET	ETW	0.4	ERASE TAPE
01470	0 02 07630	SR	SRBW	0.4	SCAN REVERSE
01471	0 02 14010	REW	REWM	0	REWIND
01472	0 40 16210	D2T	SKS	16210	200 BPI TEST
01473	0 40 16610	D5T	SKS	16610	556 BPI TEST
01474	0 40 10410	TRT	SKS	10410	TAPE READY TEST
01475	0 40 14010	FPT	SKS	14010	FILE PROTECT TEST
01476	0 40 12010	BTT	SKS	12010	BEGINNING OF TAPE TEST
01477	0 40 11010	ETT	SKS	11010	END OF TAPE TEST

RTSW	ØPD	214000	READ TO SCAN
TGTW	ØPD	4012610	TAPE GAP TEST
TFTW	ØPD	4013610	TAPE END OF FILE TEST
SRRW	ØPD	213610	SKIP REMAINDER OF RECORD
CIL	ØPD	250000	COCK INTERLACE

* * * * *

CONTROL CHARACTER DEFINITIONS.

B	0PD	2200000
C	0PD	2300000
D	0PD	2400000
E	0PD	2500000
F	0PD	2600000
I	0PD	3100000
L	0PD	4300000
N	0PD	4500000
P	0PD	4700000
R	0PD	5100000
S	0PD	6200000
T	0PD	6300000
U	0PD	6400000
W	0PD	6600000
X	0PD	6700000
Y	0PD	7000000
Z	0PD	7100000
CR	0PD	5200000
SP	0PD	1200000

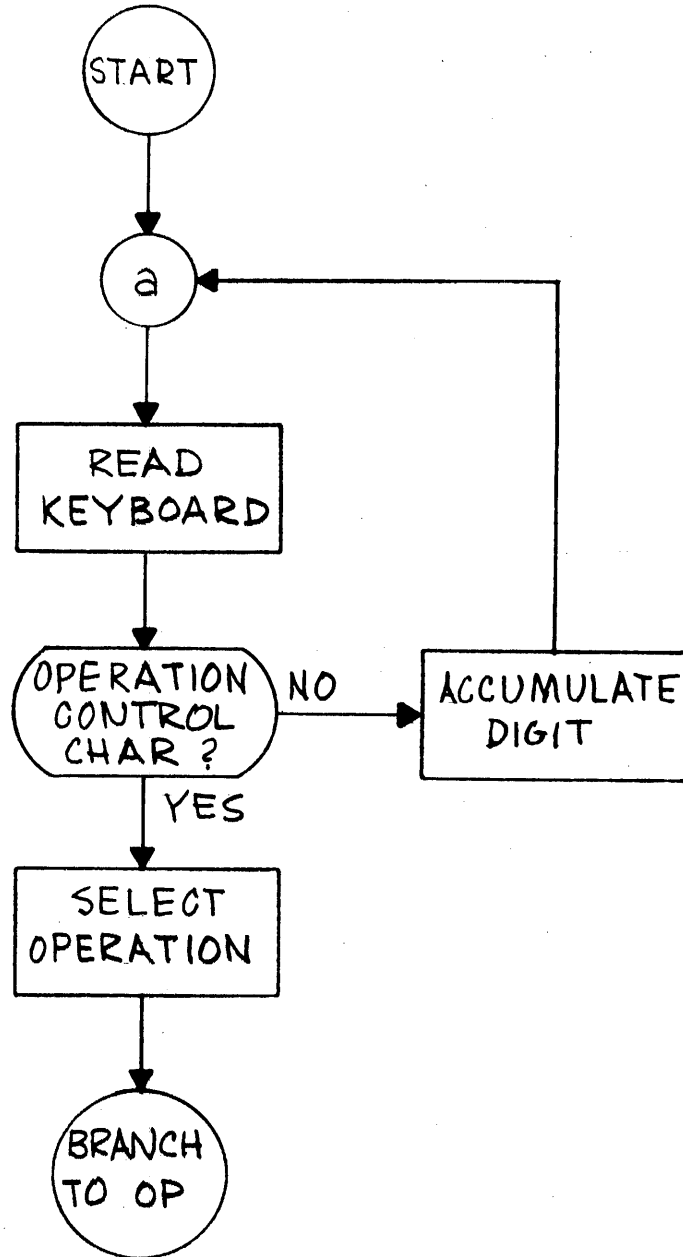
CARRIAGE RETURN
SPACE CHARACTER

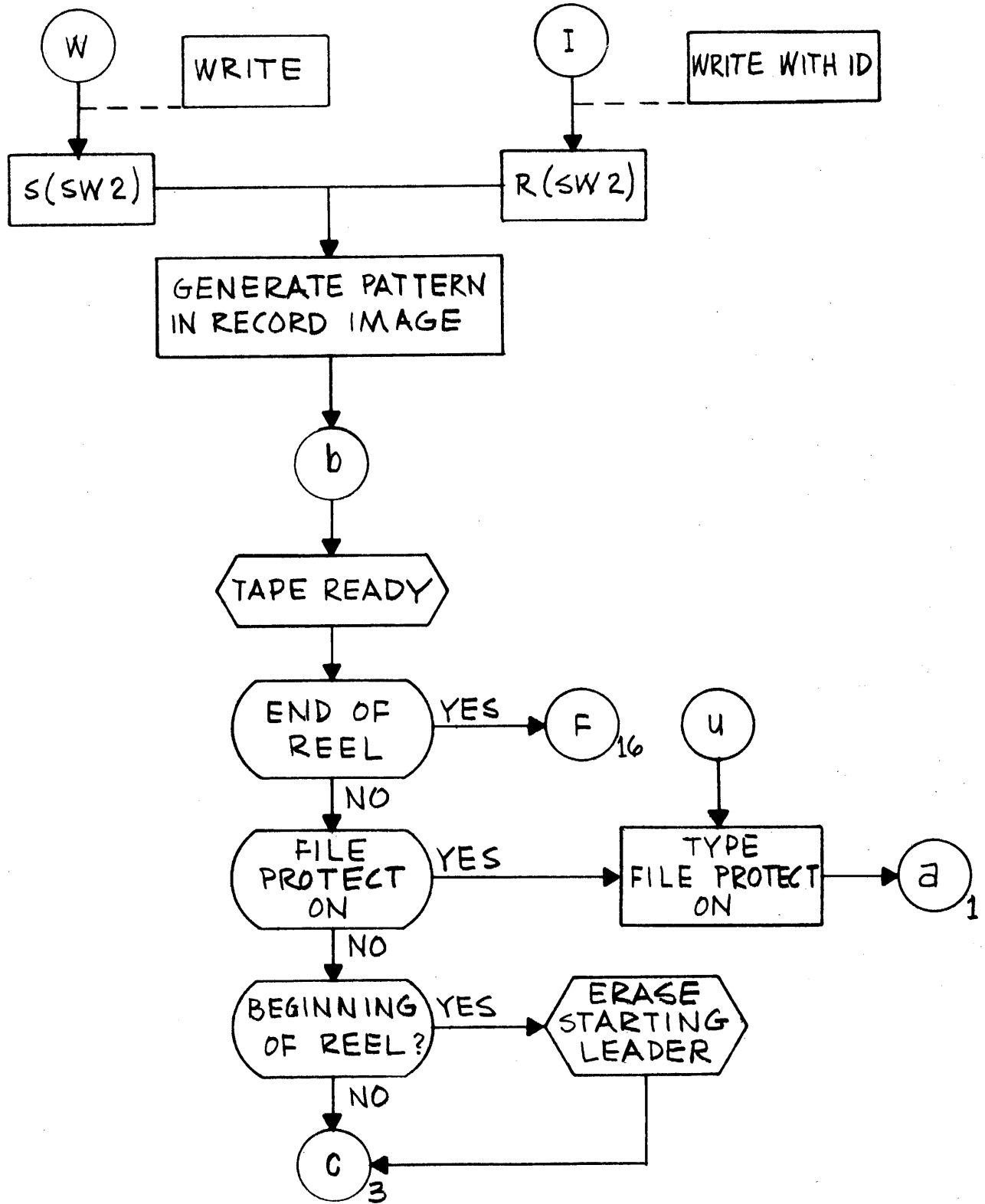
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00024	0NE	000L	24
00025	MINUS	000L	25
00026	0NES	000L	26
00027	ADMSK	000L	27
00012	T1	000L	12
00013	T2	000L	13
00014	T3	000L	14
00015	T4	000L	15
00016	ACCUM	000L	16
00031	I1W	000L	31
00033	I2W	000L	33

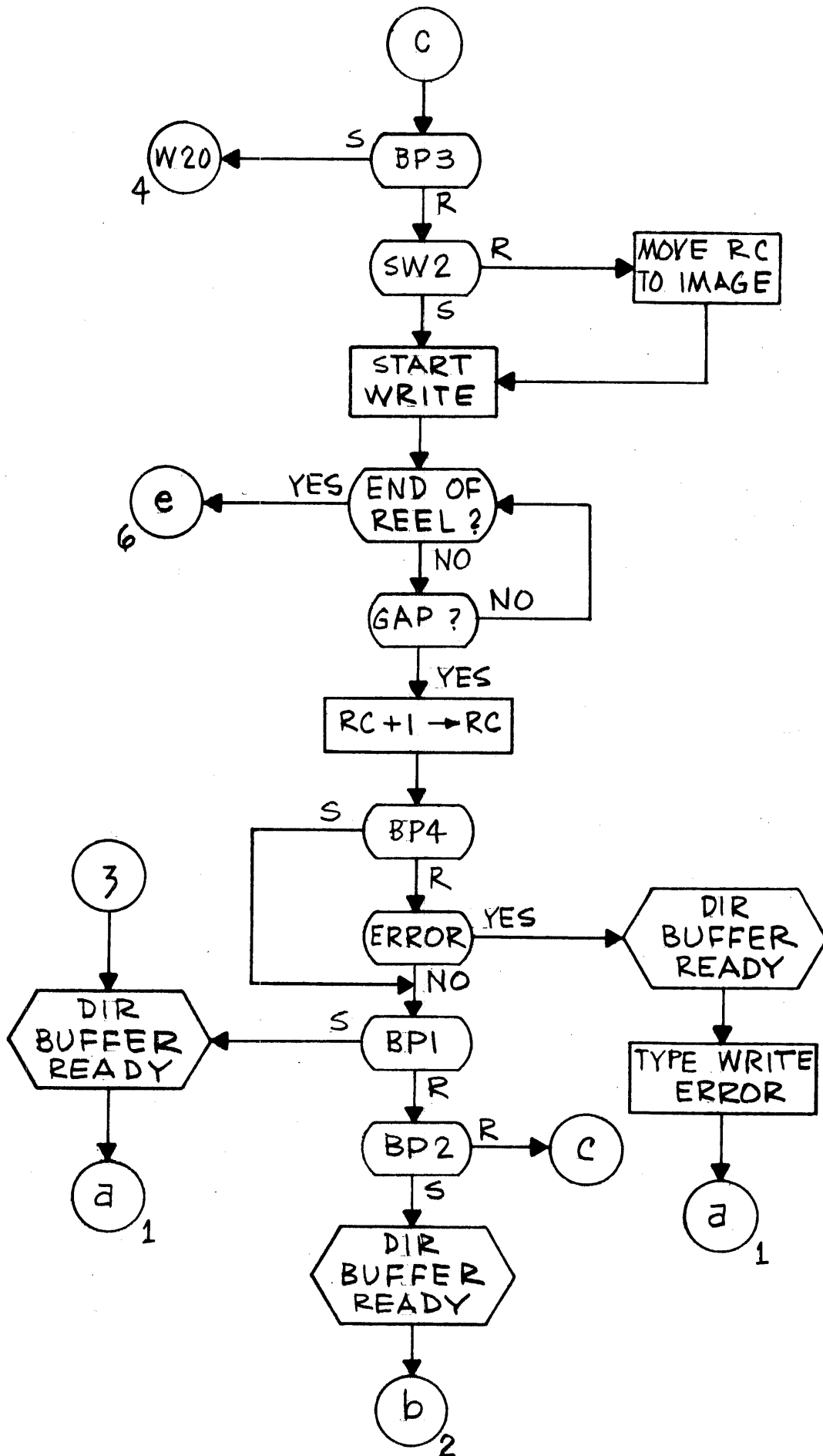
* * *

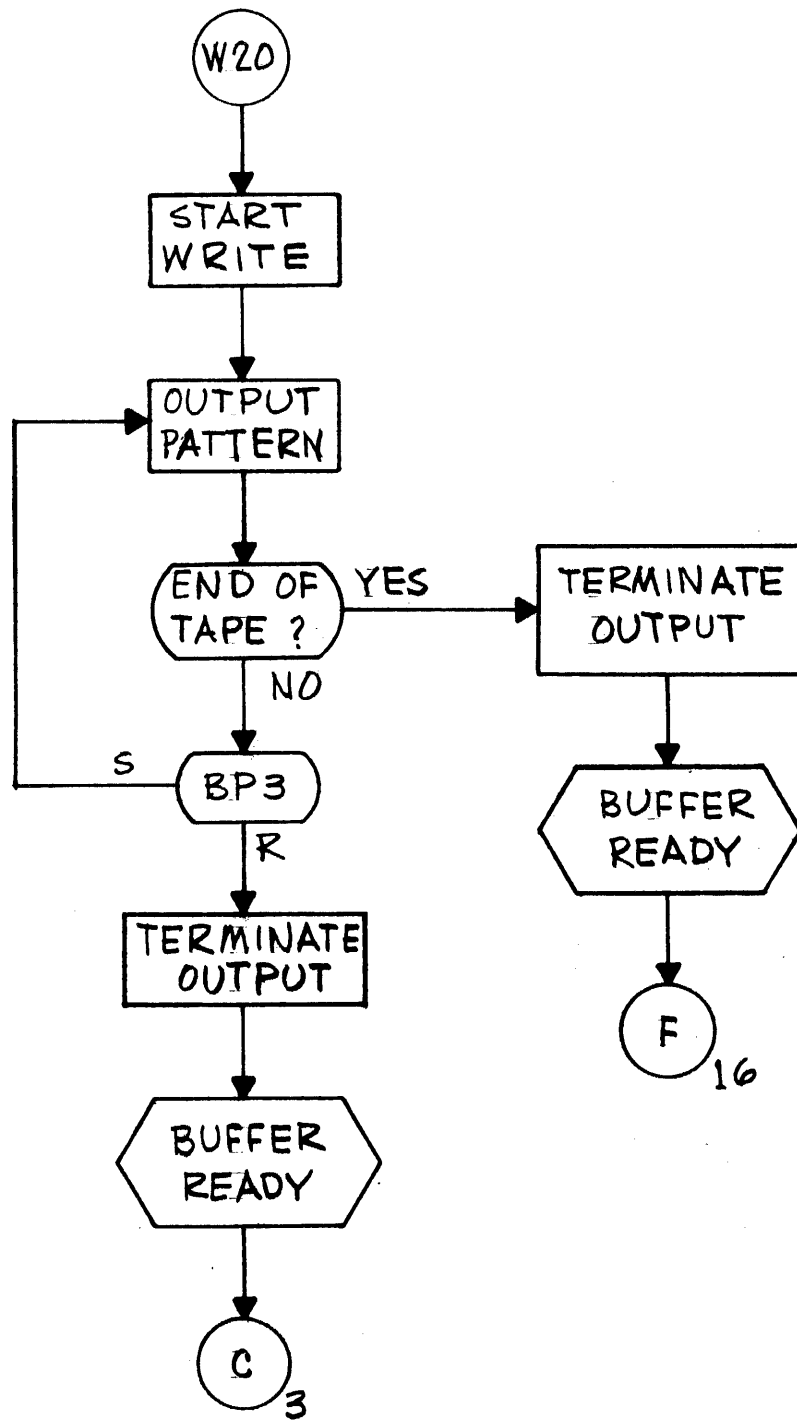
* *

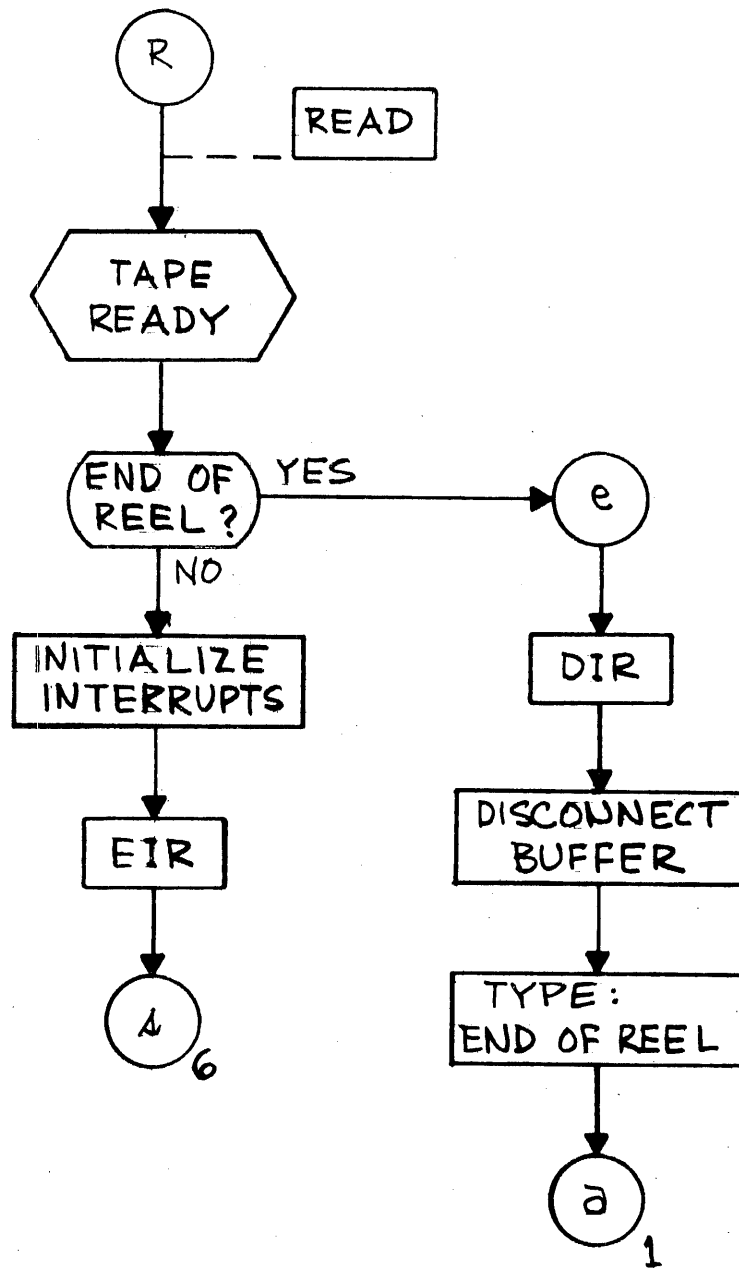
CENTRAL STORAGE.					
*	01500	0 00 00000	PATT	PZE	PATTERN
*	01501	0 00 00000	REVPAT	PZE	REVERSED ACCUM ID PATTERN
*	01502	0 00 00000	LENGTH	PZE	RECORD LENGTH
	01503	0 00 00000	NEGLEN	PZE	NEGATIVE RECORD LENGTH
	01504	0 00 00000	SHIB	PZE	SET HIGH ORDER INTERLACE BITS
	01505	0 00 00000	LDIL	PZE	CONTROL WORD TO LOAD INTERLACE
	01506	0 00 00000	RC	PZE	RECORD COUNT
*	01507	0 00 00000	SW1	PZE	
	01510	0 00 00000	SW2	PZE	
*	01511	0 00 01513	BEGIMG	PZE	BEGINNING OF IMAGE
	01512	0 00 11512	ENDIMG	PZE	HIGHEST END OF IMAGE
	01513	0 00 07777	IMAGE	BSS	
*		00400		END	START

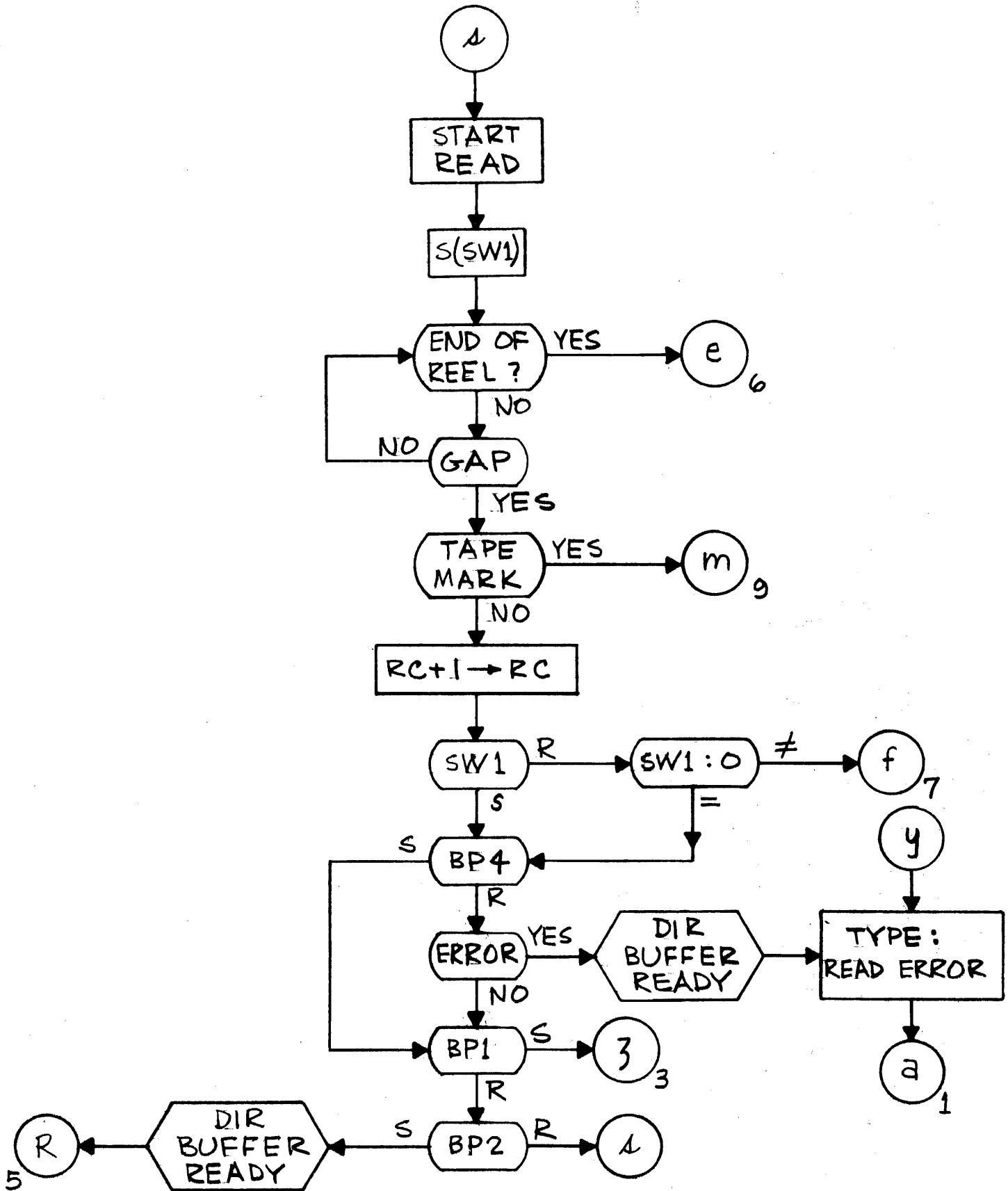


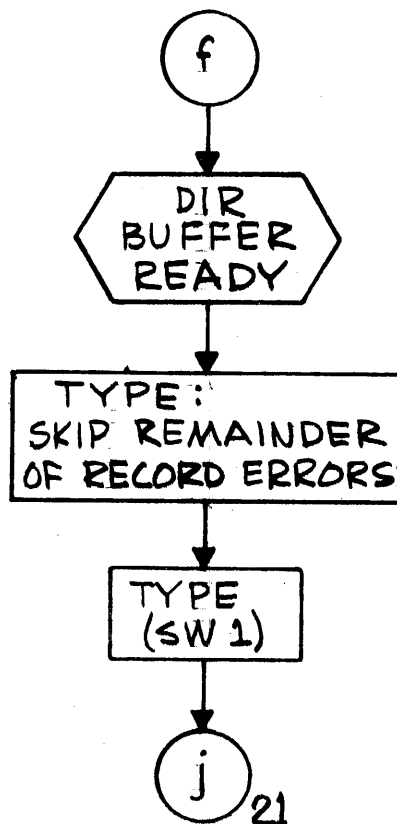
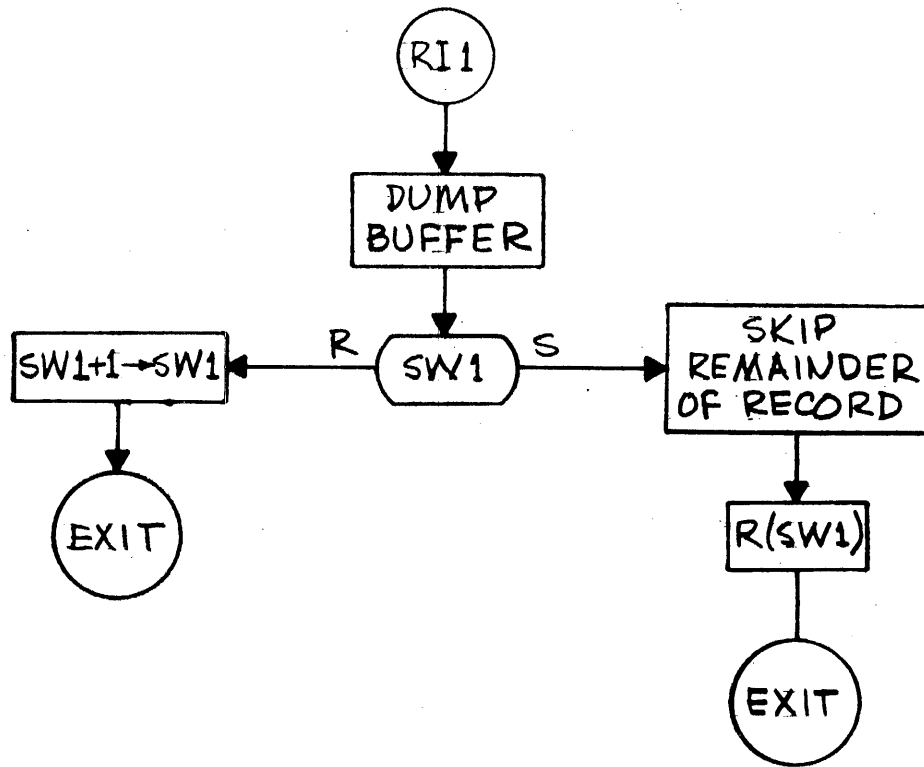


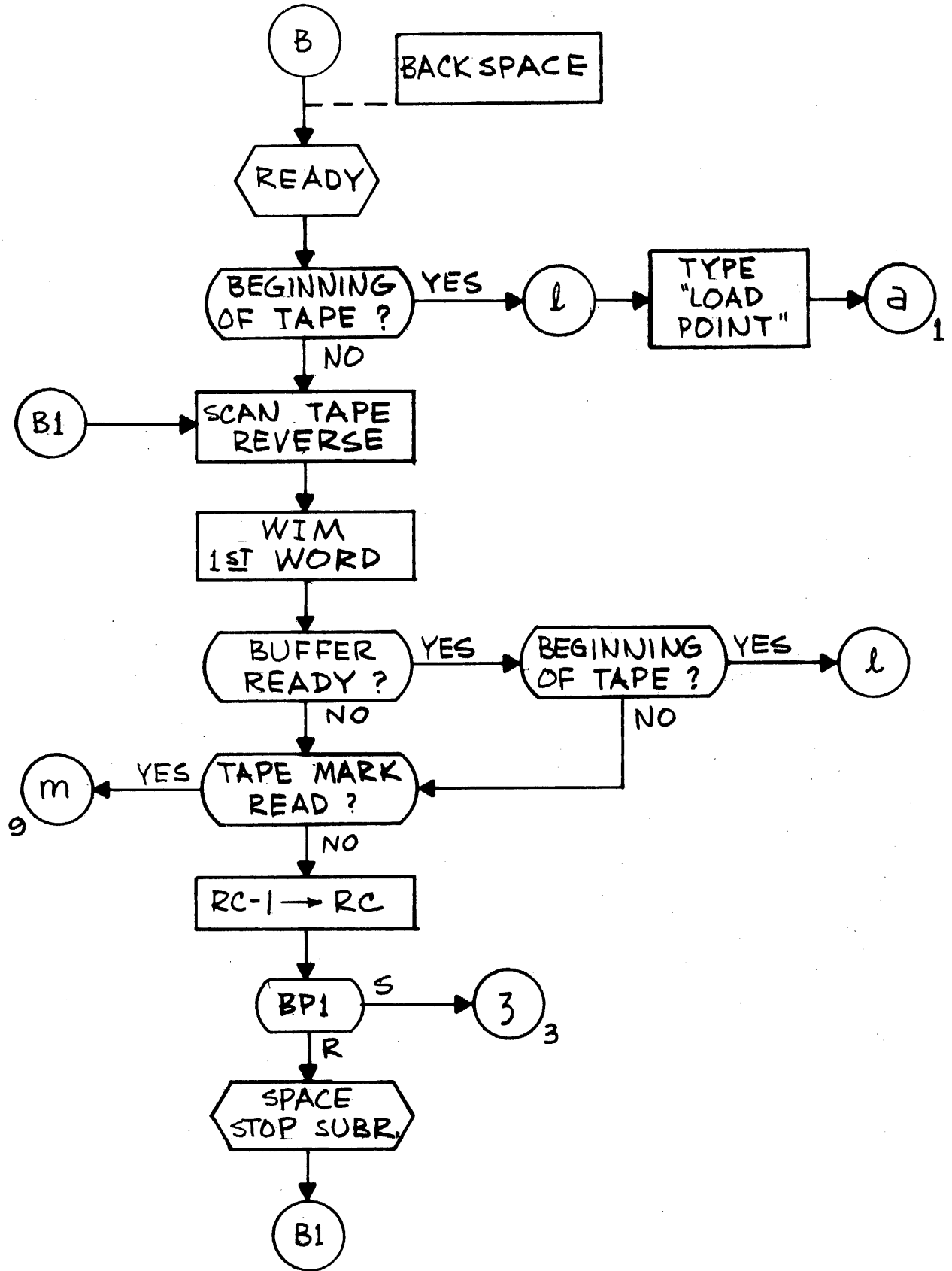


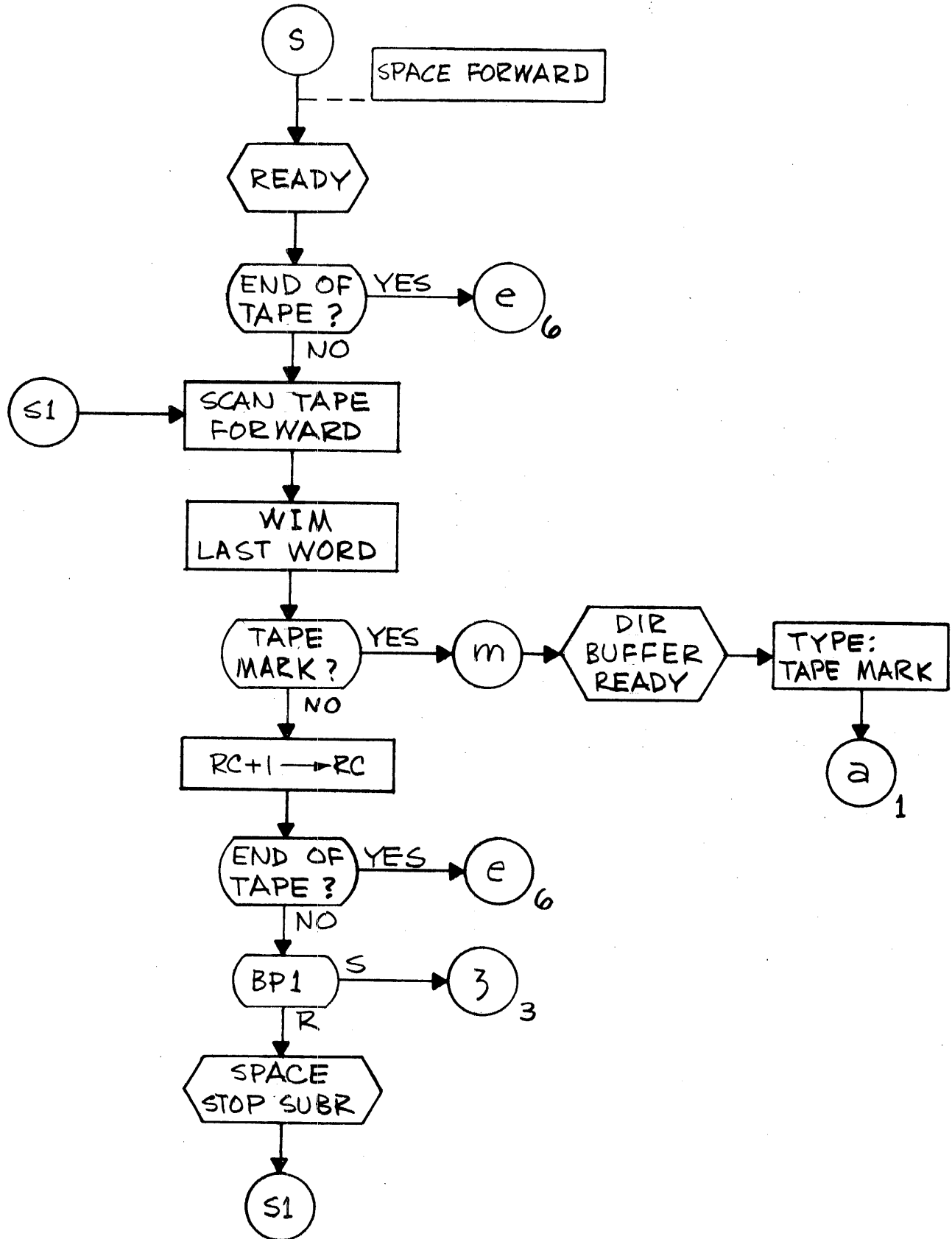


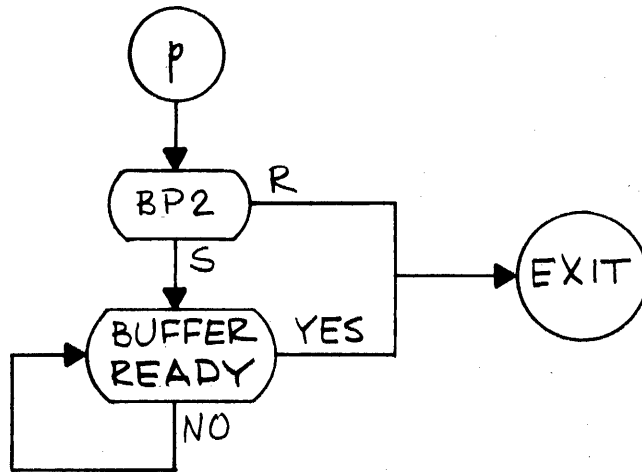
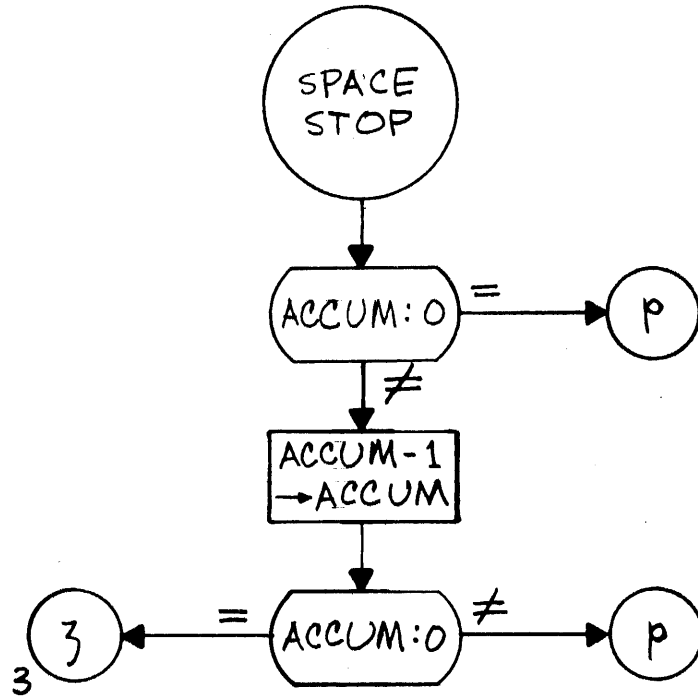


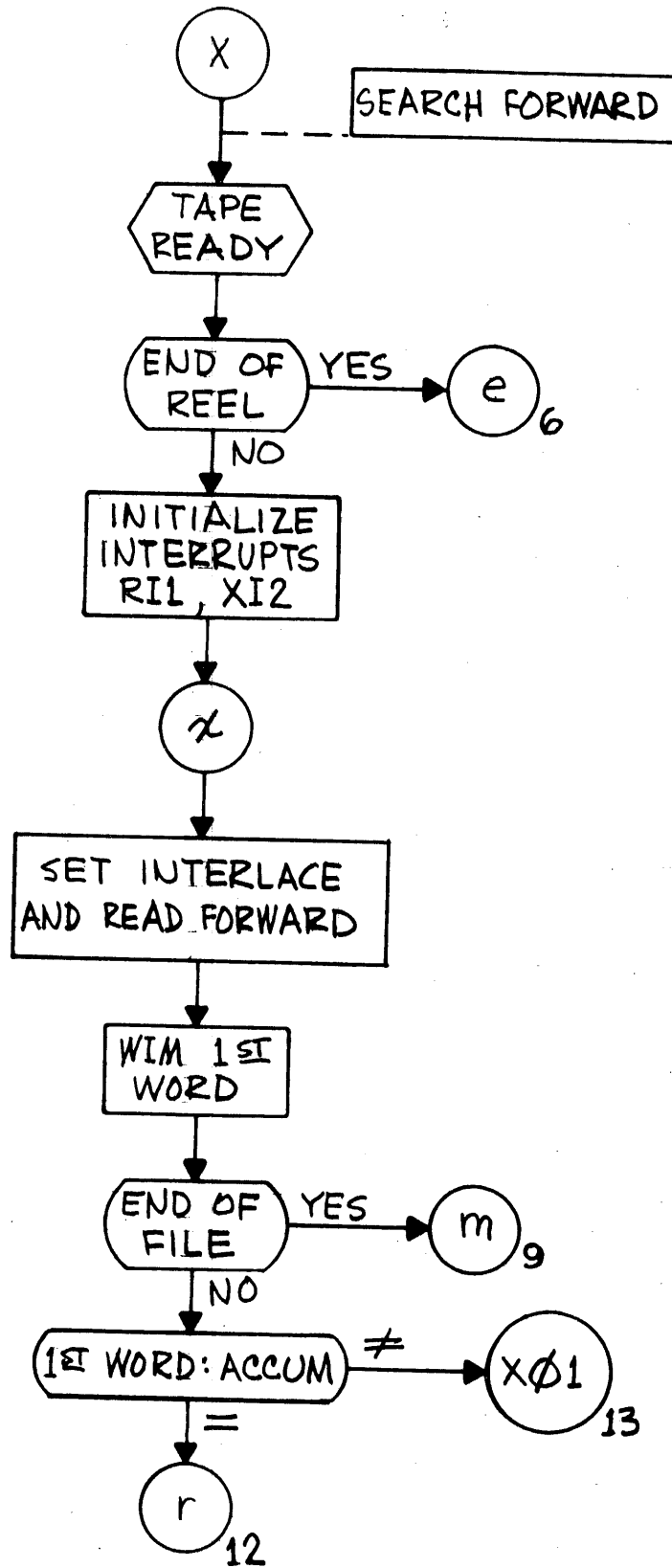


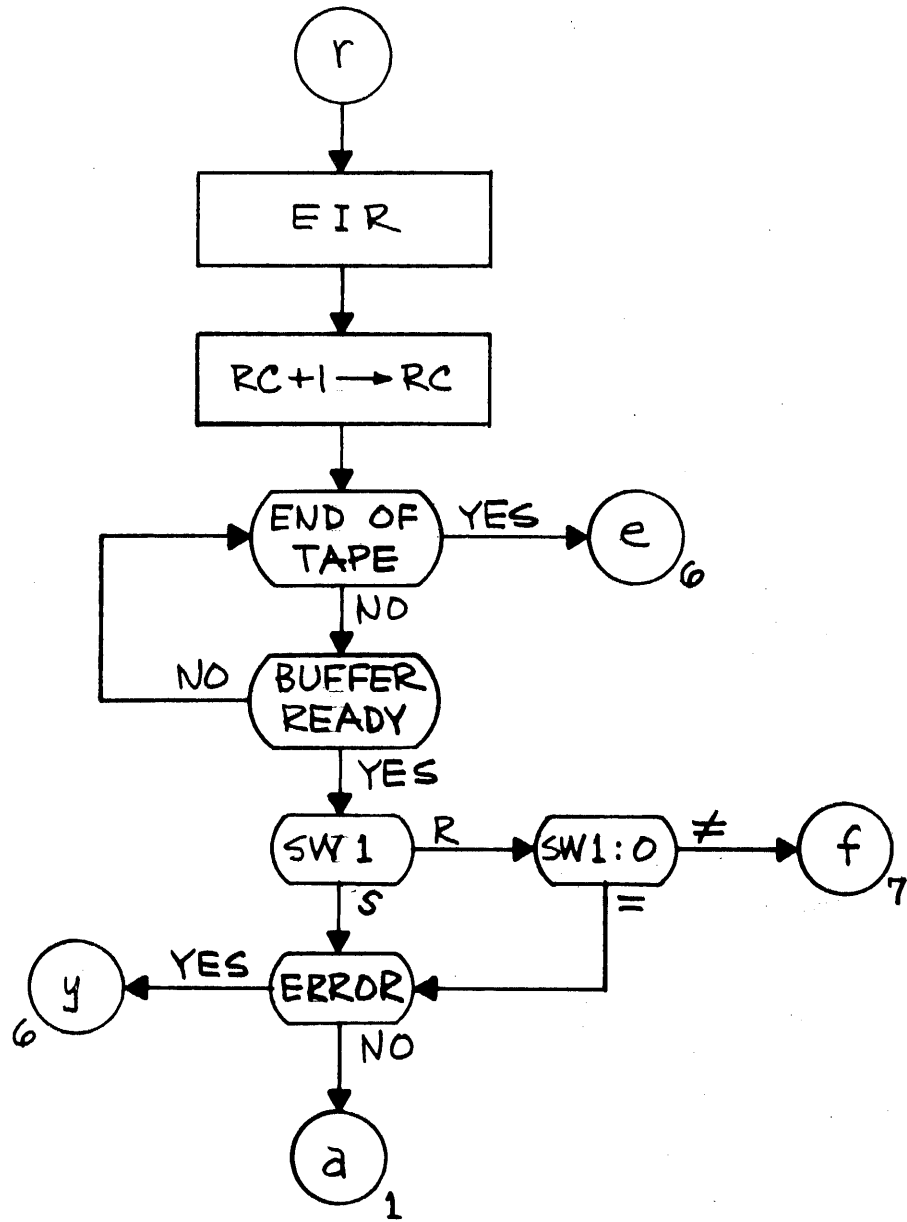


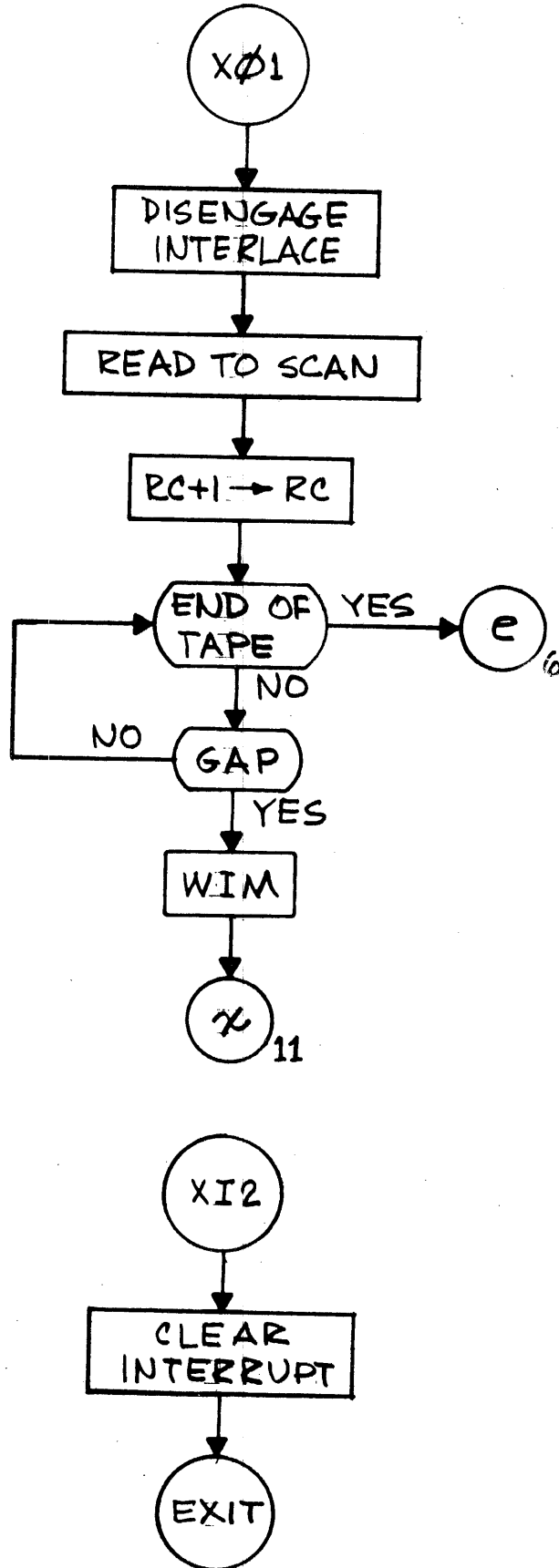


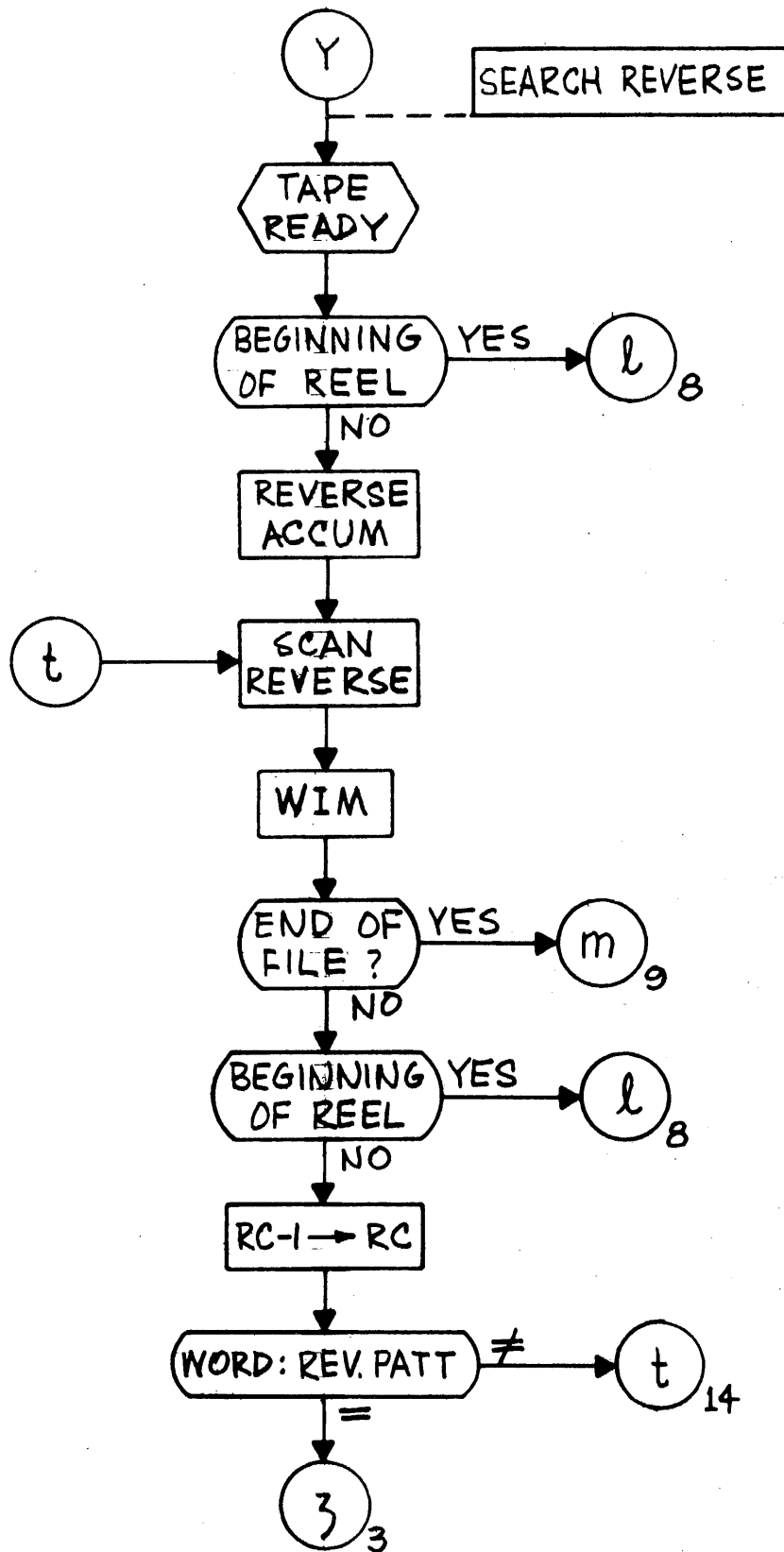


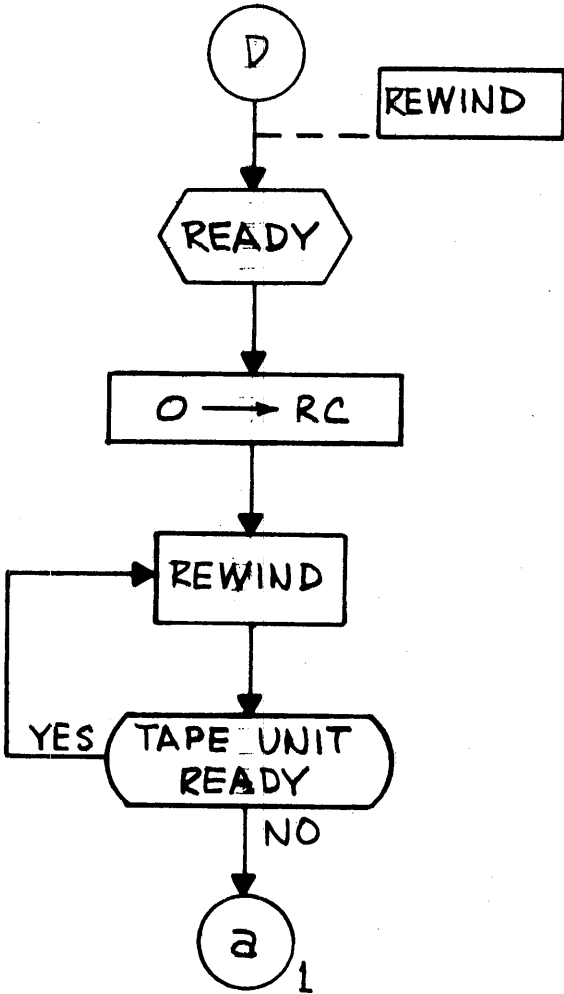


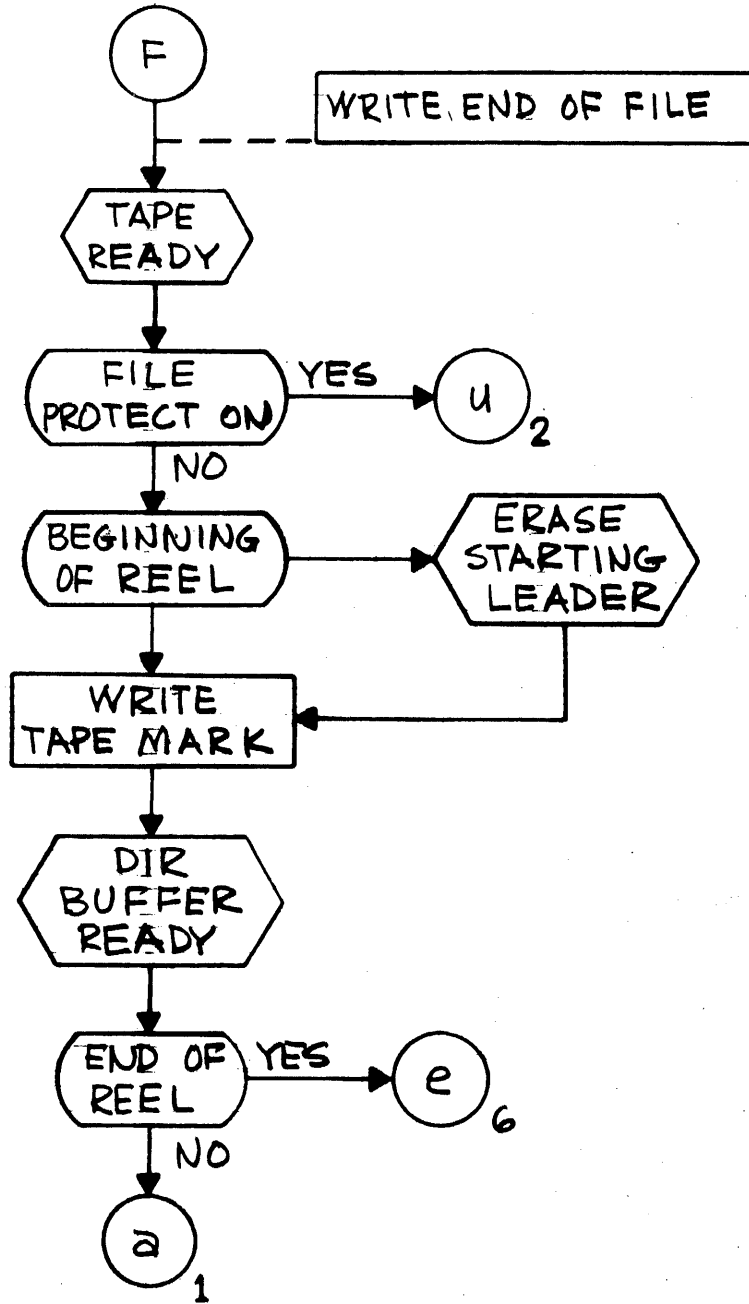


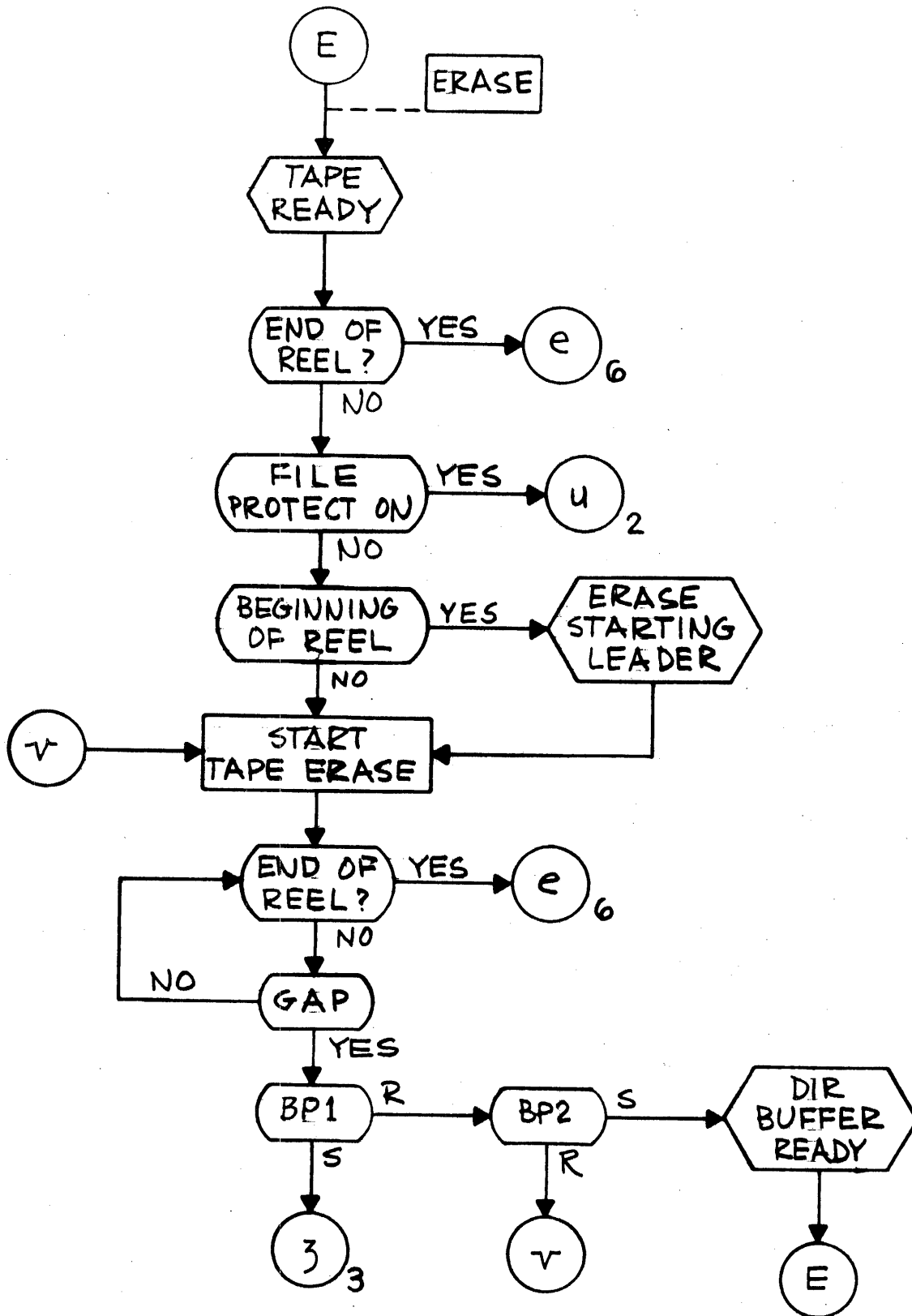


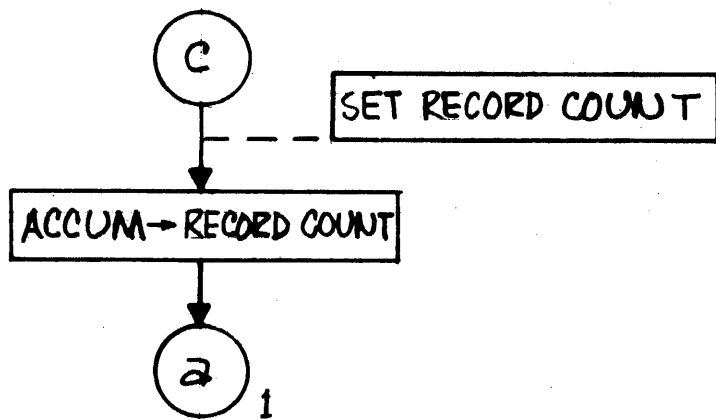
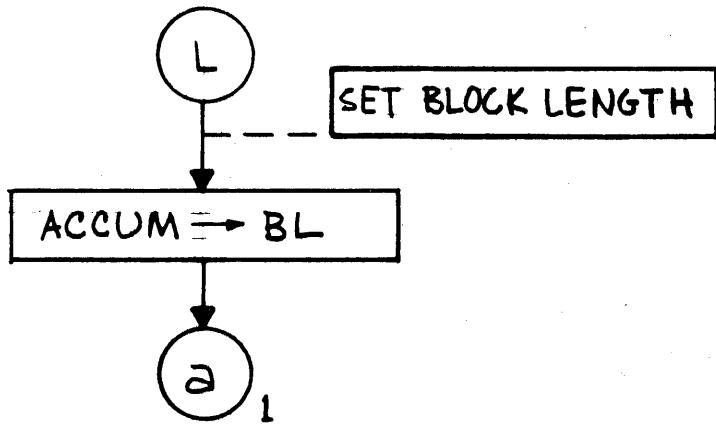
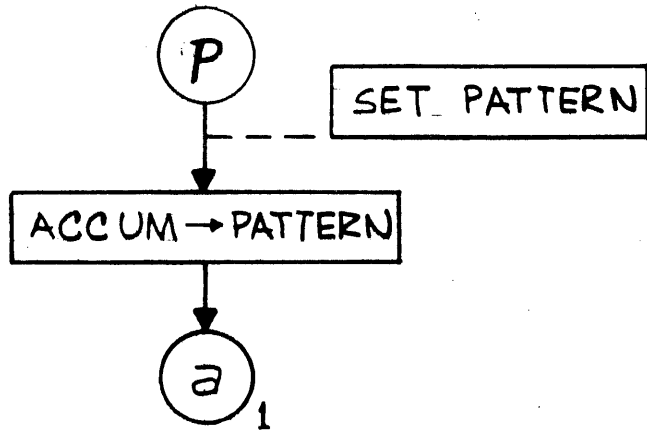


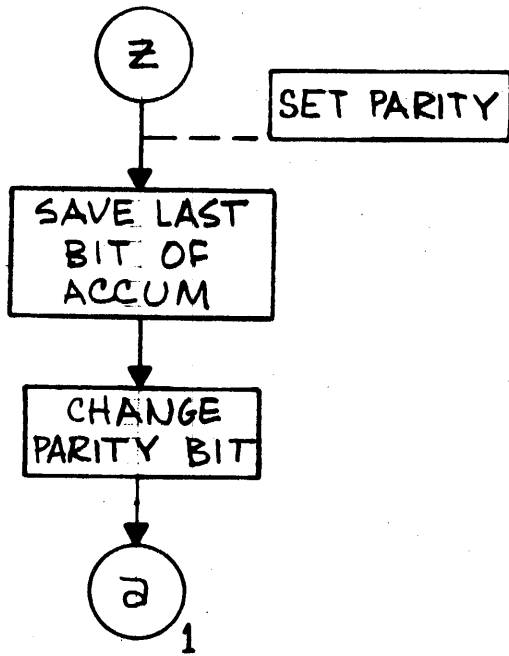
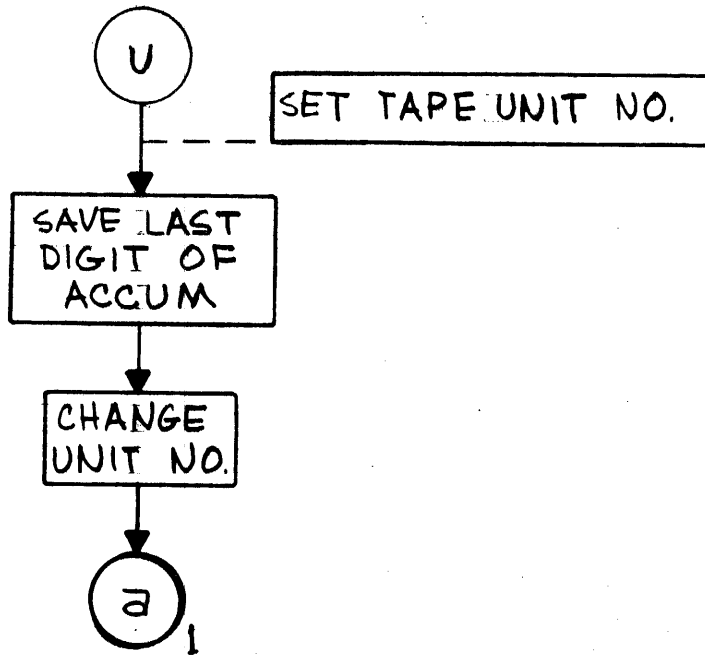


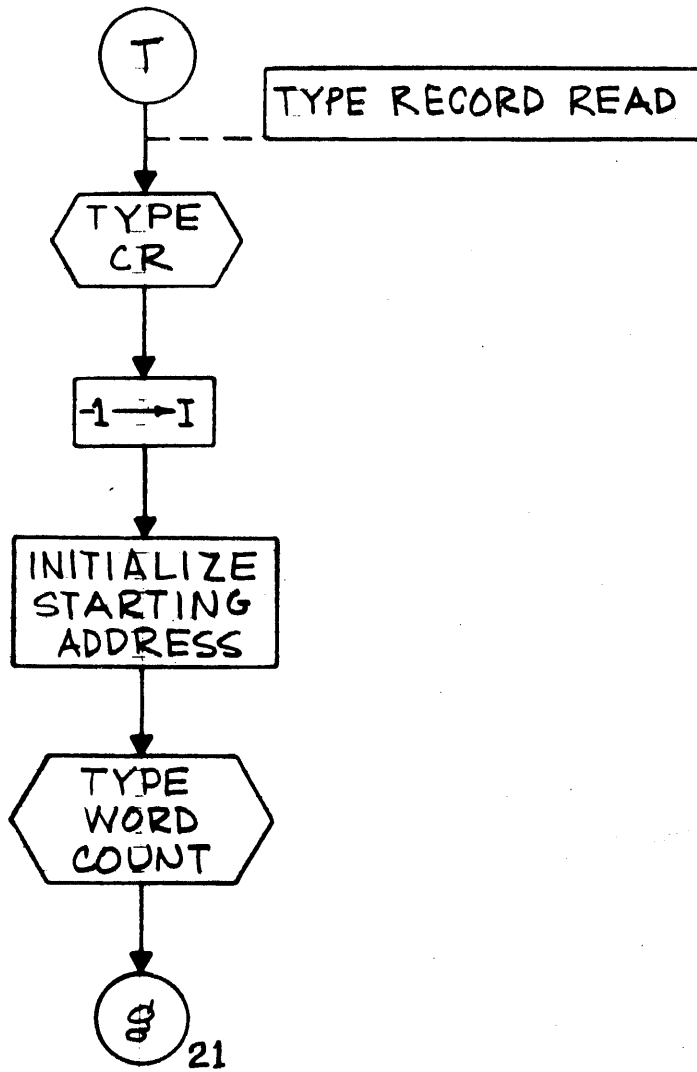


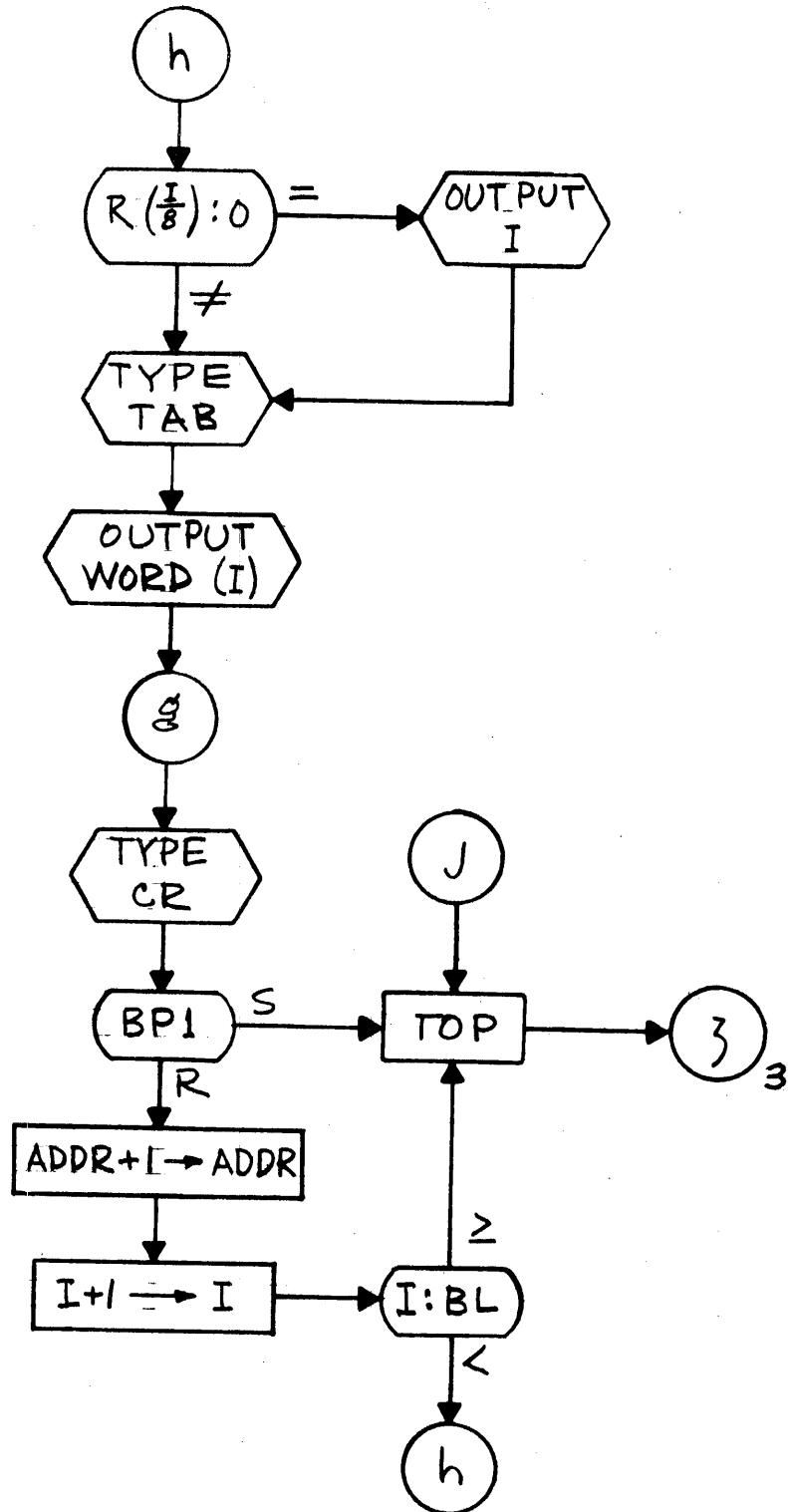


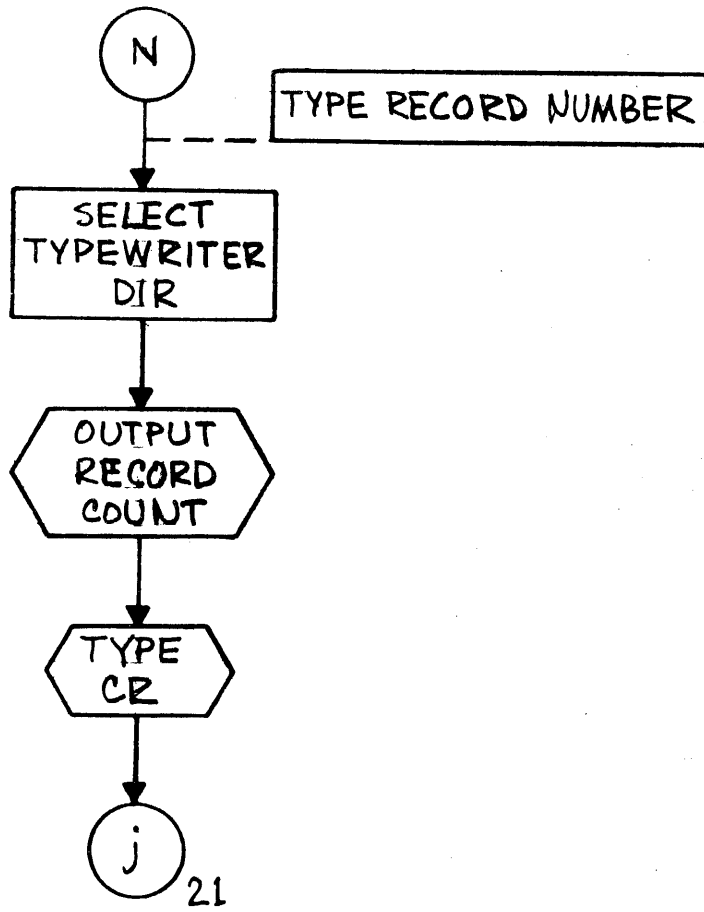












SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 1

Catalog No. 074002

IDENTIFICATION: 42 KC Magnetic Tape Test Program, Y Buffer

AUTHOR: A. W. England, SDS

ACCEPTED: 28 May 1963

COMPUTER
CONFIGURATION: All SDS 920 systems (or 910 with a typewriter) which have one or more magnetic tape units connected to the Y buffer through a 9248 tape control unit. The Y buffer must have a 9121 interlace control attached.

PURPOSE: To provide a simple and easy means for initial checkout and testing of 42 KC magnetic tape units.

PROGRAMMED
OPERATORS: None

STORAGE: The program occupies 593 words from 400g to 1520g. It uses the HELP Word Output Subroutine located at 200g. The area from the end of the program to the end of memory may be used as input and output record image.

TIMING: The program is sufficiently fast to keep the tape operating at full speed for all operations.

USE: The user is referred to the description of the W buffer version of this program (Catalog No. 074001) for details on USE and METHOD.

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 1

Catalog No. 074003

IDENTIFICATION: 42 KC Magnetic Tape System Exerciser

AUTHOR: A. W. England, SDS

ACCEPTED: 28 May 1963

COMPUTER
CONFIGURATION: All 920 systems (or 910 with typewriter) which have one or more tape units attached to the W buffer through a 9248 tape control unit. The W buffer must have a 9121 interlace control attached.

PURPOSE: This program is designed to exercise from one to eight tape units by first writing random numbers in random length records on all tapes under test and then reading these records back and comparing them with the numbers written. An attempt is made to tabulate and output all useful information concerning the errors made, if any, the mode of operation of each unit, and the number of passes over the tape.

PROGRAMMED
OPERATORS: None

STORAGE: The program occupies from location 40g to 1776g. In a 2K machine the next 1023 words are used as a record buffer area. If the computer has a 4K memory the next 2047 words are used. If the memory is 6K or larger the next 4095 words are used.

TIMING: The program requires approximately 20 minutes to write or read a full reel (2400 feet) of tape.

USE: The user is referred to the description of the Y buffer version of this program (Catalog No. 074004) for details on USE and METHOD.

SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 10

Catalog No. 074004

IDENTIFICATION: 42 KC Magnetic Tape System Exerciser, Y Buffer

AUTHOR: A. W. England, SDS

ACCEPTED: 23 May 1963

COMPUTER

CONFIGURATION: All 920 systems, or any 910 with typewriter, which have one or more tape units attached to the Y Buffer through a 9248 tape control unit. The Y Buffer must have a 9121 Interlace control attached.

PURPOSE: This program is designed to exercise from one to eight tape units by first writing random numbers in random length records on all tapes under test and then reading these records back and comparing them with the numbers written. An attempt is made to tabulate and output all useful information concerning the errors made, if any, the mode of operation of each unit, and the number of passes over the tape.

STORAGE: The program occupies from location 408 to 17768. In a 2K machine the next 1023 words are used as a record buffer area. If the computer has a 4K memory the next 2047 words are used. If the memory is 6K or larger the next 4095 words are used.

TIMING: The program requires approximately 20 minutes to write or read a full reel (2400 feet) of tape.

USE: 1.0 LOADING

Place tape in reader and FILL. When loading is complete the light on the typewriter will light if no loading error occurred.

2.0 KEYBOARD CONTROL

When the keyboard light is on, the operator has control over the program. By actuating various keys he may set the test parameters, inspect results or start the exerciser test running.

2.1 REGAINING KEYBOARD CONTROL

Control may be returned to the keyboard mode at any time by moving the RUN-IDLE-STEP switch to IDLE, pressing the START button, and moving the switch first to STEP then to RUN.

USE: (cont.) 3.0 CONTROL FUNCTIONS

The following list contains the call letters for the various functions which the program will perform. These may be typed anytime the typewriter light is lit.

3.1 SELECT UNITS, "U"

The units to be exercised are selected by first typing the letter "U" followed by the several unit numbers and finally a carriage return. After the last unit number is entered a carriage return must be given to terminate the unit select operation.

3.2 SET STARTING RANDOM NUMBER, "N"

The initial random number is set by first typing the octal number desired (up to 8 digits) and then the letter N. The number being typed can be set to zero by typing a carriage return.

3.3 SET MAXIMUM FILE LENGTH, "M"

The maximum number of records in the test file is set by typing the desired number of records in octal followed by the letter M. If the entire 2400 foot reel is to be written a maximum count of 10000₈ or greater should be sufficient.

3.4 MODE SELECT

The recording mode, either BCD or Binary is selected by typing the appropriate letter.

3.4.1 Select Binary Mode, "B"

Typing the letter B will cause the appropriate EOM instructions to be converted to the binary mode of operation.

3.4.2 Select BCD Mode, "D"

Typing the letter D will cause the EOM instructions to be set for BCD operation.

3.5 SELECT OUTPUT MEDIA

The output of the various messages and counters during the operation of the program can be on either the on-line typewriter or on paper tape for off-line listing.

This is controlled by typing the appropriate letter before starting.

USE: (cont.) 3.5.1 Select Typewriter Output, "T"

The typewriter is selected by typing the letter T.

3.5.2 Select Punch Output, "P"

The punch is selected by typing the letter P.

3.6 INITIATE TAPE OPERATION

After the appropriate parameters have been set the tape exercise operation may be initiated. There are three ways in which this may be done. If nothing has been recorded then the exercise must be begun with a START WRITE. However, once a file of information is written on tape and the program is stopped the other two starts can be used.

3.6.1 Start Write, "S"

To begin the exercise operation, type the letter S. The program will rewind all units and start to write a random number test file on the selected units.

3.6.2 Continue Operation, "C"

Once the exercise operation has been stopped with Breakpoint 1 (see section 4.1) it can be resumed from the point at which it was stopped by typing the letter C.

3.6.3 Restart Read, "R"

If during a read pass the program is stopped and the operator would like to reread the file from the beginning he can type the letter R to restart the read pass.

3.7 OUTPUT OPERATIONAL STATUS, "O"

The operator can inspect the status of the operation at anytime by stopping the program with Breakpoint 1 (see section 4.1) and typing the letter O. The program will then type out the status of the exercise operation as follows:

3.7.1 Type of Pass

It types READ or WRITE depending on the type of pass in progress.

3.7.2 Mode of Operation

It then types the mode of operation, either BINARY or BCD.

USE: (cont.) 3.7.3 Density and Unit

The density setting and UNIT NO. of the tape unit currently being addressed are typed. If this unit should not be in automatic the program cannot ascertain its density setting so it will type ***.

3.7.4 Program Counters

After this information the program will type a table of 17 counters each identified by a three or four character symbol. These symbols and their definitions follow:

MRC	Maximum Record Count. This is the octal number entered with the M key at the start of the exercise operation.
WRC	Write Record Count. If in a write pass this indicates the number of records written. In a read pass it indicates the total number written in the previous write pass.
RRC	Read Record Count. This indicates the number of records read during a read pass.
WPC	Write Pass Count. The number of write passes completed.
RPC	Read Pass Count. The number of read passes completed.
WEC	Write Error Count. The number of write errors that have occurred.
RWEC	Rewrite Error Count. This number of rewrite errors.
PREC	Permanent Read Error Count. The records that were read bad 10 times.
CPEC	Character Parity Error Count. The number of character parity errors that have occurred since the start of the exercise.
LPEC	Longitudinal Parity Error Count. The number of longitudinal parity errors that have occurred. For each read try only one character or longitudinal parity can be counted and character parity has priority.

USE: (cont.) WCEC Word Count Error Counts. The number of word count errors that have occurred. A word count error occurs if the record read is longer or shorter than the record expected.

CH1 }
 CH2 } Errors in Channels 1-6. Channel 1 is the most
 CH3 } significant bit, channel 6 the least. These
 CH4 } counters are also output whenever a read error
 CH5 } occurs if Breakpoint 2 is RESET. After a read
 CH6 } error output they are cleared.

4.0 BREAKPOINT SWITCHES

The four Breakpoint switches are used to change the status of the program while it is running. These functions are as follows:

4.1 BREAKPOINT 1

RESET: Normal

SET: Stop operation. After almost every tape operation there is a STOP point. If Breakpoint 1 is set the program will mark its place and return to the keyboard control mode. Operation can be continued by typing the letter C.

4.2 BREAKPOINT 2

RESET: Output counters and messages whenever the normal output situation occurs.

SET: Skip the output of messages and counters. This will inhibit all output except the OUT OF SYNC message and the FILE PROTECT ON message.

4.3 BREAKPOINT 3

RESET: At the end of a read pass go on to another write with new random numbers.

SET: At the end of a read pass go back and reread the same file again.

4.4 BREAKPOINT 4

RESET: Run without halts.

SET: Halt on a write error or at the end of a read pass. Clearing these halts will allow the program to continue.

USE: (cont.) 5.0 MESSAGES

The program will type or punch status messages at various times in the operation of the exercise. These are described below:

5.1 END OF PASS

At the end of a write or read pass the output will be either WRITE or READ, PASS DONE. This is followed by a carriage return and the following two lines:

```
WRITES  READS  WRITE ERR  REWRITES  BAD READS  
aaaaaaaa bbbbbbbb cccccccc dddddddd eeeeeeee
```

where the a's represent the number of write passes in octal, the b's the number of read passes, the c's the number of write errors which have occurred, the d's the number rewrite errors, and the e's the number of records which were read erroneously 10 times.

5.2 REWRITE ERROR

If a write error is detected the program erases backward over the record and attempts to rewrite it. If this second attempt is also in error the program outputs the following counter titles:

```
WRITE PASS RECORD NO. WRITE ERRS REWRITE ERRS
```

This is followed on the same line by the mode of operation (Binary or BCD) the density and the unit number. On the next line below the appropriate title it outputs the write pass count, the write record number count, the write error count and the rewrite error count. All counts are in octal.

5.3 READ ERROR

If a read error occurs, the program rereads the record nine more times and then outputs the read pass, record number, mode, density, and unit number. This is followed by a carriage return, the message, READ ERROR, another carriage return and then nine, eight-octal-digit counters which represent the following quantities (from left to right): character parity error count, longitudinal parity error count, word count, error count, errors in channel 1, channel 2, etc., to channel 6. On the next line the program outputs a good or bad message for each of the 10 reads. This consists of the letter G if the read was correct or B if the read was incorrect.

USE: (cont.)

For example:

B G G G B G G G G G

Indicates that the first and fifth reads were bad and all others were good.

5.4 READ PASS OUT OF SYNC

The first word of every record is the number of records preceding it on the tape. When each record is read, the program compares this first word with the read record count. If they disagree the program backspaces and rereads the record a second time, if they still disagree then the difference between them is computed and the program spaces over as many records as necessary to position itself in front of the correct record. If the first word of this record does not agree with the read record count after two attempts the program ends the read pass and outputs the following. As in a read error it outputs the read pass count, read record number, mode, density and unit number. This is followed by this message:

```
READ PASS ABORT, OUT OF SYNC.
```

```
aaaaaaa      bbbbbbbb
```

where the a's represent the first word of the first record read that did not agree with the read record count, and the b's represent the first word of the record read after spacing to what should have been the correct record. The program then goes to the end of read pass section where the end of pass output will be produced and from there on to another write or reread pass.

If a tape mark or the load point was encountered when spacing, the program terminates the read pass and outputs TAPE MARK before the other outputs. If it was the load point which was encountered it also outputs LOAD POINT. In either case the two words a and b will be the same since only one record was read.

5.5 FILE PROTECT ON

Before the program attempts to write on a tape it tests the file protect for that unit. If the file protect should be on, the program outputs: FILE PROTECT ON (Mode) (Density) UNIT NO. n. and returns to the keyboard mode.

METHOD: 1.0 WRITING

At the start of the write pass all units are rewound. The program then sets the tape control table for the lowest numbered unit and waits for it to be ready. As soon as this unit is ready a check is made to see if the tape is at

METHOD: (cont.) the loadpoint. If it is not, another rewind is given and the program waits until it is ready and at the load point. A three inch section of tape is erased before the first random number record is written. After writing this record on the first unit the control table is set to the next higher numbered unit and the record is written again. This continues until a record has been written on all units under test. The program then generates a new record of random numbers and starts writing this on all units.

1.1 WRITE ERROR

If a write error occurs the program erases backward to the front of this record and attempts to rewrite it. If this second attempt is also in error then the program outputs the rewrite error message. It then erases backward over the record again, erases it forward and attempts to write the record again on a new section of tape. An error here is considered a new write error and the process continues until a correct write is made.

1.2 END OF PASS

The write pass is concluded if one of two conditions occurs: Either the write record count reaches the maximum record count or an end of reel is encountered on any tape under test. When one of these occurs the program writes an end of file on all units and rewinds them. It then outputs the end of pass message and proceeds to the read pass.

2.0 READING

A read pass is similar to a write except that the program reads each record into memory and compares it with the random numbers which it regenerates for each read. The first record must be read starting from the load point. This insures that the tape is always positioned properly for the start of the pass.

2.1 READ ERRORS

When a read error occurs the program will always reread the record nine more times for a total of ten attempts regardless of whether or not a subsequent read was correct. It then outputs the results of these reads. Several conditions can cause a read error.

2.1.1 Character Parity Errors

The program counts a character parity error as any buffer error which occurs before the gap is reached.

METHOD: (cont.)

2.1.2 Longitudinal Parity Error

If no character parity errors have occurred before the gap is reached and the buffer error is on after the gap signal is detected, the program counts a longitudinal parity error.

2.1.3 Word Count Error

A word count error is defined as a record which was not of the length expected. The program tests for this in three ways. If more words than expected were read an I1 interrupt will occur because the interlace unit has been counted to zero. The program presets the last two words of the expected record buffer area to zero and checks to see that some information was read into these words. The third test is based on the fact that the program always writes records that consist of a multiple of four characters. Therefore if the buffer contains anything other than zero at the end of the read an error has occurred.

2.2 READ SYNCHRONIZATION

When each record is read the first word is compared against the program record count. If they disagree it means that the program and tape are no longer synchronized. To guard against a read error causing the disagreement, the program backspaces and reads the record again. If they still disagree then the program computes the number of records to be spaced over in order to reach the desired record and moves to that point. It reads the new record and again checks the first word. If this word disagrees with the record count and a second read attempt does not correct the disagreement then the program aborts the read pass and outputs the appropriate message. If a tape mark or the load point is encountered while spacing to the correct position the pass is aborted without further read attempts.

2.3 END OF FILE

If the program should receive an I2 interrupt before a gap signal is received then a check for end of file is made. If the interrupt was caused by the reading of a tape mark then the read pass is complete and appropriate messages are output. If there is no end of file signal after the I2 then the program assumes that the tape mark detector is not working and terminates the read pass anyway and outputs an END OF FILE READ ERROR message.

METHOD: 3.0 BCD MODE

In the BCD mode random numbers are generated and written the same as in binary. However, on the read pass all non compares between the generated number and the number from tape are checked to see if they are caused by the 12 to 00 conversion. This occurs because both the character 00 and the character 12 will be written on tape as a 12 but this character will always be read into memory as a 00.

PROGRAM LISTING

42 KC Magnetic Tape System Exerciser, Y Buffer

```

* 00200 0 76 00250          G8MCO1
    00201 0 35 00001          I
    00202 0 46 30003          CLR   ACCUM
    00203 0 35 00243          STA
    00204 0 02 20004          DIR
    00205 0 02 00100          DISY
    00206 0 02 02001          RKBW
    00207 0 32 00012          WIM
    00210 0 75 00012          LDB
    00211 0 66 20011          RCY
    00212 0 75 01725          LDB
    00213 0 71 01743          LDX
    00214 2 70 00235          SKM   CTE.2
    00215 0 41 00214          BRX   *-1
    00216 0 02 00000          DISW
    00217 2 01 40235          BRU*   CTE.2
    
```

CONTROL CHARACTER TABLE

```

* 00220 0 22 01011          B      800
    00221 0 23 00244          C      C00
    00222 0 24 01007          U      D00
    00223 0 44 01004          M      M00
    00224 0 45 01001          N      N00
    00225 0 46 00061          9      900
    00226 0 47 00766          P      P00
    00227 0 51 01025          R      R00
    00230 0 62 00340          S      S00
    00231 0 63 00763          T      T00
    00232 0 64 00252          U      U00
    00233 0 52 00202          CR    CLR
    00234 0 12 00204          SP    MCO1
    00235 0 00 00236          PZE  DIGIT
    
```

CONTROL TABLE END

ACCUMULATE DIGIT

```

* 00236 0 67 20006          LCY   6
    00237 0 75 00243          LDB   ACCUM
    00240 0 67 20003          LCY   3
    00241 0 36 00243          STB   ACCUM
    00242 0 01 00204          BRU   MCO1
    00243 0 00 00000          PZE  ACCUM
    
```

* 00244 0 02 00000 C00 DISW
 00245 0 51 00246 BRR ST8P
 * 00246 0 00 00000 ST8P PZE
 00247 0 40 20400 8PT
 00250 0 01 00204 68MCO1 BRU
 00251 0 51 00246 BRR ST8P
 *

CLEAR UNIT N8.
 TABLE FLAGS.

* 00252 0 71 01726 U00 LDX C3
 00253 3 76 00312 RPF UNT+8.2
 00254 0 41 00253 BRX *-1
 00255 0 02 02001 RKBW 1.1
 00256 0 32 00012 WIM T1
 00257 0 75 01746 LDB C77
 00260 0 76 00012 LDA T1
 00261 0 70 01745 SKM C52
 00262 0 01 00274 BRU U01
 00263 0 71 01726 LDX C3
 00264 2 53 00312 SKN UNT+8.2
 00265 0 01 00267 BRU *-2
 00266 0 01 00271 BRU U02
 00267 0 41 00264 BRX *-3
 00270 1 77 00302 SPF UNT
 00271 0 76 01726 LDA C3
 00272 0 35 00301 STA UNTI
 00273 0 01 00204 BRU MCO1

CARRIAGE RETURN

N8
 YES
 ALL FLAGS IN UNIT
 N8 TABLE RESET
 N8
 IF YES:
 SET UNIT N8. 0 FLAG
 RESET UNIT N8.
 TABLE INDEX

* 00274 0 14 01731 U01 ETR C7
 00275 0 35 00012 STA T1
 00276 0 71 00012 LDX T1
 00277 3 77 00302 SPF UNT.2
 00300 0 01 00256 BRU U03
 * 00301 0 00 00000 UNTI PZE
 * 00302 00000000 UNT 8CT 0
 00303 00000001 8CT 1
 00304 00000002 8CT 2
 00305 00000003 8CT 3
 00306 00000004 8CT 4
 00307 00000005 8CT 5
 00310 00000006 8CT 6
 00311 00000007 8CT 7

UNIT N8. TABLE INDEX

UNIT N8. TABLE

* 00312	0 00 0000	PZE			
00313	1 76 00207	RPF			
00314	0 71 00301	LDX			SW4
00315	0 41 00320	BRX			UNTI
00316	1 77 00207	SPF			SU01
00317	0 71 01726	LDX			SW4
00320	2 53 00312	SKN			C3
00321	0 01 00315	BRU			UNT+8.2
00322	0 37 00301	STX			SU02
00323	2 76 00312	LDA			UNTI
00324	0 14 01731	ETR			UNT+8.2
00325	0 35 00337	STA			C7
00326	0 71 01654	LDX			UN
00327	2 76 01654	LDA			TCTE
00330	0 14 01726	ETR			TCTE.2
00331	0 16 00337	MRG			C4
00332	2 35 01654	STA			UN
00333	0 41 00327	BRX			TCTE.2
00334	0 53 00207	SKN			C4
00335	0 61 00312	MIN			UN
00336	0 51 00312	BRU			TCTE.2
* 00337	0 00 00000	PZE			*-4
* 00340	0 46 30003	CLR			SW4
00341	0 71 01703	LDX			SU00
00342	2 35 01703	STA			SU00
00343	0 41 00342	BRX			SU00
00344	0 76 01655	LDA			SU00
00345	0 35 01656	STA			SU00
00346	0 76 01736	LDA			
00347	0 35 13777	STA			
00350	0 72 13777	SKA			
00351	0 01 00357	BRU			
00352	0 66 00001	KSH			
00353	0 35 07777	STA			
00354	0 72 07777	SKA			
00355	0 01 00357	BRU			
00356	0 66 00001	RSH			
00357	0 35 00404	STA			
00360	0 01 00412	BRU			

STEP UNIT NO. SUBK.
R(SW4)
ADVANCE AND TEST UNIT
NO. TABLE INDEX
INDEX DONE. S(SW4)
RESET TABLE INDEX
TABLE ENTRY FLAG
RESET
SET. SAVE TABLE INDEX

NEGATIVE TAPE CONTRL TABLE LENGTH
MODIFY TAPE UNIT NO.S

UNIT NUMBER

START
CLEAR COUNTERS

COMPUTE MEMORY SIZE

SAVE RECORD LENGTH MASK

ECTL					
ECTL.2					
*-1					
IRN					
IRN					
C12					
6143					
6143					
S01					
I					
4095					
4095					
S01					
I					
RLM					
W00					

COMPUTE RECORD LENGTH SUBROUTINE.

* * *

00361	0 00 00000	CRLS	PZE	STRN
00362	0 75 00403		LDB	10
00363	0 67 20012		LCY	RRN
00364	0 76 01660		LDA	RLM
00365	0 14 00404		ETR	TW8
00366	0 73 01751		SKG	THREE
00367	0 55 01752		ADD	RL
00370	0 35 00410		STA	10
00371	0 66 00012		RSH	LDIL
00372	0 36 00407		STB	SHBC
00373	0 16 00405		MRG	SHIB
00374	0 35 00406		STA	RL
00375	0 46 30003		CLR	NRL
00376	0 54 00410		SUB	NRL
00377	0 35 00411		STA	NRL
00400	0 71 00411		LDX	RL
00401	0 76 00410		LDA	CRLS
00402	0 51 00361		BRR	

* 00403	2 35 01776	STRN	STAG.2
00404	0 00 00000	RLM	10100
00405	0 02 10100	SHBC	250100
* 00406	0 00 00000	CIL	
00407	0 00 00000	SHIB	
		LDIL	

SET HIGH INTERLACE BITS
LOAD INTERLACE

RECORD LENGTH
NEGATIVE RECORD LENGTH

* 00410	0 00 00000	RL	PZE
00411	0 00 00000	NRL	PZE

RECORD LENGTH MASK

YBUF

YBUF

START WRITE PASS.

* 00412	1	76	00203	W00	RPF	RPPF
* 00413	0	43	00656		BRM	RWAU
* 00414	1	77	00200		SPF	SBF
00415	1	76	00201		KPF	ETF
00416	0	46	30C03		CLR	WRC
00417	0	35	01663		STA	IRN
00420	0	76	01656		LDA	RRN
00421	0	35	0166C		STA	CRLS
00422	0	43	00361	W04	BRM	STRN
00423	0	55	00403		ADD	W04A
00424	0	35	00432		STA	WRC
00426	0	76	01663		LDA	IMAG
00426	0	35	01776		STA	
00427	0	46	30C03		CLR	
00430	0	76	01660		LDA	RRN
00431	0	41	00432		BRX	**+1
00432	2	35	00C00	W04A	STA	**+2
00433	0	67	00013		LSH	11
00434	0	55	40432		ADD*	W04A
00435	0	55	01661		ADD	KK
00436	0	41	00432		BRX	W04A
00437	0	35	01660		STA	RRN
00440	1	76	00212	W04B	RPF	WEF
00441	1	76	00204		RPF	SWI
00442	0	43	00702	W05	BRM	TRSUBR
00443	0	23	01651		EXU	FPT
00444	0	01	00641		BRU	FPE
00445	0	53	00212		SKN	WEF
00446	0	53	00200		SKN	SBF
00447	0	01	00467		BRU	W06
00450	0	23	01652		EXU	BTT
00451	0	01	00454		BRU	**+3
00452	0	23	01644		EXU	REW
00453	0	01	00442		BRU	W05
00454	0	71	01730		LDX	C6
00455	2	23	01650		EXU	D8T+1.2
00456	0	01	00461		BRU	**+3
00457	0	41	00455		BRX	**+2
00460	0	01	00442		BRU	W05
00461	0	02	50100		CILY	
00462	2	13	00541		P8T	E800+1.2
00463	0	23	01640		EXU	ET
00464	0	40	12710		TGTY	
00465	0	01	00467		BRU	W06
* 00466	0	01	00464		BRU	**+2

R(RPPF)
REWIND ALL UNITS

CLEAR WRITE RECORD COUNT

GET RECORD LENGTH

GENERATE RANDOM NUMBERS

R(WRITE ERROR FLAG)

R(SWI)
TAPE READY
FILE PROTECT 8N
YES

N9. PREVIOUS WRITE ERROR
N9. IS THIS THE FIRST BLOCK
YES. N9
YES. LOAD POINT
YES
N9

ERASE STARTING LEADER

START ERASE

GAP
YES
N9

Address	Hex	Label	Text
* 00467	0 02 50100	CILY	
00470	0 23 00406	EXU	
00471	0 13 00407	P8T	
00472	0 23 01635	EXU	
00473	0 43 00674	BRM	
00474	0 23 01653	EXU	
00475	1 77 00201	SPF	
00476	0 40 20020	BETY	
00477	0 01 00541	BRU	
00500	0 43 00246	BRM	
00501	0 43 00312	BRM	
00502	0 01 00504	BRU	
00503	0 01 00440	BRU	
00504	1 76 00200	RPF	
00505	0 61 01663	MIN	
00506	0 76 01662	LDA	
00507	0 53 00201	SKN	
00510	0 73 01663	SKG	
00511	0 01 00513	BRU	
00512	0 01 00422	BRU	
00513	0 43 00246	BRM	
00514	0 43 00702	BRM	
00515	0 23 01637	EXU	
00516	0 10 00535	MIY	
00517	0 02 14100	T8PY	
00520	0 43 00674	BRM	
00521	0 43 00702	BRM	
00522	0 23 01644	EXU	
00523	0 43 00312	BRM	
00524	0 01 00526	BRU	
00525	0 01 00514	BRU	
00526	0 61 01665	MIN	
00527	0 43 00246	BRM	
00530	0 40 20200	BPT	
00531	0 01 00533	BRU	
00532	0 43 00714	BRM	
00533	0 43 00246	BRM	
00534	0 01 01025	BRU	
* 00535	17000000	E8FC	
00536	11300000	E200	
00537	3204000C	E556	
0054C	37777777	E800	

WRITE RECORD

END OF TAPE
YES
N8 ERROR
YES

N8
STEP UNIT N8.
DONE
CONTINUE
R(STARTING BLOCK FLAG)

END OF TAPE FLAG
RESET. ENOUGH RECORDS
SET. YES
N8

WRITE EOF'S

REWIND
STEP UNIT N8.

OUTPUT PASS COUNTERS

T8 START READ

TAPE MARK

17000000
15089
41789
60089

* * * WRITE ERROR SUBROUTINE.

BACKSPACE AND ERASE RECORD

SIWRITE ERROR FLAG

FIRST TIME
SECOND TIME

-13

--4

ERASE RECORD

ADDRESS	W01	BRM	TRSUBR
00541	0 43 00702	BRM	TRSUBR
00542	0 02 50100	CILY	
00543	0 23 00406	EXU	SHIB
00544	0 13 00407	P8T	LDIL
00545	0 23 01641	EXU	ETR
00546	0 43 00674	BRM	BRSUBR
00547	1 77 00212	SPF	WEF
00550	0 43 00246	BRM	ST8P
00551	0 53 00204	SKN	SWI
00552	0 01 00614	BRU	W01A
00553	0 61 01670	MIN	RWEC
00554	0 40 20200	BPT	2
00555	0 01 00572	BRU	W01B
00556	0 23 01000	EXU	BUT4
00557	0 71 01743	LDX	C17
00558	2 12 00634	MIW	WEM+13.2
00561	0 41 00560	BRX	*-1
00562	0 43 01602	BRM	8MAUN
00563	0 71 01740	LDX	C14
00564	2 76 00640	LDA	WEM+4.2
00565	0 75 01753	LDB	KEY
00566	0 43 00C40	BRM	W8S
00567	0 41 00564	BRX	*-3
00570	0 02 14000	T8PW	
00571	0 43 00674	BRM	BRSUBR
00572	0 40 20040	BPT	4
00573	0 00 00000	HLT	
00574	0 43 00246	BRM	ST8P
00575	1 76 00204	RPF	SWI
00576	0 43 00702	BRM	TRSUBR
00577	0 02 50100	CILY	
00600	0 23 00406	EXU	SHIB
00601	0 13 00407	P8T	LDIL
00602	0 23 01640	EXU	ET
00603	0 40 12710	TGTY	
00604	0 01 00606	BRU	**2
00605	0 01 00603	BRU	*-2
00606	0 23 01653	EXU	ETT
00607	0 01 00611	BRU	**2
00610	0 01 00467	BRU	W06
00611	0 43 00674	BRM	BRSUBR
00612	1 77 00201	SPF	ETF
00613	0 01 00501	BRU	W07

NO	DATE	TIME	OPERATOR	OPERATION	REASON	REMARKS
* 00614	1 77	00204	W01A	SPF	SWI	
00615	0 61	01667		MIN	WEC	
00616	0 01	00442		BRU	W05	
* 00617	52121266		WEM	BCI	13.	WRITE PASS RECORD NR. WRITE ERRS REWRITE ERRS
00634	0 00	01665	WEM	PZE	WPC	
00635	0 00	01663		PZE	WRC	
00636	0 00	01667		PZE	WEC	
00637	0 00	01670		PZE	RWEC	
00640	52121212		SCRC	ECT	52121212	
* 00641	0 23	01000	FPE	EXU	8UT4	FILE PROTECT ERROR
00642	0 71	01727		LDX	CS	-5
00643	2 12	00656		MIW	FPM+5.2	
00644	0 41	00643		BRX	*-1	
00645	0 43	01602		ARM	8MAUN	
00646	0 02	14000		T8PW		
00647	0 43	00674		ARM	BRSUBR	
00650	0 01	00204		BRU	MCO1	
* 00651	52121226		FPM	BCI	5.	FILE PROTECT 8N

YBUF

YBUF
YBUF
YBUF
YBUF
YBUF
YBUF
YBUF
YBUF

REWIND ALL UNITS

00656	0 00 0000	RWAU	PZE	0
00657	0 02 14110		REWY	1
00660	0 02 14111		REWY	2
00661	0 02 14112		REWY	3
00662	0 02 14113		REWY	4
00663	0 02 14114		REWY	5
00664	0 02 14115		REWY	6
00665	0 02 14116		REWY	7
00666	0 02 14117		REWY	C11
00667	0 71 01735		LDX	UNTI
00670	0 37 00301		STX	SU00
00671	0 43 00312		BRM	
00672	0 20 00000		N9P	
00673	0 51 00656		BRR	RWAU

PRESET UNIT N8. TABLE INDEX

SET UP FIRST UNIT.

BUFFERS READY SUBROUTINE.

00674	0 00 00000	BRSUBR	PZE	
00675	0 40 21000		BRIM	
00676	0 01 00675		BRU	*-1
00677	0 40 22000		BRTY	
00700	0 01 00677		BRU	*-1
00701	0 51 00674		BRR	BRSUBR

TAPE UNIT READY SUBROUTINE.

00702	0 00 00000	TRSUBR	PZE	
00703	0 23 01650		EXU	TRT
00704	0 51 00702		BRR	TRSUBR
00705	0 01 00703		BRU	*-2

CLEAR ERROR COUNTERS SUBROUTINE.

00706	0 00 00000	CECS	PZE	
00707	0 46 30003		CLR	
00710	0 71 01741		LDX	C15
00711	2 35 01703		STA	ECTL.2
00712	0 41 00711		BRX	*-1
00713	0 51 00706		BRR	CECS

OUTPUT PASS COUNTERS SUBROUTINE.

```

* * *
00714 0 00 00000 0PCS
00715 0 23 01000
00716 0 53 00203
00717 0 01 00723
00720 0 12 00640
00721 0 12 00752
00722 0 01 00725
00723 0 12 00747
00724 0 12 00750
00725 0 71 01744
00726 2 12 00763
00727 0 41 00726
00730 0 02 14000
00731 0 43 00674
00732 0 23 00777
00733 0 71 01727
00734 2 76 01714
00735 0 75 00024
00736 0 43 00040
00737 0 41 00734
00740 0 12 00640
00741 0 02 14000
00742 0 43 00674
00743 0 51 00714
*

```

```

READ PASS
N9
YES
READ
WRITE
-15
PASS DONE

```

-5

```

* * *
00744 12472162 PDM BCI PASS DONE WRITES READS WRITE ERR REWRITES BAD RE
00762 21246252 BCI BCI 1*ADS

```

* * * SET PUNCH OR TYPE.

00763	0 76 00773	T00	LDA	T8UT1	SET TYPE
00764	0 75 00774		LDB	T8UT4	
00765	0 01 00770		BRU	POC+2	
00766	0 76 00775	P00	LDA	P8UT1	SET PUNCH
00767	0 75 00776		LDB	P8UT4	
00770	0 35 00777		STA	9UT1	
00771	0 36 01000		STB	9UT4	
00772	0 01 00204		BRU	MCO1	

00773	0 02 02041	T8UT1	TYPW	1.1	
00774	0 02 02641	T8UT4	TYPW	1.4	
00775	0 02 02044	P8UT1	PPTW	1.1	
00776	0 02 02644	P8UT4	PPTW	1.4	

00777	0 00 00000	8UT1	PZE		
01000	0 00 00000	8UT4	PZE		

* * * SET INITIAL RANDOM NUMBER.

01001	0 76 00243	N00	LDA	ACCUM	
01002	0 35 01655		STA	IRN	
01003	0 01 00202		BRU	CLR	

* * * SET MAXIMUM NUMBER OF RECORDS.

01004	0 76 00243	M00	LDA	ACCUM	
01005	0 35 01662		STA	MRC	
01006	0 01 00202		BRU	CLR	

* * * SET BCD OR BINARY MODE.

01007	1 77 00210	D00	SPF	BCDF	SET BCD FLAG
01010	0 01 01012		BRU	**2	
01011	1 76 00210	B00	RPF	BCDF	RESET BCD FLAG
01012	0 76 01636		LDA	RT	
01013	0 14 01022		ETR	BB1	
01014	0 53 00210		SKN	BCDF	
01015	0 16 01023		MRG	B82	
01016	0 35 01636		STA	RT	
01017	0 16 01024		MRG	B83	
01020	0 35 01635		STA	WT	
01021	0 01 00204		BRU	MCO1	

01022	7776777	B81	BCT	7776777	
01023	0001000	B82	BCT	1000	
01024	0000000	B83	BCT	0000000	

* * * START READ PASS.

01025	1	77	00203	R00	SPF	RPPF	S(READ PASS IN PROGRESS FLAG)
01026	0	76	01656		LDA	IRN	1ST RANDOM NUMBER TO
01027	0	35	01657		STA	RRNH	RANDOM NUMBER HOLD.
01030	0	43	00656		DRM	RWAU	REWIND ALL UNITS
01031	1	77	00200		SPF	SBF	S(STARTING BLOCK FLAG)
01032	0	46	30C03		CLR		
01033	0	35	01664		STA	RRC	INITIALIZE INTERRUPTS
01034	0	76	01334		LDA	G8RI1	
01035	0	35	00C30	I1Y	STA	I1Y	
			00C30		B89L	30	
01036	0	76	01335		LDA	G8RI2	
01037	0	35	00C32		STA	I2Y	
			00C32	I2Y	B89L	32	R(SWI.SW2)
01040	1	76	00204	K07	RPF	SW1	
01041	1	76	00205		RPF	SW2	
01042	1	76	00213		RPF	SYNCF	R(SYNC FLAG)
01043	1	76	00206	K08	RPF	SW3	R(SW3.REF)
01044	1	76	00202		RPF	REF	
01045	1	76	00211		RPF	CPEF	R(CHARACTER PARITY ERROR FLAG)
01046	0	76	01657		LDA	RRNH	MOVE RANDOM NUMBER FROM
01047	0	35	01660		STA	RRN	HOLD TO RUN.
01050	0	43	00361		BRM	CRLS	COMPUTE RECORD LENGTH
01051	0	71	00410		LDX	RL	CLEAR LAST WORD IN IMAGE
01052	0	46	30C03		CLR		
01053	2	35	01775		STA	IMAG-1.2	
01054	2	35	01774		STA	IMAG-2.2	
01055	0	43	00702	K01	BRM	TRSUBR	CLEAR NEXT TO LAST WORD
01056	0	53	00200		SKN	SBF	STARTING BLOCK
01057	0	01	01C64		BRU	RO1A	N8
01060	0	23	01652		EXU	ATT	YES. LOAD POINT
01061	0	01	01C64		BRU	RO1A	YES
01062	0	23	01644		EXU	REW	N8. REWIND
01063	0	01	01C55		BRU	RO1	
01064	0	02	50100	K01A	U1LY		START READ
01065	0	23	00406		EXU	SH18	ERROR
01066	0	13	00407		P8T	LD1L	YES
01067	0	23	01636		EXU	RT	N8.GAP
01070	0	02	20002		E1R		YES
01071	0	40	20020		DET Y		N8
01072	0	01	01C76	K01D	BRU	RO1B	
01073	0	40	12710		TGTY	RO1C	
01074	0	01	01106		BRU		
01075	0	01	01071		BRU	*-4	

Y8UF
Y8UF

Y8UF
Y8UF

Y8UF

Y8UF

Y8UF

01076 0 40 12710
 01077 0 01 01106
 01100 0 53 00202
 01101 0 01 01103
 01102 0 01 01073
 01103 1 77 00202
 01104 1 77 00211
 01105 0 01 01073
 GAP YES
 NO. FIRST ERROR YES
 NO
 (SPREAD ERROR FLAG)
 (SICHAACTER PARITY ERROR FLAG)

01106 0 02 20004
 01107 0 53 00202
 01110 0 01 01115
 01111 0 53 00211
 01112 0 01 01122
 01113 0 61 01672
 01114 0 01 01122
 01115 0 40 20020
 01116 0 01 01120
 01117 0 01 01122
 01120 1 77 00202
 01121 0 61 01673
 01122 0 76 01664
 01123 0 75 00026
 01124 0 70 01776
 01125 0 01 01336
 01126 0 71 00411
 01127 0 76 01750
 01130 0 55 00410
 01131 0 35 01135
 01132 0 46 30003
 01133 0 76 01660
 01134 0 41 01135
 01135 2 17 00000
 01136 0 72 00026
 01137 0 01 01167
 01140 0 76 01660
 01141 0 67 00013
 01142 0 55 01660
 01143 0 55 01661
 01144 0 35 01660
 01145 0 41 01135
 PREVIOUS ERROR NO
 YES. CHARACTER PARITY NO
 YES. COUNT CHARACTER PARITY NO
 YES NO
 COUNT LONGITUDINAL PARITY

01106 0 02 20004
 01107 0 53 00202
 01110 0 01 01115
 01111 0 53 00211
 01112 0 01 01122
 01113 0 61 01672
 01114 0 01 01122
 01115 0 40 20020
 01116 0 01 01120
 01117 0 01 01122
 01120 1 77 00202
 01121 0 61 01673
 01122 0 76 01664
 01123 0 75 00026
 01124 0 70 01776
 01125 0 01 01336
 01126 0 71 00411
 01127 0 76 01750
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 01131 0 35 01135
 01132 0 46 30003
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 01134 0 41 01135
 01135 2 17 00000
 01136 0 72 00026
 01137 0 01 01167
 01140 0 76 01660
 01141 0 67 00013
 01142 0 55 01660
 01143 0 55 01661
 01144 0 35 01660
 01145 0 41 01135
 DIR SKN
 BRU SKN
 SKN BRU
 MIN BRU
 BETY BRU
 BRU BRU
 SPF MIN
 LDA LDA
 LDB SKM
 BRU BRU
 LDX LDA
 LDA ADD
 STA STA
 CLR LDA
 BRX BRX
 EBR SKA
 BRU BRU
 LDA LDA
 LSH LSH
 ADD ADD
 ADD STA
 BRX BRX

01106 0 02 20004
 01107 0 53 00202
 01110 0 01 01115
 01111 0 53 00211
 01112 0 01 01122
 01113 0 61 01672
 01114 0 01 01122
 01115 0 40 20020
 01116 0 01 01120
 01117 0 01 01122
 01120 1 77 00202
 01121 0 61 01673
 01122 0 76 01664
 01123 0 75 00026
 01124 0 70 01776
 01125 0 01 01336
 01126 0 71 00411
 01127 0 76 01750
 01130 0 55 00410
 01131 0 35 01135
 01132 0 46 30003
 01133 0 76 01660
 01134 0 41 01135
 01135 2 17 00000
 01136 0 72 00026
 01137 0 01 01167
 01140 0 76 01660
 01141 0 67 00013
 01142 0 55 01660
 01143 0 55 01661
 01144 0 35 01660
 01145 0 41 01135
 R01C R03
 R03A R12
 R12A

01106 0 02 20004
 01107 0 53 00202
 01110 0 01 01115
 01111 0 53 00211
 01112 0 01 01122
 01113 0 61 01672
 01114 0 01 01122
 01115 0 40 20020
 01116 0 01 01120
 01117 0 01 01122
 01120 1 77 00202
 01121 0 61 01673
 01122 0 76 01664
 01123 0 75 00026
 01124 0 70 01776
 01125 0 01 01336
 01126 0 71 00411
 01127 0 76 01750
 01130 0 55 00410
 01131 0 35 01135
 01132 0 46 30003
 01133 0 76 01660
 01134 0 41 01135
 01135 2 17 00000
 01136 0 72 00026
 01137 0 01 01167
 01140 0 76 01660
 01141 0 67 00013
 01142 0 55 01660
 01143 0 55 01661
 01144 0 35 01660
 01145 0 41 01135
 COMPARE WORDS CORRECT NO
 YES. GENERATE NEXT NUMBER

01106 0 02 20004
 01107 0 53 00202
 01110 0 01 01115
 01111 0 53 00211
 01112 0 01 01122
 01113 0 61 01672
 01114 0 01 01122
 01115 0 40 20020
 01116 0 01 01120
 01117 0 01 01122
 01120 1 77 00202
 01121 0 61 01673
 01122 0 76 01664
 01123 0 75 00026
 01124 0 70 01776
 01125 0 01 01336
 01126 0 71 00411
 01127 0 76 01750
 01130 0 55 00410
 01131 0 35 01135
 01132 0 46 30003
 01133 0 76 01660
 01134 0 41 01135
 01135 2 17 00000
 01136 0 72 00026
 01137 0 01 01167
 01140 0 76 01660
 01141 0 67 00013
 01142 0 55 01660
 01143 0 55 01661
 01144 0 35 01660
 01145 0 41 01135
 Y8UF

Y3UF

WAIT FOR TAPE TO STOP

14 OF 30

PAGE

Y3UF

LAST WORD:0
 NOT EQUAL
 EQUAL
 NEXT TO LAST WORD:0
 NOT EQUAL.(BUFFER):0
 EQUAL. NOT EQUAL
 EQUAL. TEST SW3
 RESET
 SET. SIKREF
 WORD COUNT ERROR COUNTER + 1
 NO. TEST SW1
 RESET
 SET

BRSUBR
 TI
 9NES
 8NES
 R12A
 **3
 16383.2
 R12A
 TI
 **3
 SW3
 **3
 REF
 WCEC
 SW1
 R04
 R09

CHARACTER CORRECT
 NO
 YES
 IN PCU MADE
 NO
 YES. WAS ERROR DUE TO 0
 TO 12 CONVERSION
 NO
 YES
 TEST LSB ERROR

C77
 **2
 R12D
 9CDF
 R12C
 C77
 C10
 **2
 R12D
 REF
 9NE
 CH6
 TW9
 CH5
 F8UR
 CH4
 EIGHT
 CH3
 ZA
 CH2
 ZB
 CH1
 6
 R12A+1

TEST MSB ERROR
 SHIFT CHARACTER

SKA
 BRU
 BRU
 SKN
 BRU
 LDB
 SKM
 BRU
 BRU
 SPF
 SKA
 MIN
 SKA
 MIN
 SKA
 MIN
 SKA
 MIN
 SKA
 MIN
 SKA
 MIN
 SKA
 MIN
 ABC
 RCY
 SAC
 BRU

0 43 00674
 0 30 00012
 0 76 00C26
 0 71 00C26
 0 72 41135
 0 01 01156
 2 77 37777
 0 72 41135
 0 72 00012
 0 01 01162
 0 53 00206
 0 01 01164
 1 77 00202
 0 61 01674
 0 53 00204
 0 01 01221
 0 01 01247

0 72 01746
 0 01 01172
 0 01 01215
 0 53 00210
 0 01 01200
 0 75 01746
 0 70 01734
 0 01 01200
 0 01 01215
 1 77 00202
 0 72 00024
 0 61 01702
 0 72 01751
 0 61 01701
 0 72 01753
 0 61 01700
 0 72 01754
 0 61 01677
 0 72 01755
 0 61 01676
 0 72 01756
 0 61 01675
 0 46 20005
 0 66 20006
 0 46 10012
 0 01 01136

R12B
 R12C
 R12D

01221	0 53 00202	K04	SKN	REF	WAS THERE A READ ERROR
01222	0 01 01234		BRU	R11	NO
01223	0 76 00024		LDA	BNE	YES
01224	0 35 01332		STA	RTEM	
01225	0 35 01333		STA	RTC	
01226	1 77 00204		SPF	SW1	
01227	0 43 00702	K10	BRM	TRSUBR	BACKSPACE RECORD
01230	0 23 01643		EXU	SR	
01231	0 43 00674		BRM	BRSUBK	
01232	0 43 00246		BRM	STBP	
01233	0 01 01043		BRU	R08	
01234	0 43 00312	K11	BRM	SUDD	STEP UNIT NUMBER
01235	0 01 01240		BRU	**3	DONE
01236	0 43 00246	K11A	BRM	STBP	CONTINUE
01237	0 01 01040		BRU	R07	
01240	0 61 01664		MIN	RRC	READ RECORD COUNT + 1
01241	0 76 01660		LDA	RKN	
01242	0 35 01657		STA	RRNH	
01243	0 53 00200		SKN	SBF	IF STARTING BLOCK FLAG
01244	0 01 01236		BRU	R11A	SET RESET IT
01245	1 76 00200		RPF	SBF	
01246	0 01 01236		BRU	R11A	

01247	0 46 30003	K09	CLR	RTC	READ ERROR
01250	0 76 01333		LDA	I	NO
01251	0 67 00001		LSH	RTC	YES. MARK ERROR THIS TRY
01252	0 35 01333		STA	REF	
01253	0 53 00202		SKN	**3	TEN TRIES COMPLETE
01254	0 01 01257		BRU	RTEM	YES
01255	0 16 01332		MRG	RTEM	NO
01256	0 35 01332		STA	C8	ANY G88D READS
01257	0 72 01732		SKA	**2	NO
01260	0 01 01262		BRU	R10	YES. OUTPUT
01261	0 01 01227		BRU	C9	NO
01262	0 76 01733		LDA	RTEM	YES. OUTPUT HEAD STATUS
01263	0 73 01332		SKG	PREC	
01264	0 61 01671		MIN	2	
01265	0 40 20200		BPT	R09A	
01266	0 01 01322		BRU	RS8	
01267	0 43 01562		BRM	BUT4	
01270	0 23 01000		EXU	C6	
01271	0 71 01730		LDA	REN+3.2	
01272	2 12 01327		MIW	**1	CK READ ERROR CK
01273	0 41 01272		SRX		
01274	0 02 14000		T8PW		
01275	0 43 00674		BRU		

* 01276	0 23 00777	EXU	BUT1		
01277	0 71 01735	LDX	C11		
01300	2 76 01725	LDA	RECL+9.2		
01301	0 75 00024	LDB	KEY1		
01302	0 43 00040	BRM	WBS		
01303	0 41 01300	BRX	*-3		
01304	0 12 00640	MIW	SCRC		
01305	0 71 01737	LDX	C13		
01306	0 76 01332	LDA	RTEM		
01307	0 72 00024	SKA	ANC		
01310	0 01 01313	BRU	*+3		
01311	0 12 01327	MIW	GCHAR		
01312	0 01 01314	BRU	*+2		
01313	0 12 01330	MIW	BCHAR		
01314	0 12 01331	MIW	SPCHAR		
01315	0 66 00001	RSH	1		
01316	0 41 01307	BRX	*-7		
01317	0 02 14000	TSPM			
01320	0 43 00674	BRM	BRSUBR		
01321	0 43 00706	BRM	CECS		
01322	0 43 00246	BRM	STBP		
01323	0 01 01234	BRU	R11		
		K09A			
* 01324	52512521	NEM	BCI	3. READ ERROR	
* 01327	27121212	GCHAR	BCI	1.6	
01330	22121212	GCHAR	BCI	1.8	
01331	12121212	SPCHAR	BCI	1.	
* 01332	0 00 00000	KTEM	PZE		
01333	0 00 00000	KTC	PZE		
* 01334	0 43 01513	GRI1	BRM	R11	
01335	0 01 01520	GRI2	BRU	R12	

CLEAR ERROR COUNTERS

READ TRY ERROR MARKER
READ TRY COUNTER

BCD MODE
 NR
 YES
 FOR ANY 12 IN THE RRC
 CONVERT THE CORRESPONDING
 00 IN THE 10 WORD TO 12.

DONE
 YES
 NO

CORRECTED 1ST WORD:RRC

NOT EQUAL
 EQUAL
 1ST TRY
 YES
 NR. TEST SW 2
 RESET
 SET
 N = RRC - 1ST WORD
 N = N - 1
 SAVE 1ST WORD

N = 0
 NOT EQUAL
 EQUAL

N : 0
 LESS
 GREATER. SPACE FORWARD

END OF FILE

YES
 NR
 DONE
 NR
 YES

01336	0	53	00210	SKN	ACDF
01337	0	01	01361	BRU	R05B
01340	0	76	01734	LDA	C10
01341	0	75	01746	LDB	C77
01342	0	70	01664	SKM	RRC
01343	0	01	01350	BRU	*+5
01344	0	35	00014	STA	T3
01345	0	16	01776	MRG	IMAG
01346	0	35	01776	STA	IMAG
01347	0	76	00014	LDA	T3
01350	0	67	00006	LSH	6
01351	0	72	00024	SKA	ONE
01352	0	01	01354	BRU	*+2
01353	0	01	01342	BRU	ROSA
01354	0	76	01664	LDA	RRC
01355	0	75	00026	LDB	ONES
01356	0	70	01776	SKM	IMAG
01357	0	01	01361	BRU	R05B
01360	0	01	01126	BRU	R12
01361	0	53	00213	SKN	SYNCF
01362	0	01	01424	BRU	R05G
01363	0	53	00205	SKN	SW2
01364	0	01	01366	BRU	*+2
01365	0	01	01452	BRU	R13
01366	0	54	01776	SUB	IMAG
01367	0	54	00024	SUB	ONE
01370	0	75	01776	LDB	IMAG
01371	0	36	01427	STB	SAVE
01372	0	43	00674	BRM	HRSUBR
01373	0	72	00026	SKA	ONES
01374	0	01	01377	BRU	*+3
01375	1	77	00205	SPF	SW2
01376	0	01	01042	BRU	R06-1
01377	0	72	00025	SKA	SIGN
01400	0	01	01412	BRU	R05D
01401	0	43	00702	BRM	TRSUBR
01402	0	23	01642	EXU	SF
01403	0	30	00012	YIM	T1
01404	0	40	13710	TFTY	
01405	0	01	01430	BRU	R15
01406	0	54	00024	SUB	ONE
01407	0	72	00026	SKA	ONES
01410	0	01	01402	BRU	ROSE+1
01411	0	01	01422	BRU	RC5F

*

NO	QTY	DESCRIPTION	UNIT	PRICE	TOTAL	DATE	STATUS
* 01412	0 43	00702	KUSD				
01413	0 23	01643					
01414	0 30	00012					
01415	0 23	01652					
01416	0 01	01430					
01417	0 55	00024					
01420	0 72	00025					
01421	0 01	01413					
01422	0 43	00674	KOSF				
01423	0 01	01375					
* 01424	1 77	00213	KOSG				
01425	0 43	00674					
01426	0 01	01227					
* 01427	0 00	00000	SAVE				

•

LEAD POINT

YES
NO
DONE
NO
YES

(SYNC. FLAG)
WAIT FOR TAPE TO STOP
BACKSPACE AND READ AGAIN

TA HOLD 1ST WORD

SRM
EXU
YIM
EXU
BRU
ADD
SKA
BRU
BRM
BRU
TRSUBR
SR
TI
ATT
RIS
ONE
SIGN
ROSD+1
BRSUBR
ROSC
SPF
BRM
BRU
SYNCF
ARSUBR
RIO

BRM
EXU
YIM
EXU
BRU
ADD
SKA
BRU
BRM
BRU
SPF
BRM
BRU
PZE

KUSD
KOSF
KOSG
SAVE

BRM	BRSUBR	END OF FILE	LOAD POINT	OUTPUT READ STATUS	READ PASS ABORT MESSAGE
01430	R15	0 43 00674			
01431	TFTY	0 40 13710			
01432	BRU	0 01 01434			
01433	BRU	0 01 01442			
01434	EXU	0 23 01000			
01435	MIW	0 12 01475			
01436	MIW	0 12 01476			
01437	MIW	0 12 01477			
01440	T8PW	0 02 14000			
01441	BRM	0 43 00674			
01442	EXU	0 23 01652			
01443	BRU	0 01 01445			
01444	BRU	0 01 01452			
01445	EXU	0 23 01000			
01446	MIW	0 12 01500			
01447	MIW	0 12 01501			
01450	MIW	0 12 01502			
01451	T8PW	0 02 14000			
01452	BRM	0 43 00674			
01453	BRM	0 43 01562			
01454	EXU	0 23 01000			
01455	LDX	0 71 01726			
01456	MIW	2 12 01513			
01457	BRX	0 41 01456			
01460	T8PW	0 02 14000			
01461	BRM	0 43 00674			
01462	LDA	0 76 01371			
01463	LDB	0 75 01753			
01464	EXU	0 23 00777			
01465	BRM	0 43 00040			
01466	LDA	0 76 01370			
01467	LDB	0 75 01753			
01470	BRM	0 43 00040			
01471	MIW	0 12 00640			
01472	T8PW	0 02 14000			
01473	BRM	0 43 00674			
01474	BRU	0 01 01537			
01475	TMM	52632147			
01500	LPM	52434621			
01503	KPAM	52512521			

3. TAPE MARK
3. LOAD POINT
8. READ PASS ABORT. OUT OF SYNC.

* *
 01513 0 00 00000 R11 PZE
 01514 0 02 13710 SRRY
 01515 0 30 00012 YIM
 01516 1 77 00206 SPF
 01517 0 01 41513 BRU*

TI
 SW3
 R11

S(SW 3)

* * *
 01520 0 02 20004 K12 DIR
 01521 0 30 00012 YIM
 01522 0 01 41523 BRU*
 01523 0 00 01524 PZE
 01524 0 40 13710 TTTY
 01525 0 01 01537 BRU
 01526 0 40 20200 BPT
 01527 0 01 01537 BRU
 01530 0 43 01562 BRM
 01531 0 23 01000 EXU
 01532 0 71 01741 LDX
 01533 2 32 01562 WIM
 01534 0 41 01533 BRX
 01535 0 02 14000 T0PW
 01536 0 43 00674 BRM
 01537 0 43 00656 BRM
 01540 0 61 01666 MIN
 01541 0 40 20200 BPT
 01542 0 01 01544 BRU
 01543 0 43 00714 BRM
 01544 0 40 20040 BPT
 01545 0 00 00000 HLT
 01546 0 43 00246 BRM
 01547 0 40 20100 BPT
 01550 0 01 01025 BRU
 01551 0 76 01660 LDA
 01552 0 35 01656 STA
 01553 0 01 00412 BRU

CLEAR INTERRUPT
 END 9F FILE
 YES
 N9
 OUTPUT READ STATUS

-6

REWIND ALL UNITS
 COUNT READ PASS

OUTPUT PASS COUNTERS

HALT
 YES
 N9
 REREAD
 YES
 N9
 GO TO WRITE

-6

READ STATUS OUTPUT SUBROUTINE.

* 01562	0 00	00000	PZE	
* 01563	0 23	01000	EXU	BUT4
* 01564	0 71	01741	LDX	C15
01565	2 12	01765	MIW	RS0M1+6.2
01566	0 41	01565	BRX	*-1
01567	0 43	01602	BRM	BMAUN
01570	0 76	01710	LDA	RPCL
01571	0 75	00024	LDB	KEY1
01572	0 43	00040	BRM	W8S
01573	0 76	01706	LDA	RRCL
01574	0 75	01753	LDB	KEY
01575	0 43	00040	BRM	W8S
01576	0 12	00640	MIW	SCRC
01577	0 02	14000	T0PW	
01600	0 43	00674	BRM	BRSUBR
01601	0 51	01562	BRR	RS0

* 01602	0 00	00000	PZE	
01603	0 53	00210	SKN	BCDF
01604	0 01	01607	BRU	*+3
01605	0 12	01765	MIW	RS0M2
01606	0 01	01611	BRU	*+3
01607	0 12	01766	MIW	RS0M3
01610	0 12	01767	MIW	RS0M3+1
01611	0 71	01730	LDX	C6
01612	2 23	01650	EXU	D8T+1.2
01613	0 01	01615	BRU	*+2
01614	0 41	01612	BRX	*-2
01615	2 12	01775	MIW	DNT+3.2
01616	0 12	01770	MIW	RS0M4
01617	0 12	01771	MIW	RS0M4+1
01620	0 02	14000	T0PW	
01621	0 43	00674	BRM	BRSUBR
01622	0 76	01602	LDA	BMAUN
01623	0 02	02041	TYPW	1.1
01624	0 72	01747	SKA	C200
01625	0 23	00777	EXU	BUT1
01626	0 76	00337	LDA	UN
01627	0 66	00006	RSH	6
01630	0 35	00012	STB	T1
01631	0 12	01331	MIW	SPCHAR
01632	0 12	00012	MIW	T1
01633	0 12	00640	MIW	SCRC
01634	0 51	01602	BRR	BMAUN

OUTPUT MODE AND UNIT NO. SUBR

BCD MODE
NO
YES

-3
TEST FOR DENSITY

OUTPUT DENSITY NO.

IF ENTRANCE FROM OPERATOR REQUESTED
OUTPUT ROUTINE. ALWAYS TYPE.

SPACE

CR

CONTROL TABLE FOR ALL MAGNETIC TAPE FUNCTIONS. Y BUFFER.

BINARY OR BCD SELECTABLE FUNCTIONS.

01635	0 02 03750	WT	WTBY	0.4	WRITE TAPE	YBUF
01636	0 02 03710	RT	RTBY	0.4	READ TAPE	YBUF

N8N SELECTABLE FUNCTIONS

01637	0 02 02150	WE6F	WTDY	0.1	WRITE END OF FILE	YBUF
01640	0 02 03773	ET	E8M	03773	ERASE TAPE	YBUF
01641	0 02 07770	ETR	E8M	07770	ERASE TAPE REVERSE	YBUF
01642	0 02 03730	SF	E8M	03730	SCAN FORWARD	YBUF
01643	0 02 07730	SR	E8M	07730	SCAN REVERSE	YBUF
01644	0 02 14110	KEW	REWY	0	REWIND	YBUF
01645	0 40 16310	D2T	SKS	16310	200 BPI TEST	YBUF
01646	0 40 16710	D5T	SKS	16710	556 BPI TEST	YBUF
01647	0 40 17310	D8T	SKS	17310	800 BPI TEST	YBUF
01650	0 40 10510	TRT	SKS	10510	TAPE READY TEST	YBUF
01651	0 40 14110	FPT	SKS	14110	FILE PROTECT TEST	YBUF
01652	0 40 12110	BTT	SKS	12110	BEGINNING OF TAPE TEST	YBUF
01653	0 40 11110	ETT	SKS	11110	END OF TAPE TEST	YBUF

-LENGTH OF CONTROL TABLE

01654	0 00 77761	TCTE	PZE*	WT**		
		KEWY	8PD	214110	REWIND TAPE	YBUF
		RTSY	8PD	214100	READ TO SCAN	YBUF
		TGTY	8PD	4012710	TAPE GAP TEST	YBUF
		TFTY	8PD	4013710	TAPE END OF FILE TEST	YBUF
		SRRY	8PD	213710	SKIP REMAINDER OF RECORD	YBUF
		CILY	8PD	250100	C&CK INTERLACE	YBUF

00023	ZER0	889L	23	00000000
00024	8NE	889L	24	00000001
00025	SIGN	889L	25	40000000
00026	8NES	889L	26	77777777
00027	ADRM SK	889L	27	00037777

* * * * *

FLAG AND SWITCH ASSIGNMENTS.

00200 SBF EQU MCOO
 00201 ETF EQU MCOO+1
 00202 REF EQU MCOO+2
 00203 RPPF EQU MCOO+3
 00204 SW1 EQU MCOO+4
 00205 SW2 EQU MCOO+5
 00206 SW3 EQU MCOO+6
 00207 SW4 EQU MCOO+7
 00210 BCDF EQU MCOO+8
 00211 CPEF EQU MCOO+9
 00212 WEF EQU MCOO+10
 00213 SYNCF EQU MCOO+11

RAND8M NUMBER STORAGE.

01655 0 00 00000 IRN PZE
 01656 0 00 00000 IRN PZE
 01657 0 00 00000 RRNH PZE
 01660 0 00 00000 RRN PZE
 01661 23146555 KK 8CT 23146555

RECORD COUNTERS.

01662 0 00 00000 MRC PZE
 01663 0 00 00000 WRC PZE
 01664 0 00 00000 RRC PZE

PASS COUNTERS

01665 0 00 00000 WPC PZE
 01666 0 00 00000 RPC PZE

ERROR COUNTERS.

01667 0 00 00000 WEC PZE
 01670 0 00 00000 RWEC PZE
 01671 0 00 00000 PREC PZE
 01672 0 00 00000 CPEC PZE
 01673 0 00 00000 LPEC PZE
 01674 0 00 00000 WCEC PZE
 01675 0 00 00000 CH1 PZE
 01676 0 00 00000 CH2 PZE
 01677 0 00 00000 CH3 PZE
 01700 0 00 00000 CH4 PZE
 01701 0 00 00000 CH5 PZE
 01702 0 00 00000 CH6 PZE
 01703 0 00 77762 ECTL PZE*

STARTING BLOCK FLAG
 END OF TAPE FLAG
 READ ERROR FLAG
 READ PASS IN PROGRESS FLAG
 SWITCH 1
 SWITCH 2
 SWITCH 3
 SWITCH 4
 BCD FLAG
 CHARACTER PARITY ERROR FLAG
 WRITE ERROR FLAG
 SYNC. FLAG

INITIAL RAND8M NUMBER
 FIRST RAND8M NUMBER
 RUNNING RAND8M NUMBER H8LD
 RUNNING RAND8M NUMBER
 KLUGE CONSTANTS

MAXIMUM RECORD COUNT
 WRITE RECORD COUNT
 READ RECORD COUNT

WRITE PASS COUNT
 READ PASS COUNT

WRITE ERROR COUNT
 REWRITE ERROR COUNT
 PERMANENT READ ERROR COUNT
 CHARACTER PARITY ERROR COUNT
 LOGITUDINAL PARITY ERROR COUNT
 WORD COUNT ERROR COUNT
 READ ERRORS IN CHANNEL 1
 READ ERRORS IN CHANNEL 2
 READ ERRORS IN CHANNEL 3
 READ ERRORS IN CHANNEL 4
 READ ERRORS IN CHANNEL 5
 READ ERRORS IN CHANNEL 6
 END OF COUNTER TABLE AND LENGTH

* * *

* * *

* * *

* * *

* * *

WPC--*

COUNTER LOCATIONS.

* 01704	0 00 01662	ULL	PZE	MRC
* 01705	0 00 01663		PZE	MRC
* 01706	0 00 01664	KRCL	PZE	RRC
* 01707	0 00 01665	RPCL	PZE	WPC
* 01710	0 00 01666	RPCL	PZE	RPC
* 01711	0 00 01667		PZE	WEC
* 01712	0 00 01670		PZE	RWEC
* 01713	0 00 01671		PZE	PREC
* 01714	0 00 01672	RECL	PZE	CPEC
* 01715	0 00 01673		PZE	LPEC
* 01716	0 00 01674		PZE	WCEC
* 01717	0 00 01675		PZE	CH1
* 01720	0 00 01676		PZE	CH2
* 01721	0 00 01677		PZE	CH3
* 01722	0 00 01700		PZE	CH4
* 01723	0 00 01701		PZE	CH5
* 01724	0 00 01702		PZE	CH6

GENERAL CONSTANTS.

* 01725	07700000	C1	8CT	07700000	
* 01726	7777777C	C3	DEC	-8	
	01726	C4	EQU	C3	
01727	77777773	C5	DEC	-5	
01730	77777775	C6	DEC	-3	
01731	00000007	C7	8CT	7	8CT 77777770
01732	00001000	C8	9CT	1000	
01733	00001777	C9	8CT	1777	
01734	00000012	C10	8CT	12	
01735	77777767	C11	DEC	-9	
01736	00007777	C12	8CT	7777	
01737	77777766	C13	DEC	-10	
01740	77777774	C14	DEC	-4	
01741	77777772	C15	DEC	-6	
01742	77777757	C16	DEC	-17	
01743	77777763	C17	DEC	-13	
01744	77777761	C18	DEC	-15	
01745	00000052	C52	8CT	52	
01746	00000077	C77	8CT	77	
* 01747	37777600	C200	8CT	37777600	
* 01750	2 17 01776	E8R	E8R	IMAG.2	
* 01751	00000002	TW9	DEC	2	
01752	00000003	THREE	DEC	3	
01753	00000004	FOUR	DEC	4	
01754	00000010	EIGHT	DEC	8	
01755	00000020	2A	8CT	20	
* 01756	00000040	2B	8CT	40	
	00012	T1	888L	12	
	00013	T2	888L	13	
	00014	T3	888L	14	
	00015	T4	888L	15	
	01753	KEY	EQU	FOUR	
	00024	KEY1	EQU	ONE	
* 01757	52512521	RS8M1	8CI	5. READ PASS	RECORD NO.
01765	12222324	RS8M2	8CI	1. BCD	
01766	12223145	KS8M3	8CI	2. BINARY	
01770	12644531	RS8M4	8CI	2. UNIT NO	
01772	12020000	DNT	8CI	4. 200 556 800 ***	

CONTROL CHARACTER DEFINITIONS.

B	8PD	2200000
C	8PD	2300000
D	8PD	2400000
M	8PD	4400000
N	8PD	4500000
Y	8PD	4600000
P	8PD	4700000
K	8PD	5100000
S	8PD	6200000
T	8PD	6300000
U	8PD	6400000
CR	8PD	5200000
SP	8PD	1200000

*
*
*

*
*

01776 07777 IMAG BSS 4095

8CTAL W8RD 8UTPUT SUBROUTINE.

*
*
*

00040	0 00	00000	0RG	32
00041	0 35	00015	PZE	
00042	0 46	00014	STA	T4
00043	0 54	00024	XAB	
00044	0 72	00025	SUB	8NE
00045	0 01	00050	SKA	SIGN
00046	0 12	01331	BRU	**3
00047	0 01	00043	MIW	SPCHAR
00050	0 76	40015	BRU	**4
00051	0 75	01726	LDA*	T4
00052	0 66	20003	LDB	C4
00053	0 35	00015	KCY	3
00054	0 12	00015	STA	T4
00055	0 67	00006	MIW	T4
00056	0 72	00024	LSH	6
00057	0 01	00052	SKA	8NE
00060	0 51	00040	BRU	**5
			HRR	W8S

77777770

OPERATOR REQUESTED OUTPUT ROUTINE.

* * *

00061	0 02 02641	600	TYPW	1.4	PASS
00062	0 12 00640		MIW	SCRC	WRITE
00063	0 53 00203		SKN	RPPF	READ
00064	0 01 00067		BRU	**3	
00065	0 12 00752		MIW	PDM+6	
00066	0 01 00071		BRU	**3	
00067	0 12 00747		MIW	PDM+3	
00070	0 12 00750		MIW	PDM+4	
00071	0 43 01602		BRM	9MAUN	
00072	0 71 01742		LDX	C16	
00073	0 12 00640	901	MIW	SCRC	
00074	0 02 14000		T8PW		
00075	0 43 00674		BRM	BRSUBR	
00076	0 02 02641		TYPW	1.4	
00077	2 12 00133		MIW	9T+17.2	
00100	0 02 14000		T8PW		
00101	0 43 00674		BRM	BRSUBR	
00102	2 76 01725		LDA	CLL+17.2	
00103	0 75 01751		LDB	TW8	
00104	0 02 02041		TYPW	1.1	
00105	0 43 00040		BRM	W8S	
00106	0 41 00073		BRX	901	
00107	0 02 14000		T8PW		
00110	0 43 00674		BRM	BRSUBR	
00111	0 01 00204		BRU	MCO1	

OUTPUT TABLE IDENTIFIERS.

*
*
*

Identifier	BT	Code
00112	44512312	1.MRC
00113	66512312	1.WRC
00114	51512312	1.RRC
00115	66472312	1.WPC
00116	51472312	1.RPC
00117	66252312	1.WEC
00120	51662523	1.RWEC
00121	47512523	1.PREC
00122	23472523	1.CPEC
00123	43472523	1.LPEC
00124	66232523	1.WCEC
00125	23300112	1.CH1
00126	23300212	1.CH2
00127	23300312	1.CH3
00130	23300412	1.CH4
00131	23300512	1.CH5
00132	23300612	1.CH6

PROGRAMMED OPERATORS.

SET PROGRAM FLAG

17700000

P8PD

SPF

00133	0	35	00147
00134	0	76	40000
00135	0	16	00025
00136	0	35	40000
00137	0	76	00147
00140	0	51	00000

STA	FTI
LDA*	0
MRG	SIGN
STA*	0
LDA	FTI
BRR	0

RESET PROGRAM FLAG

17600000

P8PD

RPF

00141	0	35	00147
00142	0	76	40000
00143	0	14	00150
00144	0	35	40000
00145	0	76	00147
00146	0	51	00000

STA	FTI
LDA*	0
ETR	FCI
STA*	0
LDA	FTI
BRR	0

00147	0	00	00000
00150	3	7777777	

PZE
ECT

37777777

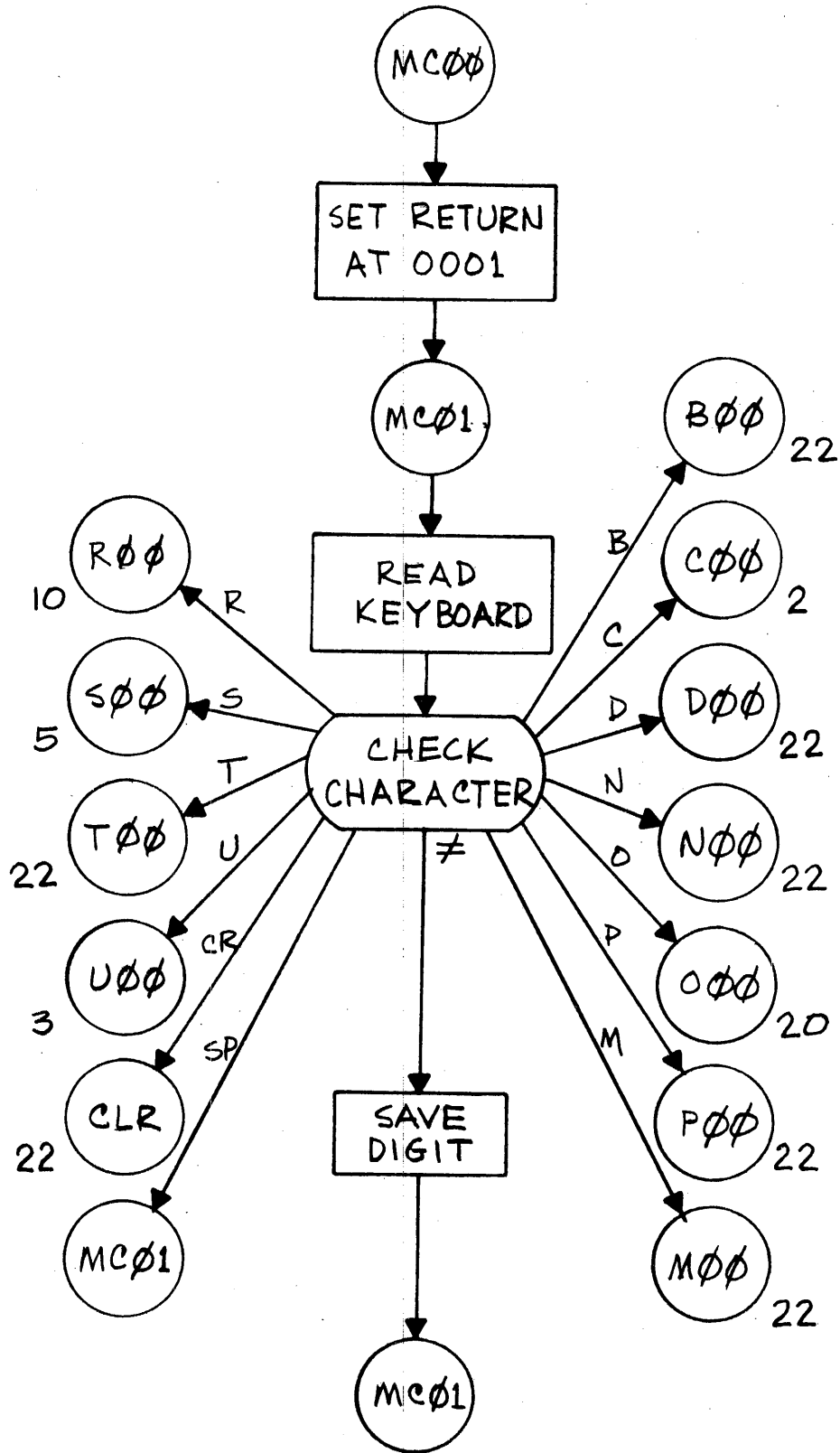
00200

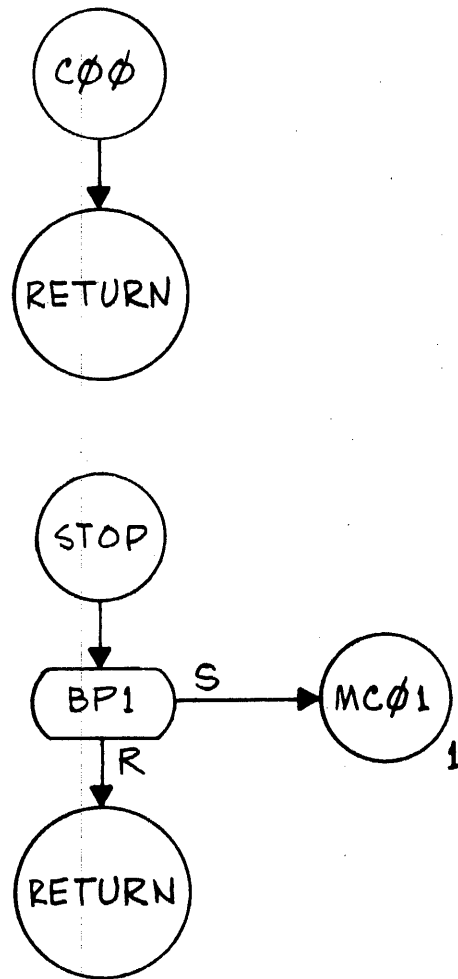
END

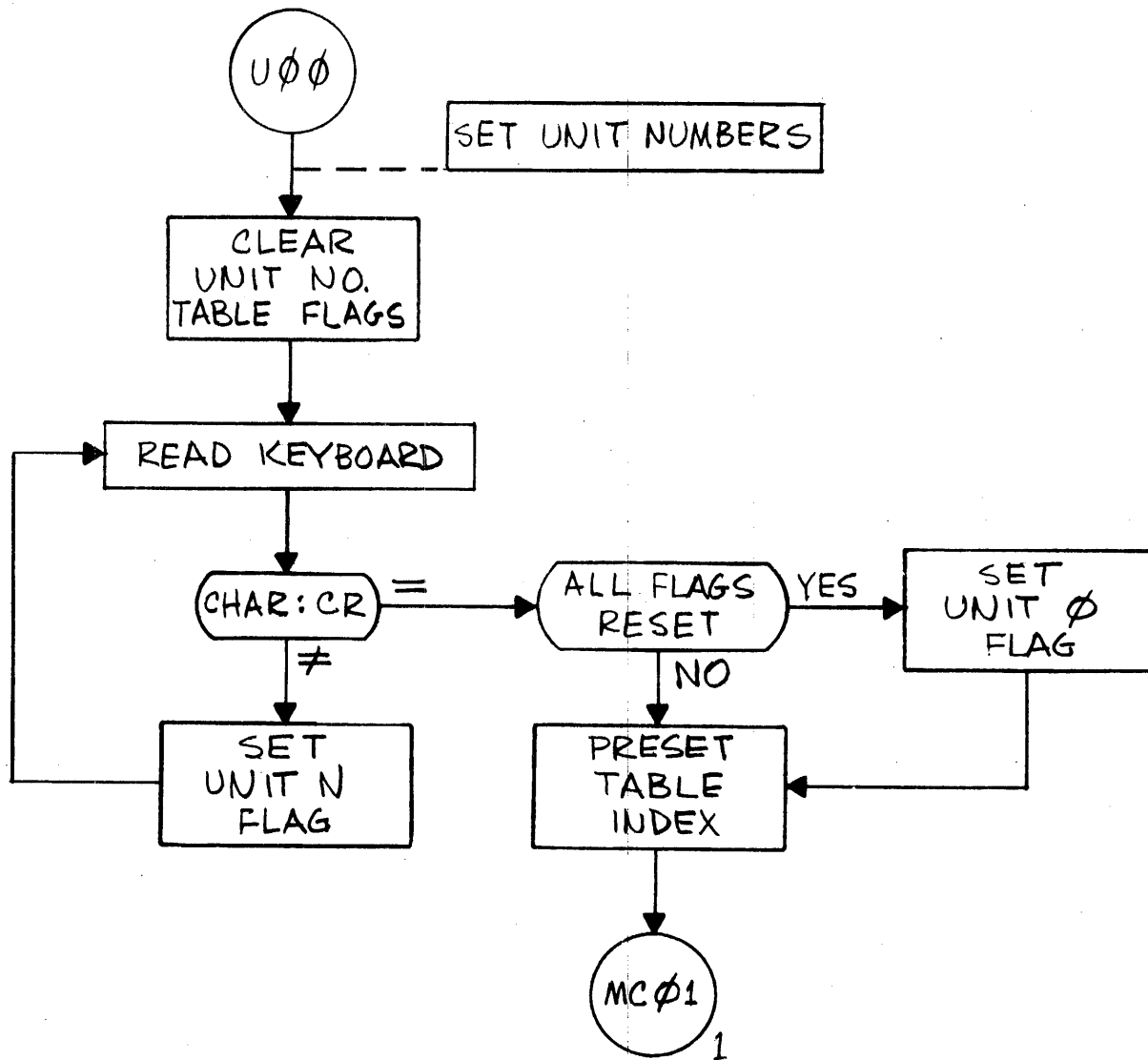
MC00

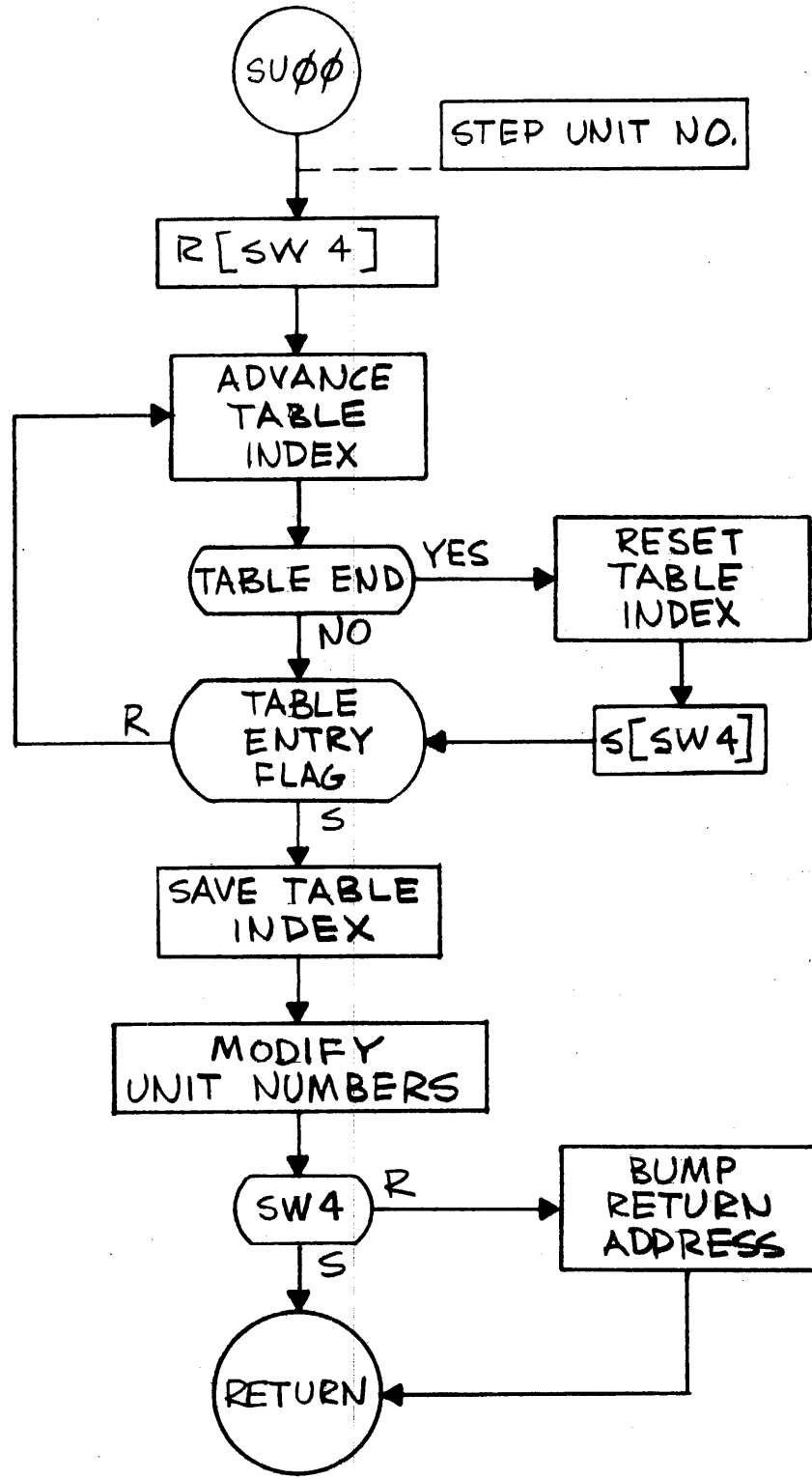
FLOW DIAGRAM

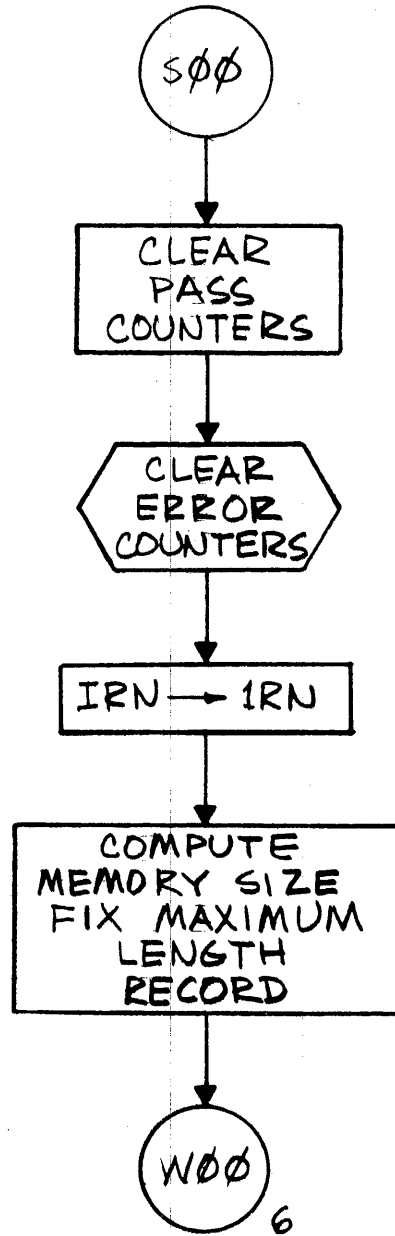
42 KC Magnetic Tape System Exerciser, Y Buffer

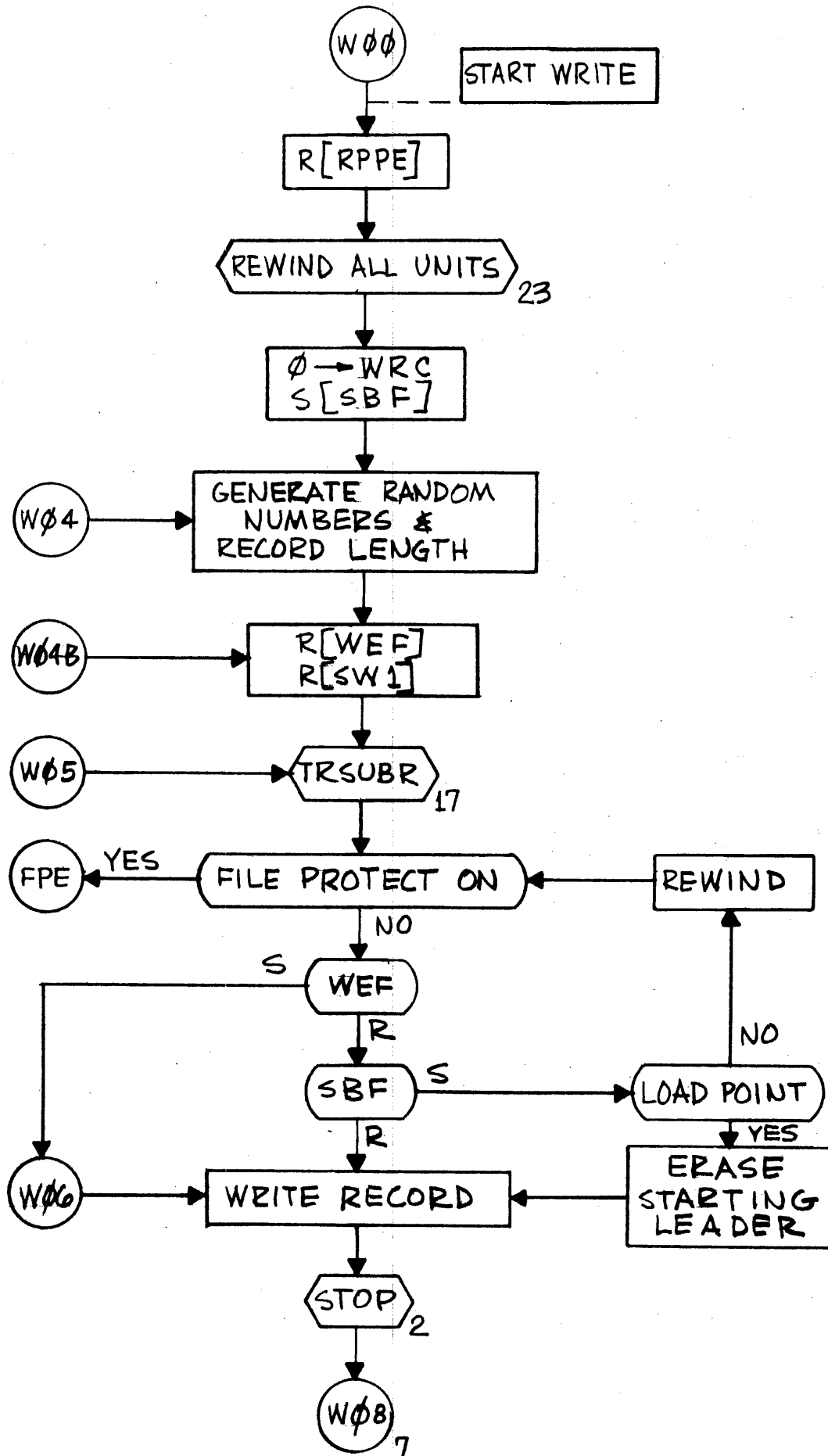


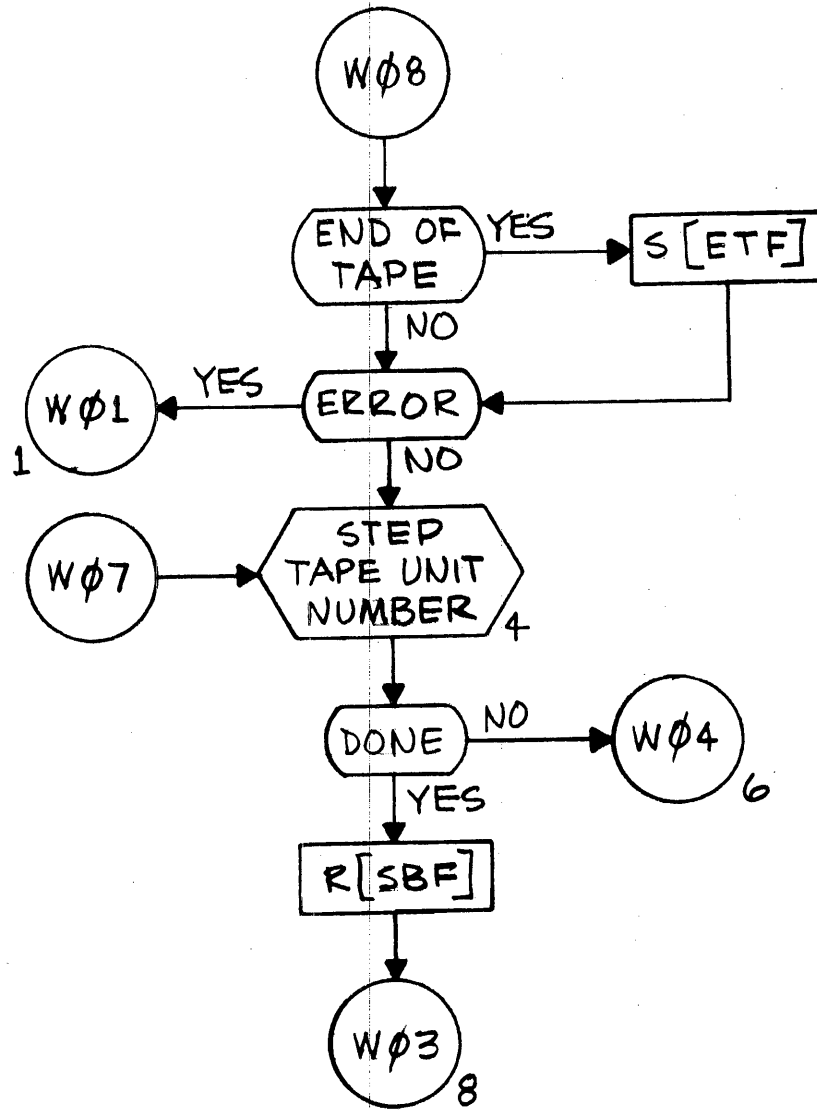


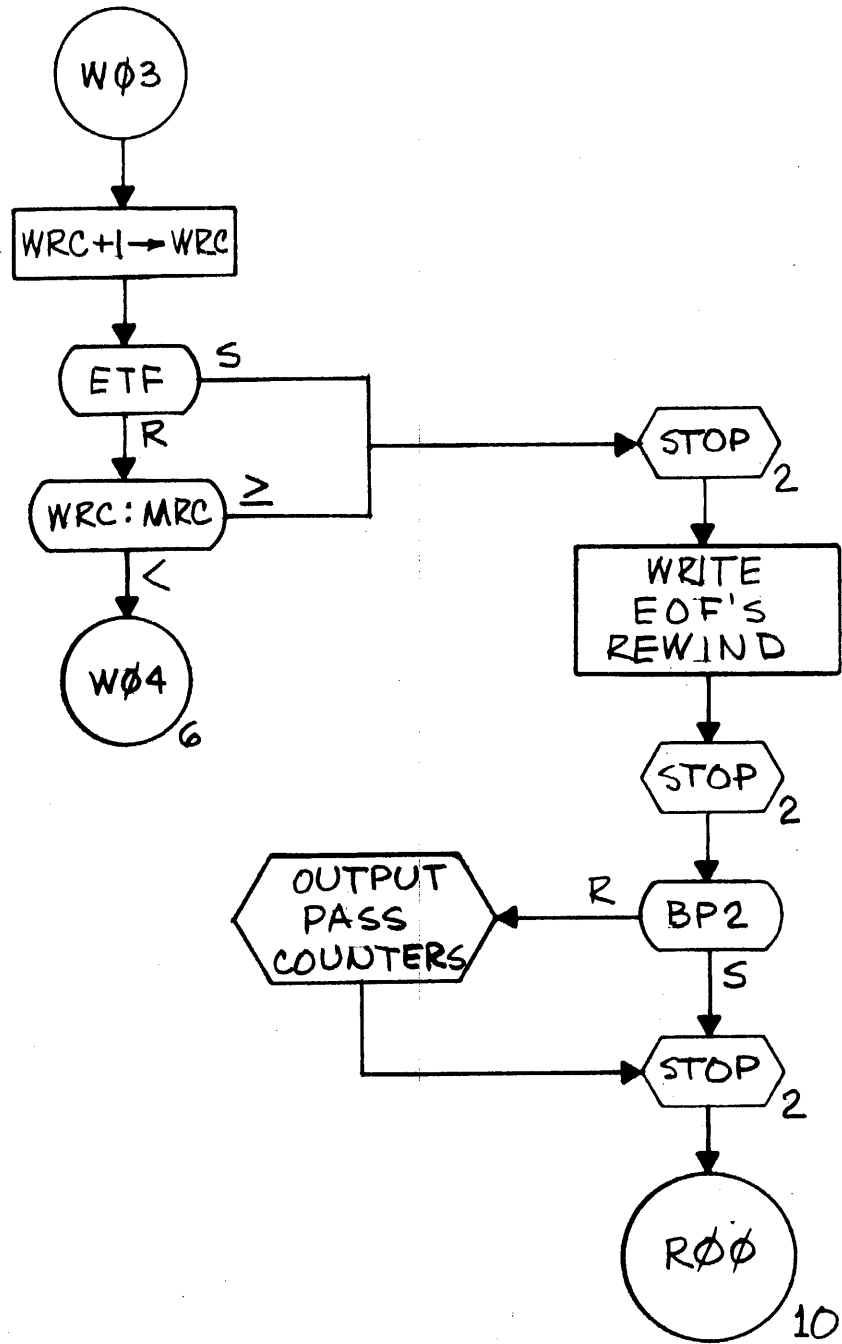


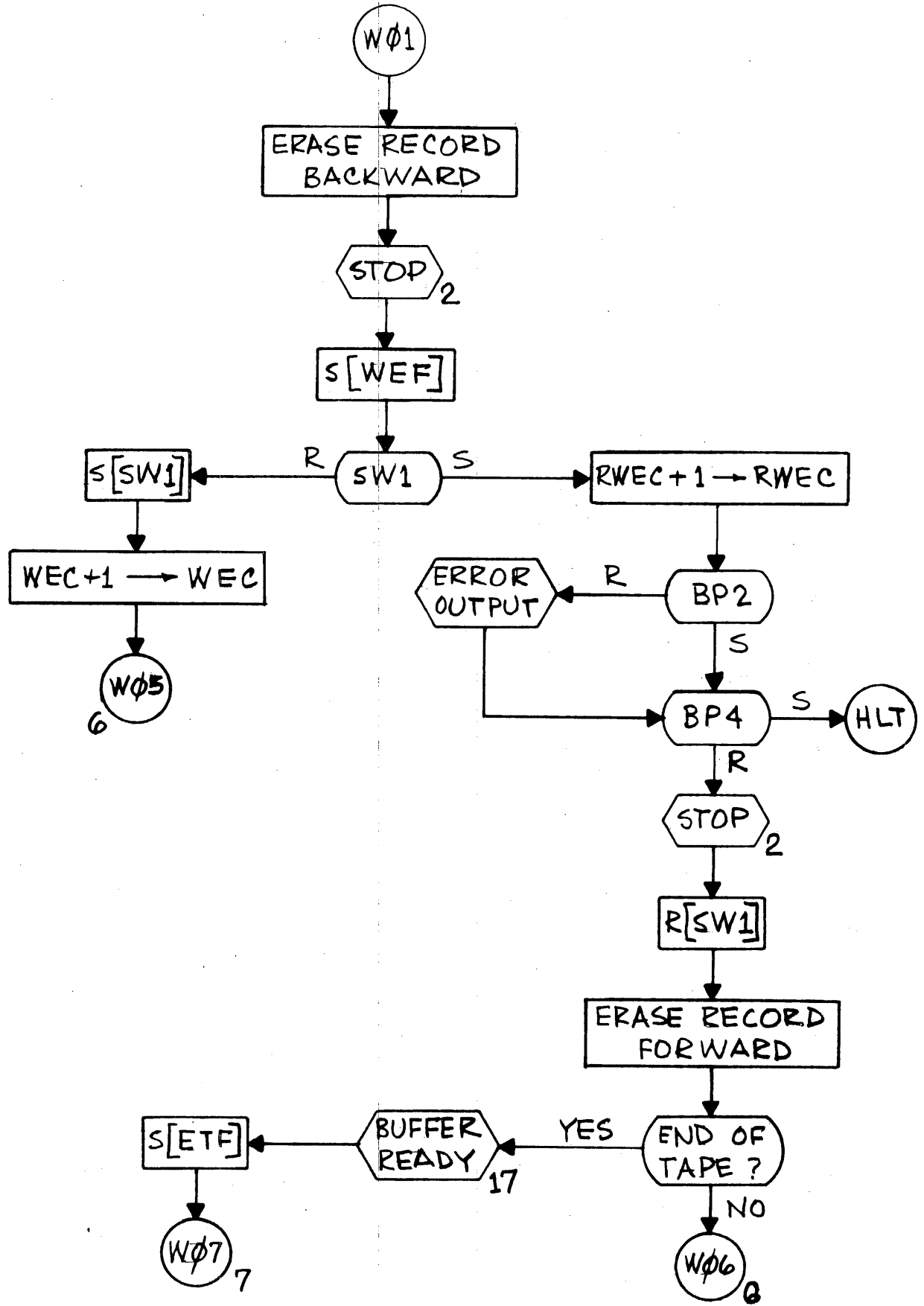


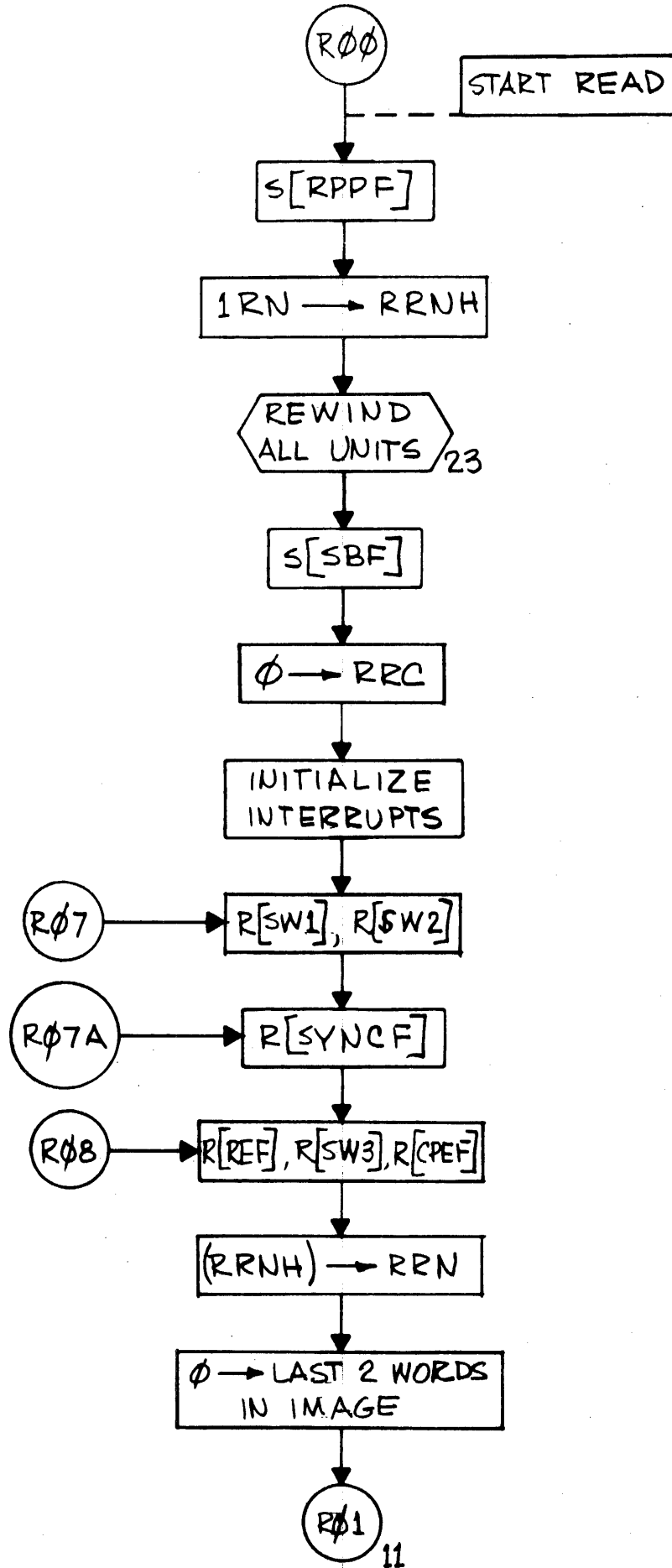


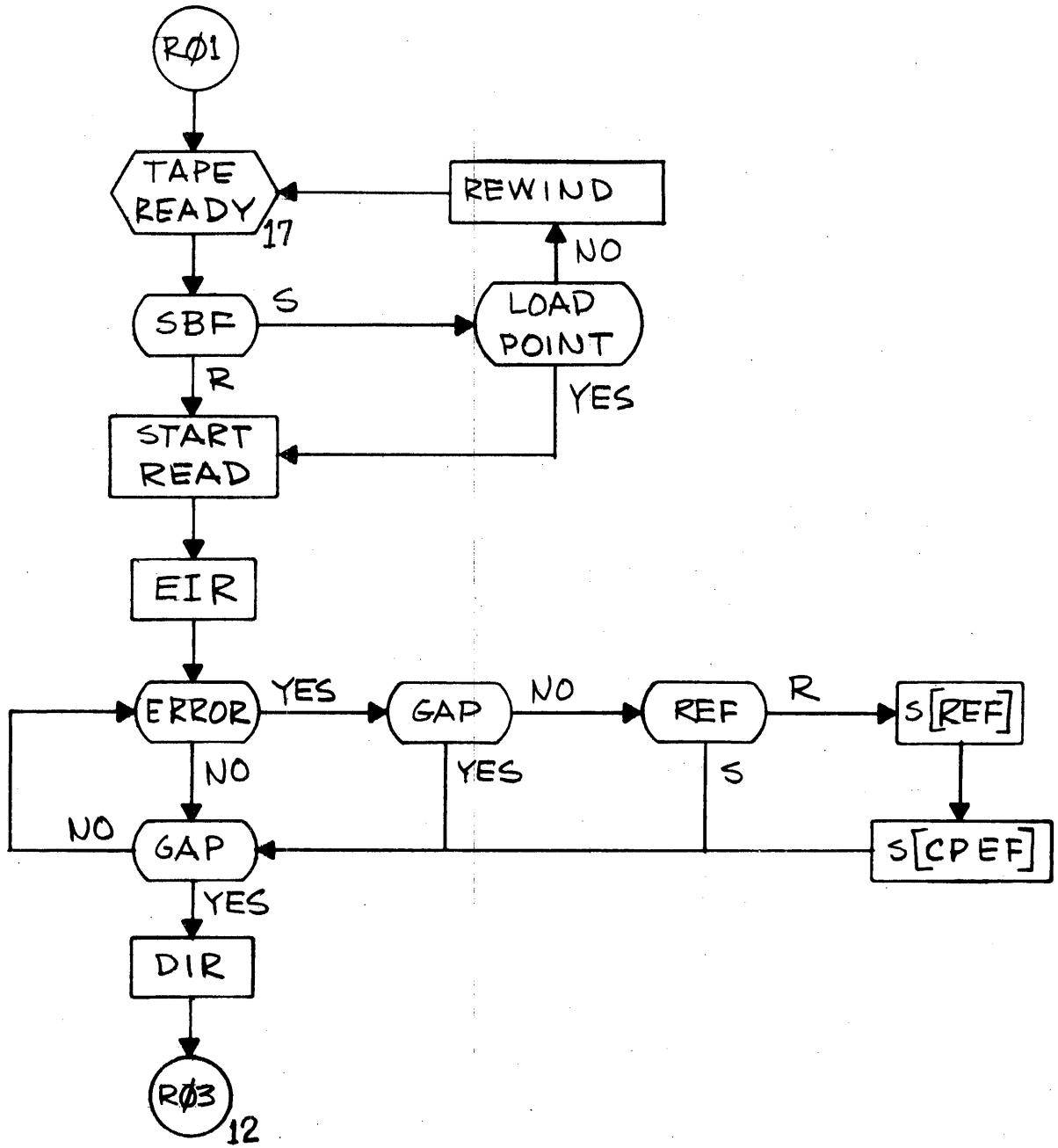


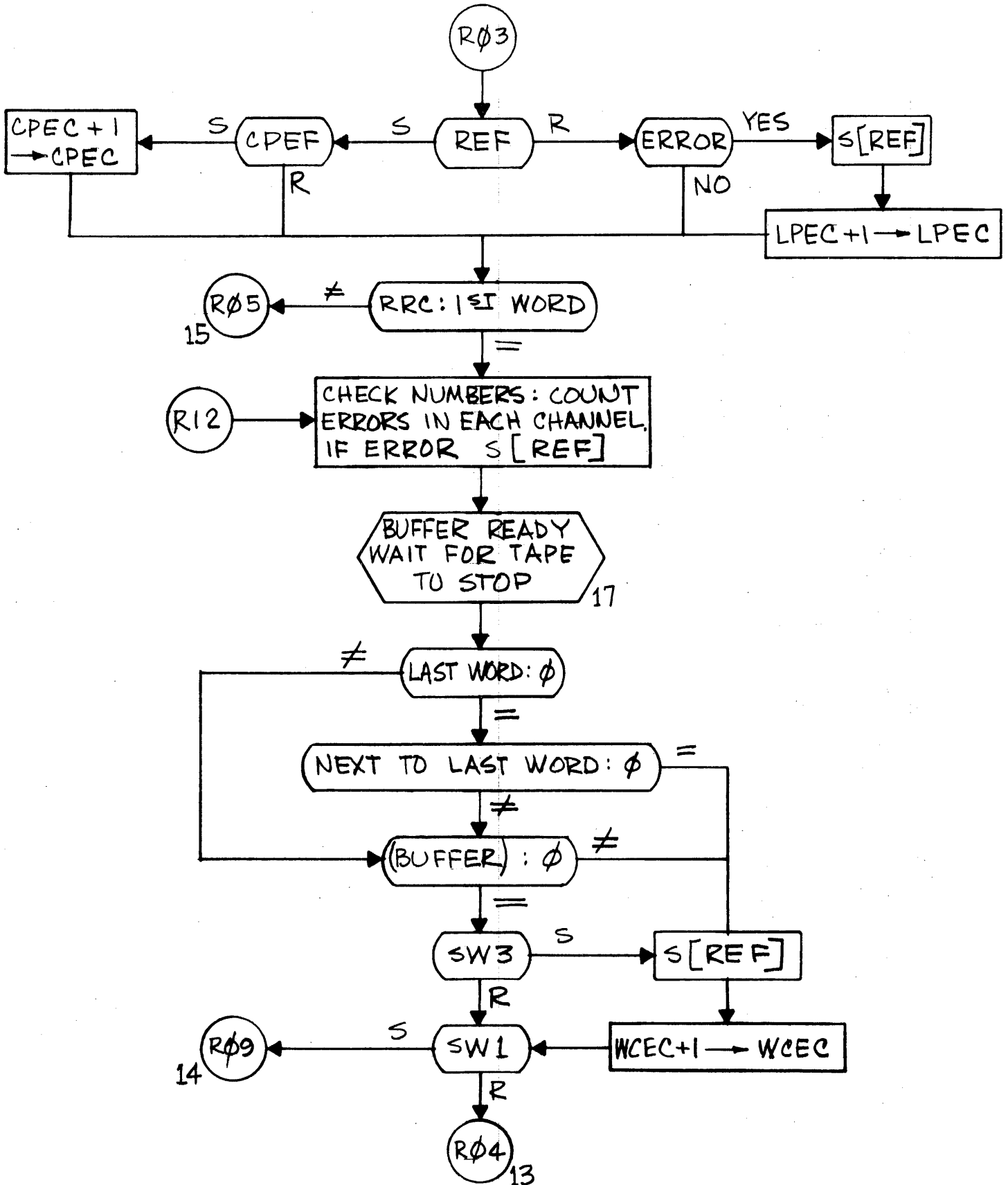


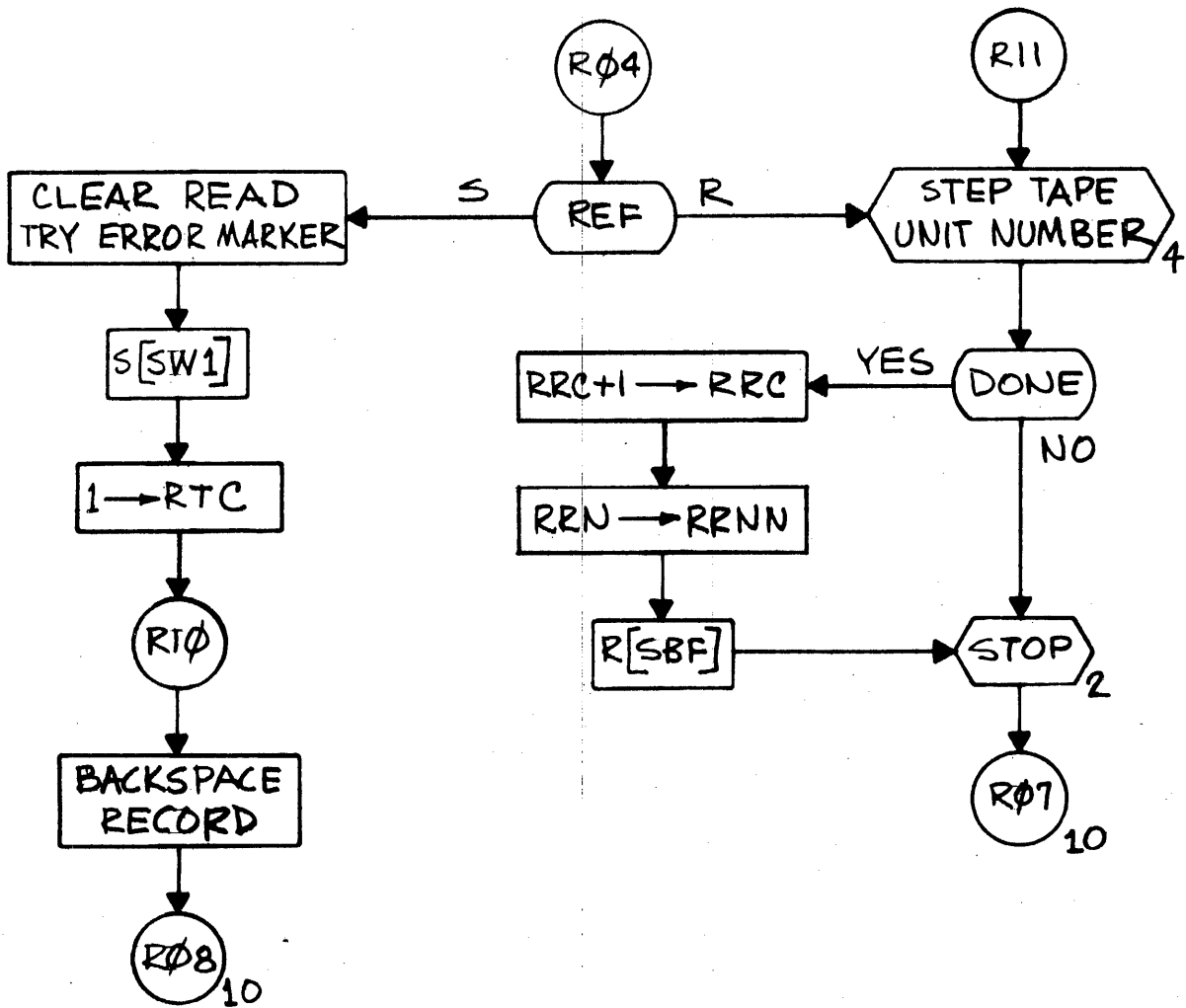


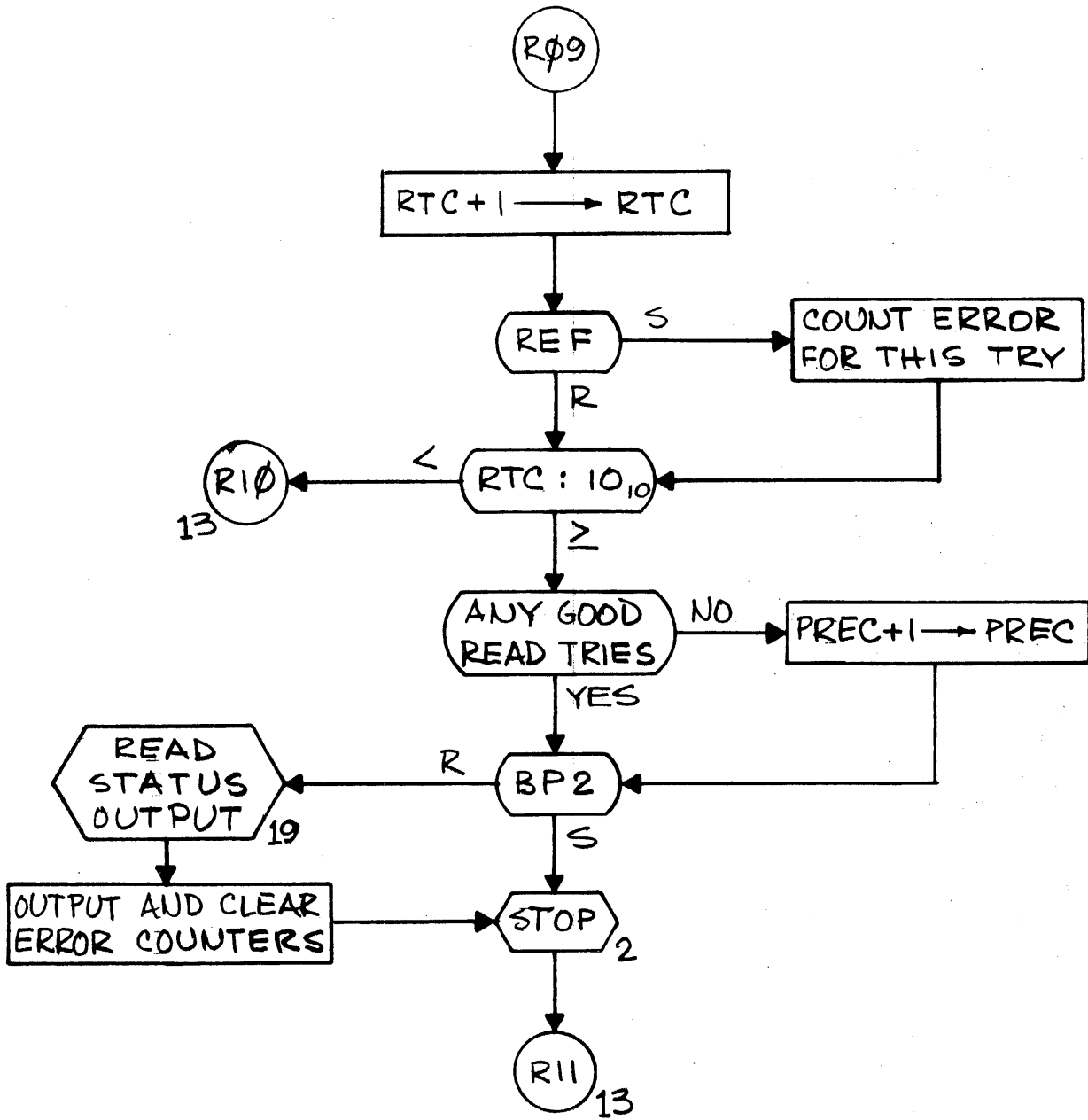


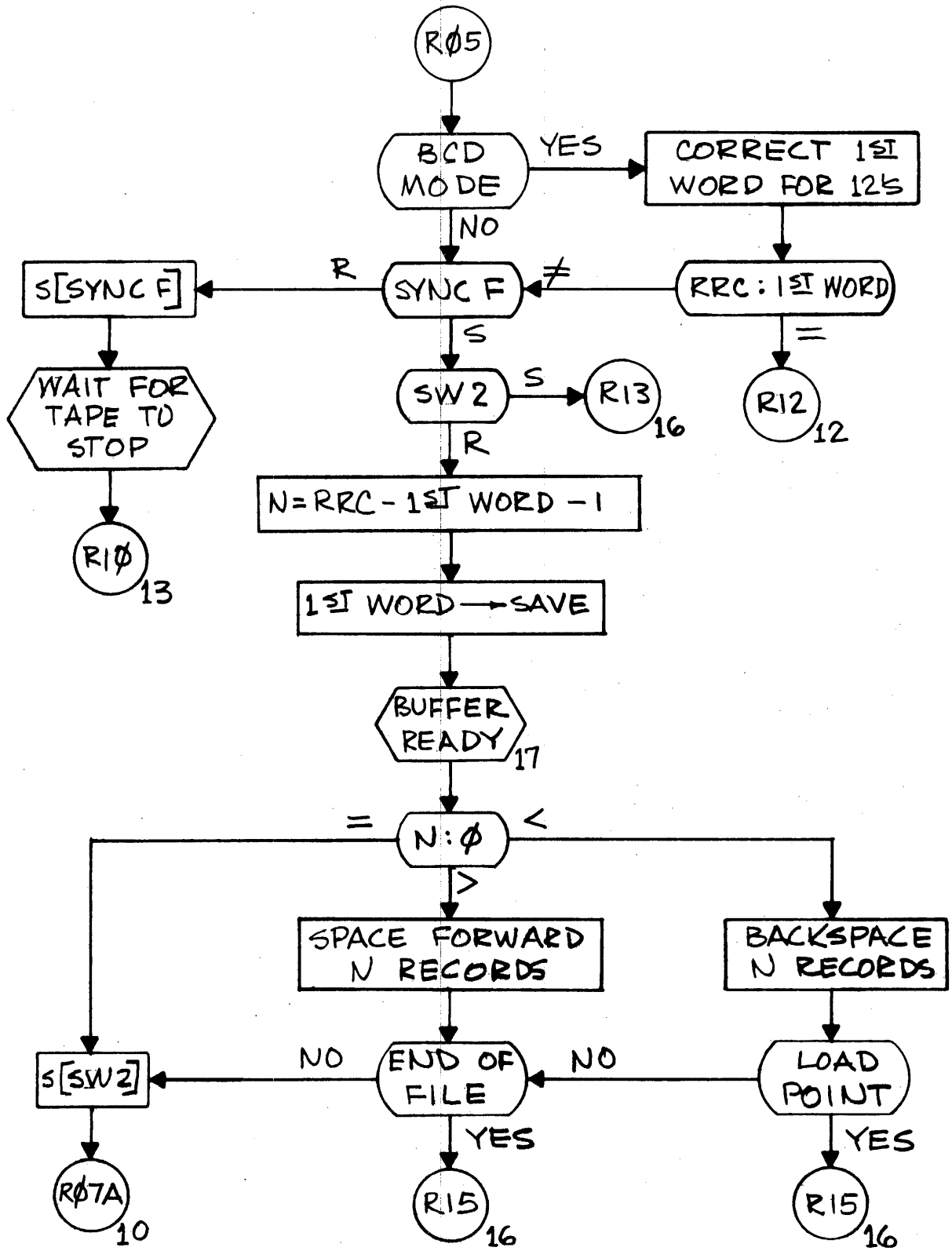


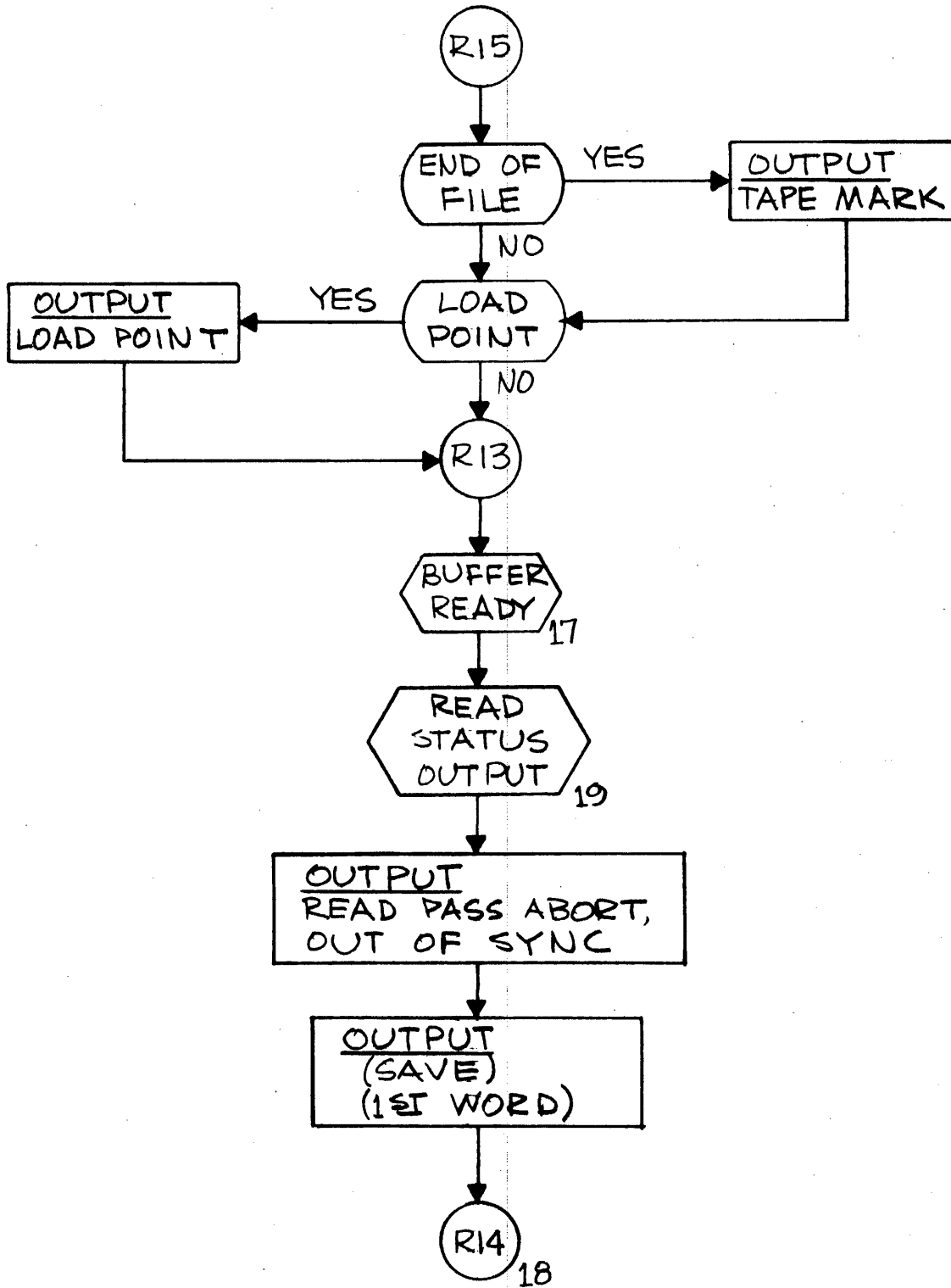


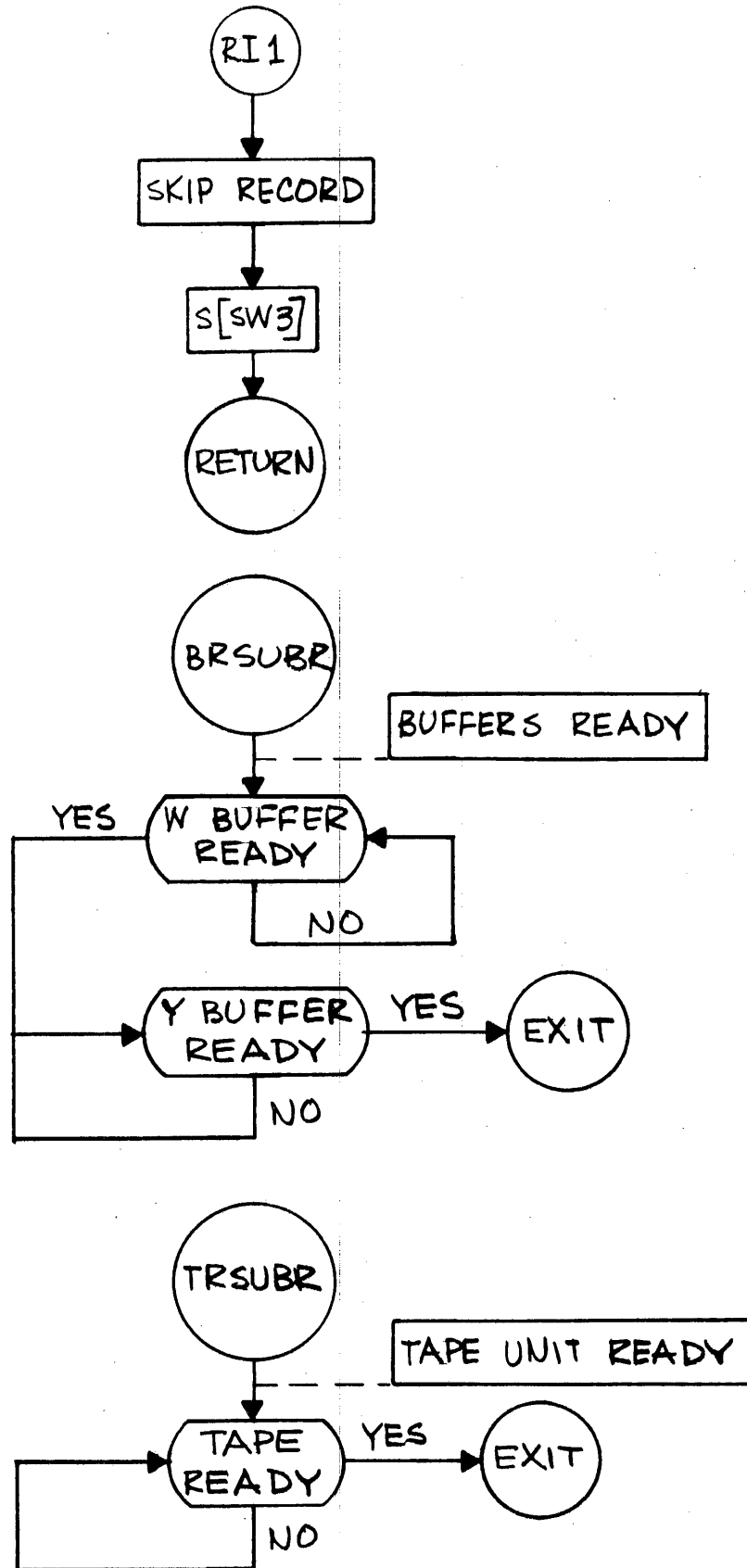


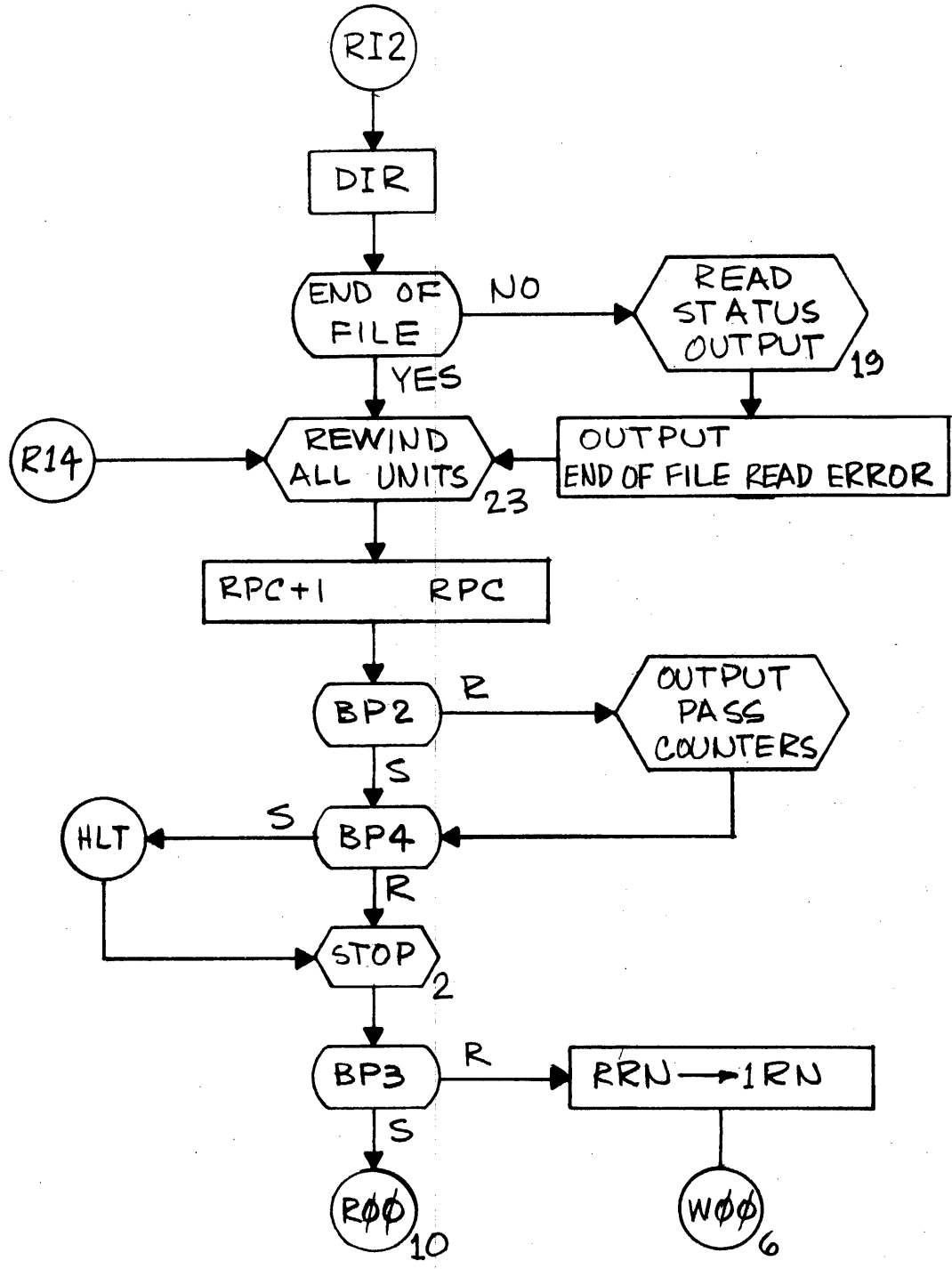


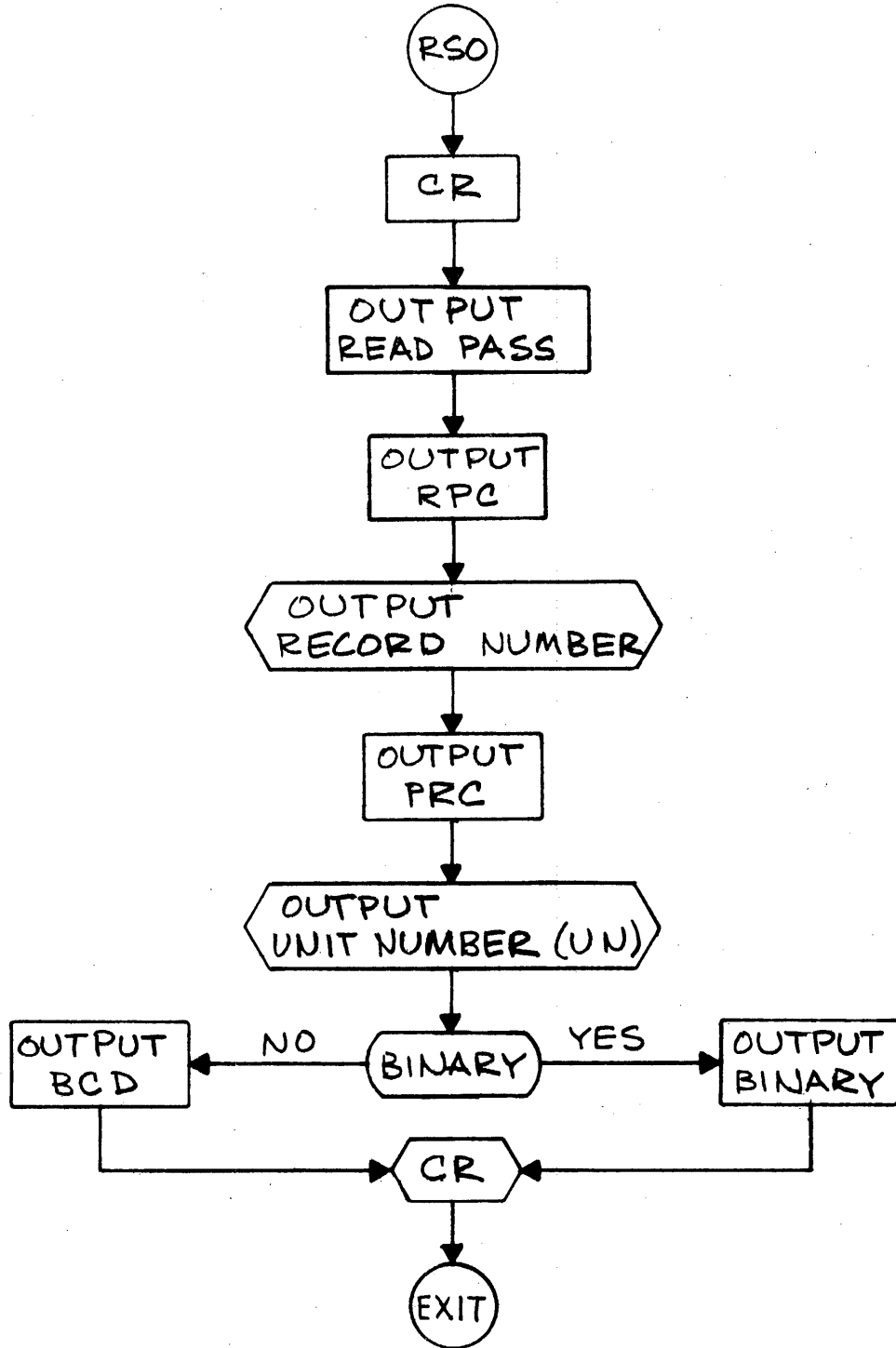


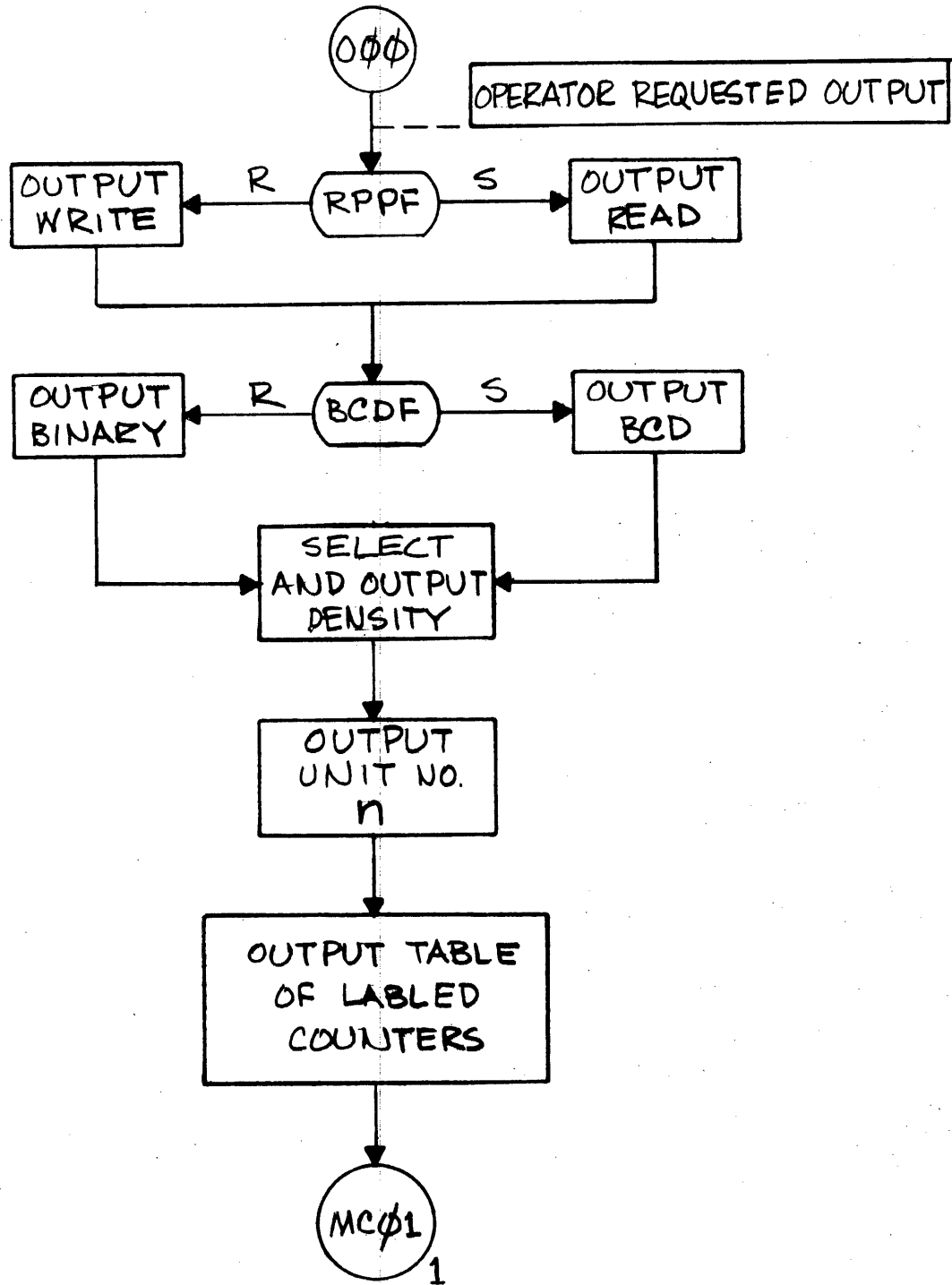


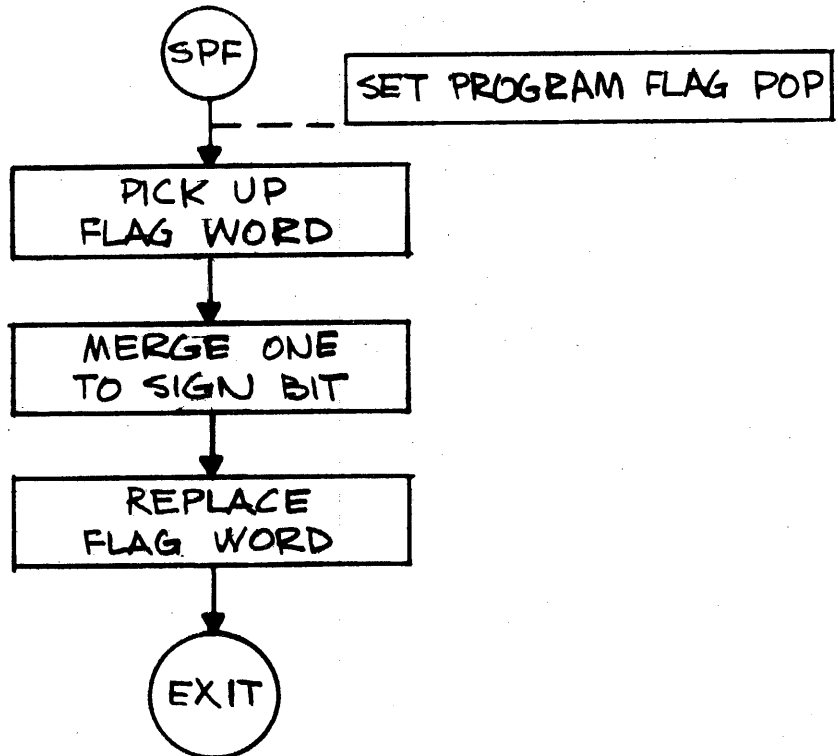
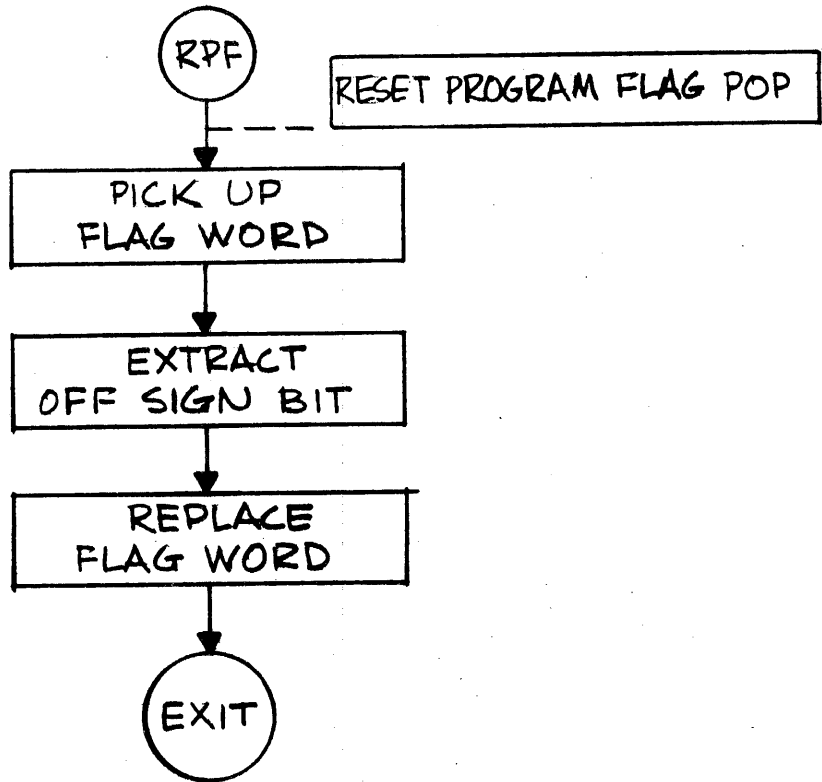


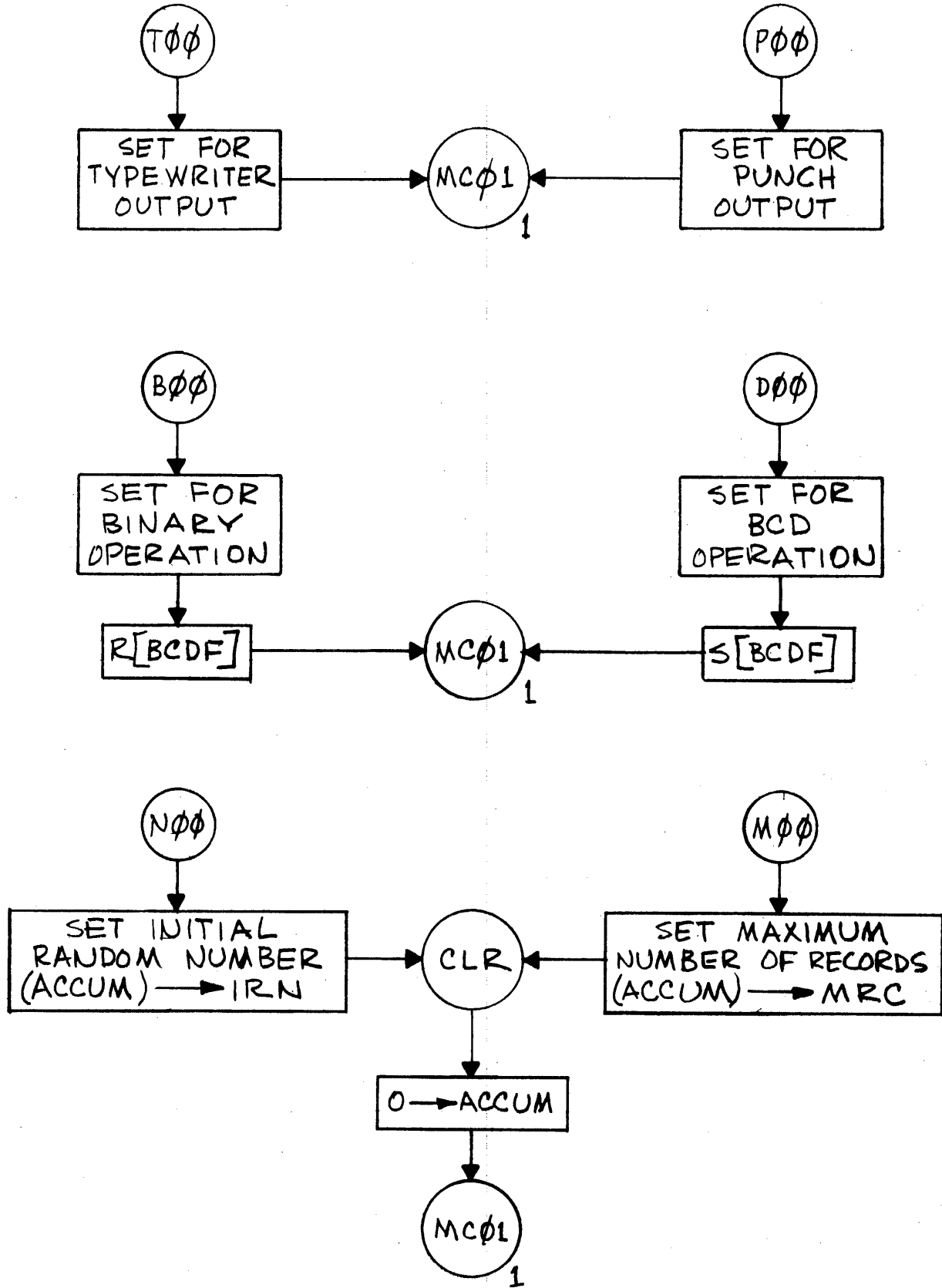


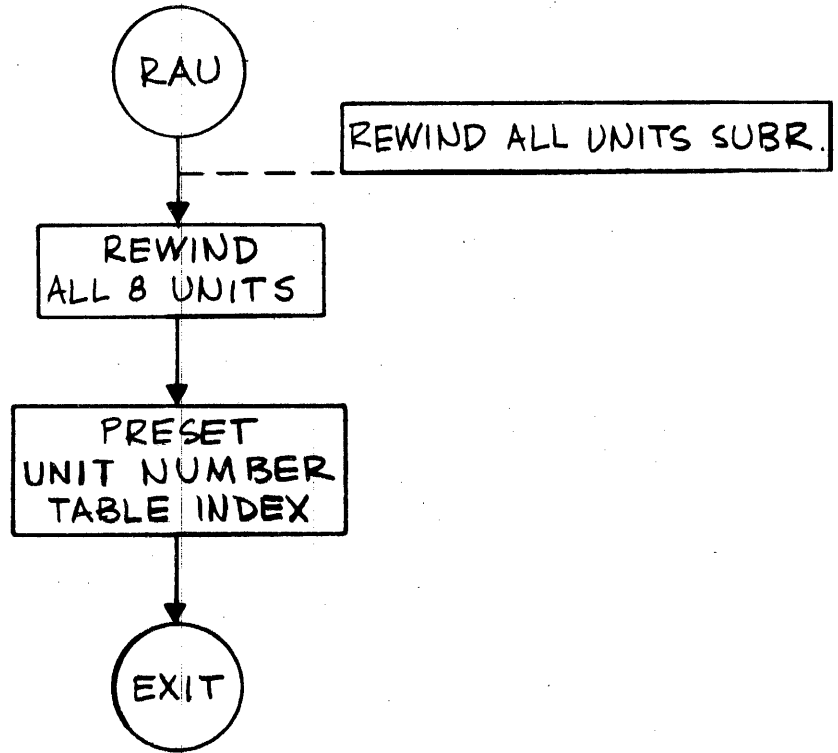












SDS 900 SERIES PROGRAM LIBRARY

PROGRAM DESCRIPTION

Page 1 of 7

Catalog No. 299008

IDENTIFICATION: 920 Closed Loop Analog Statistical Test Program

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ACCEPTED: 11 May 1964

COMPUTER CONFIGURATION: Applicable to any SDS 920 computer system with EJ20 Standard Junction Box.

PURPOSE: To compute the mean and standard deviation from closed loop analog measurements for the purpose of determining system accuracy and stability.

PROGRAMMED OPERATORS: DPSS, BID, DSQ

STORAGE: Program allocation 001, 100₈ to 1756₈. Temporary storage 40₈ to 64₈. Data storage 30₈ locations per D/A channel.

TIMING: 1.3 ms/scan/channel.

USE: 1.0 LOADING

The program is in absolute format on a self-loading binary tape. All necessary Programmed Operators and their linkages are contained on the program tape. Use FILL procedure to load the program.

2.0 RESTART

If it is required at any time to restart the program, set the RUN-IDLE-STEP switch to IDLE, press START, and move the switch to STEP and then to RUN.

3.0 SYSTEM PARAMETERS

Following Loading or Restart the program will request the operator to define several system parameters. These include the number of D/A channels, the size of the ADC converter, and the starting multiplexer channel for the first D/A converter. All numerical inputs are in decimal.

USE: (Cont)

3.1 "D/A CHANNELS"

Input the number of D/A channels to be tested.

3.2 "ADC SIZE"

Input the size of the analog to digital converter including the sign.

3.3 "MX CHANNEL"

Input the multiplexer channel number associated with the first digital to analog converter. Each additional digital to analog converter will be input through succeeding multiplexer channels.

4.0 SCAN PARAMETERS

Included in the scan parameters that require operator input are the channel number, number of scans to be performed, and the output limits for the digital to analog converter.

4.1 "SCAN COUNT"

Input the number of scans to be performed for each channel.

4.2 "CHANNEL"

Input the D/A channel to be scanned (0 to N). If all D/A channels are to be scanned simultaneously, input the letter "A" instead of the decimal input.

4.3 "LIMITS"

Input the limits, as decimal fractions, indicating the low and high values to be output to the D/A converters as a step function. If a random function is desired, input the letter "R" instead of the first decimal input. The program will proceed to scan following these inputs.

5.0 SCAN

The scan consists of an accumulation of data obtained from system measurements. System measurements involve output to a D/A converter, selecting the return multiplexer channel, and input from the AD/A converter. Each successive output for a particular D/A converter uses a different value computed from either a random number generator or a step generator.

USE: (Cont)

The accumulation of data consists of updating sums for mean and standard deviation computation and updating a distribution table. The distribution table represents a record of measurements deviating from their expected in converter counts. The table ranges up to plus or minus 8 converter counts. Those greater than 8 are listed as 8.

Scan will terminate when one of two conditions is attained. Either operator intervention by breakpoint control, or the Scan Count has been reached. Breakpoint control consists of depressing and raising a breakpoint switch.

5.1 Breakpoint #1

If Breakpoint #1 is depressed during Scan or listing, control is transferred to Scan Parameters (4.0).

5.2 Breakpoint #2

If Breakpoint #2 is depressed during Scan or listing, control is transferred to Output Parameters (6.0).

5.3 Scan Limit

When the number of scans have been performed, defined in Scan Parameters, Scan will terminate and control transfer^{^ will be} to Output Parameters (6.0).

6.0 OUTPUT PARAMETERS

Following Scan, the program will request the operator to define two output parameters before listing the data. These are the format and the channel number to be output.

6.1 "CHANNEL"

Input the D/A channel to be output (0 to N). If there is no input, the last channel or channels previously scanned will be listed.

6.2 "FORMAT"

Input the character "M" or "D" specifying the type of listing desired (see Table II for examples). If no input is made, the previous format is assumed.

USE: (Cont)

6.2.1 General Format, Input "D"

The general format listing consists of the channel number, the number of scans performed, the maximum and minimum measurements made from the expected measurement, the mean bias (mean measurement from the expected), the standard deviation about the mean bias, and a distribution table representing deviation of measurements in ADC converter counts about the expected measurement (D/A output value).

6.2.2 Abbreviated Format, Input "M"

Only the channel number, mean bias, and standard deviation are listed.

METHOD:

The mean bias and standard deviation are computed in the following manner.

For all $X_i = (\text{ADC value})_i - (\text{D/A value})_i$

$$\text{Mean bias} = \frac{1}{n} \sum_{i=1}^n X_i = \delta$$

$$\text{Standard deviation} = \left[\frac{1}{n} \sum_{i=1}^n (X_i)^2 - (\delta)^2 \right]^{1/2}$$

TABLE I
CLOSED LOOP ANALOG STATISTICAL TEST PROGRAM

COMPUTER OUTPUT	INPUT RANGE	REMARKS
I. A. "D/A CHANNELS"	1. 1 to N	Follows Loading or Restart. Specify the total number of D/A converters under test.
I. B. "ADC SIZE"	1. 7 to 14	Specify the size of the Analog to Digital converter including the sign.
I. C. "MX CHANNEL"	1. 0 to N	Specify the multiplexer channel associated with the first D/A channel.
II. A. "SCAN COUNT"	1. 1 to N 2. no entry	Follows data listing or Breakpoint #1. Specify the number of scans to be performed for each channel. Assume last specified scan count.
II. B. "CHANNEL"	1. 0 to N 2. A 3. no entry	Perform test on specified D/A channel only. Perform test on all D/A channels (I. A.). Assume last specified channel or channels (II. A.).
II. C. "LIMITS"	1. a. -. 99999 to . 99999 1. b. -. 99999 to . 99999 2. R 3. no entry	Input lower limit of 'ramp' function. Input upper limit of 'ramp' function. Perform 'random' function over entire D/A range Assume last output function and limits.

TABLE I (Cont)

COMPUTER OUTPUT	INPUT RANGE	REMARKS
III.A. "CHANNEL"	<ol style="list-style-type: none"> 1. 0 to N 2. A 3. no entry 	<p>Output the data for the specified D/A channel</p> <p>Output data for all D/A channels (I.A.)</p> <p>Output data for channel or channels specified under II.B.</p>
III.B. "FORMAT"	<ol style="list-style-type: none"> 1. M 2. D 3. no entry 	<p>Output the channel number, mean, and standard deviation (see Table II).</p> <p>Output the channel number, total number of scans, maximum and minimum measurements, mean measurement, standard deviation about the mean, and a distribution table (see Table III.)</p> <p>Assume previous specified format.</p>

TABLE III

1. 'M' (Typical for simultaneous 3 channel scan.)

CHANNEL	MEAN	STD DEVIATION
0	1.56	.49
1	.64	1.02
2	.20	.15

2. 'D' (Typical for single channel scan)

CHANNEL	2
SCAN	25013
MAX	4.00
MIN	-3.00
MEAN BIAS	.64
STD DEV	1.02
-3	3
-2	71
-1	1405
0	11904
1	10010
2	1129
3	485
4	4

			1		LOAD		
			2	*			
			3	*		SYSTEM PARAMETERS	
			4	*			
00200	0 76 01231		5	ST1	LDA	RESTR	
00201	0 35 00001		6		STA	1	
00202	1 00 01151		7	ST1A	TYPE	HOG1	
00203	1 01 00000		8		DECI		
00204	0 41 00202		9		BRX	ST1A	
00205	0 73 00023		10		SKG	ZERO	X > 0
00206	0 01 00202		11		BRU	ST1A	NO
00207	0 35 01317		12		STA	DACHNS	SET D/A CHANNELS
			13	*			
00210	1 00 01156		14	ST2	TYPE	HOG2	
00211	1 01 00000		15		DECI		
00212	0 41 00210		16		BRX	ST2	
00213	0 73 01302		17		SKG	P14	
00214	0 73 01277		18		SKG	P5	
00215	0 01 00210		19		BRU	ST2	
00216	0 35 01314		20		STA	ADCSIZ	
00217	0 76 01302		21		LDA	P14	
00220	0 54 01314		22		SUR	ADCSIZ	
00221	0 35 00040		23		STA	SIZE	
00222	0 46 30003		24		CLR		
00223	0 76 01343		25		LDA	014	
00224	0 67 40040		26		LSH*	SIZE	
00225	0 35 01315		27		STA	INCNO	
00226	0 46 30003		28		CLR		
00227	0 54 01315		29		SUR	INCNO	
00230	0 35 01316		30		STA	FIELD	
			31	*			
00231	1 00 01162		32	ST3	TYPE	HOG3	
00232	1 01 00000		33		DECI		
00233	0 41 00231		34		BRX	ST3	
00234	0 53 00041		35		SKN	DFLAG	
00235	0 01 00231		36		BRU	ST3	
00236	0 35 01320		37		STA	MXL0C	
			38	*		SCAN PARAMETERS	
00237	1 00 01166		39	ST4	TYPE	HOG4	
00240	1 01 00000		40		DECI		
00241	0 41 00237		41		BRX	ST4	
00242	0 53 00041		42		SKN	DFLAG	
00243	0 76 01321		43		LDA	SCNO	
00244	0 35 01321		44		STA	SCNO	
00245	0 46 30003		45		CLR		
00246	0 54 01321		46		SUB	SCNO	
00247	0 35 01322		47		STA	SCNO1	
			48	*			
00250	0 76 00026		49	ST5	LDA	NEGONE	
00251	0 75 01325		50		LDR	POINT	
00252	0 53 01341		51		SKN	FE	
00253	0 46 30003		52		CLR		
00254	0 36 01325		53		STR	POINT	
00255	0 36 01326		54		STR	CHNO	

00256	0 35 01341	55		STA	FE	
00257	0 35 01342	56		STA	FA	
00258	1 00 01175	57		TYPE	H0G7	CHANNEL
00259	1 01 00000	58		DECI		
00260	0 53 00047	59		SKN	AFLAG	
00261	0 01 00276	60		BRU	ST5A	
00262	0 53 00041	61		SKN	DFLAG	
00263	0 01 00311	62		BRU	ST6	
00264	0 73 00026	63		SKG	NEGONE	
00265	0 01 00250	64		BRU	ST5	
00266	0 46 00014	65		XAB		
00267	0 76 01317	66		LDA	DACHNS	
00268	0 73 00044	67		SKG	SUM	
00269	0 01 00250	68		BRU	ST5	
00270	0 76 00026	69		LDA	NEGONE	
00271	0 01 00305	70		BRU	ST50	
00272	0 53 00041	71	ST5A	SKN	DFLAG	
00273	0 01 00301	72		BRU	**2	OK
00274	0 01 00250	73		BRU	ST5	ERROR
00275	0 76 00042	74		LDA	CHARS	
00276	0 70 01265	75		SKM	A	TEST FOR ALL
00277	0 01 00250	76		BRU	ST5	
00278	0 46 00003	77		CLR		
00279	0 36 01325	78	ST50	STB	POINT	SCAN
00280	0 36 01326	79		STB	CHNO	OUTPUT
00281	0 35 01342	80		STA	FA	SET ALL FLAG
00282	0 35 01341	81		STA	FE	
00283		82	*			
00284	1 00 01172	83	ST6	TYPE	H0G6	
00285	1 02 00000	84		DECF		FRACTIONAL INPUT, L
00286	0 41 00325	85		BRX	ST6A	TEST FOR R
00287	0 53 00041	86		SKN	DFLAG	DECIMAL ENTRY
00288	0 01 00317	87		BRU	ST60	NO
00289	0 35 01324	88		STA	LOWERL	
00290	1 02 00000	89	ST6R	DECF		FRACTION INPUT, UPP
00291	0 41 00325	90		BRX	ST6A	
00292	0 53 00041	91		SKN	DFLAG	
00293	0 01 00335	92		BRU	STZ+1	
00294	0 35 01323	93		STA	UPPERL	
00295	0 01 00334	94		BRU	STZ	RESET RANDOM
00296	0 53 00041	95	ST6A	SKN	DFLAG	TEST FOR DECIMAL
00297	0 01 00330	96		BRU	**2	INPUT
00298	0 01 00311	97		BRU	ST6	
00299	0 76 00042	98		LDA	CHARS	
00300	0 70 01257	99		SKM	R	CHARACTER=R
00301	0 01 00311	100		BRU	ST6	NO. RETURN
00302	0 46 00003	101		CLR		YES, R
00303	0 36 01340	102	STZ	STB	RFLAG	SET RANDOM FLAG
00304	0 43 00652	103		BRM	BPTST	TEST J.P.
00305	0 53 01341	104	DATCL	SKN	FE	
00306	0 01 00343	105		BRU	CLALL	CLEAR
00307	0 76 01325	106	SINGLE	LDA	POINT	
00308	0 43 00354	107		BKM	CLEAR	
00309	0 01 01345	108		BRU	SCAN	

00343	0 46 30003	109	CLALL	CLR		ALL
00344	0 54 01317	110		SUR	DACHNS	
00345	0 35 00056	111		STA	T1	
00346	0 46 30003	112		CLP		
00347	0 71 00056	113		LDX	T1	COUNT
00350	0 43 00354	114		BRM	CLEAR	CLEAR CH. DATA
00351	0 55 00024	115		ADD	ONE	INCREMENT CHANNEL
00352	0 41 00350	116		BRX	*-2	LOOP
00353	0 01 01345	117		BRU	SCAN	
		118	*		DATA CLEAR	
00354	0 00 00000	119	CLEAR	PZF		
00355	0 35 00062	120		STA	TA1	
00356	0 37 00061	121		STX	TX1	
00357	0 43 00702	122		BRM	LOCATE	
00360	0 55 01344	123		ADD	1B1	INDEX
00361	0 54 01271	124		SUR	N24	
00362	0 35 01337	125		STA	ENDAT	
00363	0 71 01271	126		LDX	N24	
00364	0 36 41337	127		STR*	ENDAT	
00365	0 41 00364	128		BRX	*-1	
00366	0 76 00025	129		LDA	SIGN	SET MAX AND MIN
00367	0 77 37751	130		EAX	MAX-24	TO LIMITS
00370	0 35 41337	131		STA*	ENDAT	
00371	0 55 00025	132		ADD	NEGONE	
00372	0 77 37752	133		EAX	MIN-24	
00373	0 35 41337	134		STA*	ENDAT	
00374	0 76 00062	135		LDA	TA1	
00375	0 71 00061	136		LDX	TX1	
00376	0 51 00354	137		BRP	CLEAR	
00377	0 76 00026	138	ST7	LDA	NEGONE	
00400	0 75 01325	139		LDB	POINT	
00401	0 53 01341	140		SKN	FE	ALL
00402	0 46 30003	141		CLR		YES
00403	0 35 01342	142		STA	FA	
00404	0 36 01326	143		STR	CHNO	
00405	1 00 01175	144		TYPE	HOG7	*CHANNEL
00406	1 01 00000	145		DECI		
00407	0 53 00047	146		SKN	AFLAG	
00410	0 01 00421	147		BRU	ST7A	
00411	0 53 00041	148		SKN	DFLAG	
00412	0 01 00432	149		BRU	STR	
00413	0 46 00014	150		XAP		
00414	0 76 01317	151		LDA	DACHNS	DA SIZE
00415	0 73 00044	152		SKG	SUM	
00416	0 01 00377	153		BRU	ST7	
00417	0 76 00026	154		LDA	NEGONE	
00420	0 01 00430	155		BRU	SET7	
00421	0 76 00042	156	ST7A	LDA	CHARS	
00422	0 53 00041	157		SKN	DFLAG	
00423	0 01 00425	158		BRU	*+2	
00424	0 01 00377	159		BRU	ST7	
00425	0 70 01265	160		SKM	A	
00426	0 01 00377	161		BRU	ST7	
00427	0 46 30003	162		CLR		

00430	0 36 01326	163	SET7	STR	CHNO	
00431	0 35 01342	164		STA	FA	
00432	1 00 01201	165	ST8	TYPE	H0G8	
00433	1 01 00000	166		DECI		
00434	0 53 00047	167		SKN	AFLAG	
00435	0 01 00441	168		BRU	ST8A	
00436	0 53 00041	169		SKN	DFLAG	
00437	0 01 00451	170		BRU	GAMMA	
00440	0 01 00432	171		BRU	ST8	
00441	0 76 00042	172	ST8A	LDA	CHARS	
00442	0 70 01255	173		SKN	M	TEST FOR M
00443	0 01 00446	174		BRU	**3	
00444	0 46 00014	175		XAR		
00445	0 01 00450	176		BRU	**3	
00446	0 70 01256	177		SKN	D	TEST FOR *D*
00447	0 01 00432	178		BRU	ST8	
00450	0 35 00045	179		STA	FG	SET FORMAT FLAG
00451	0 46 00003	180	GAMMA	CLR		
00452	0 53 01342	181		SKN	FA	
00453	0 35 01326	182		STA	CHNO	
00454	0 53 00045	183		SKN	FG	
00455	0 01 00507	184		BRU	SIGMA	
00456	1 00 01204	185		TYPE	H0G9	
00457	0 43 00714	186	GAMMA1	BRM	SCALE	SCALE CHAN. DATA
00460	0 76 01326	187		LDA	CHNO	CONVERT CH. NO.
00461	0 02 00001	188		ROV		TO DECIMAL
00462	1 72 00027	189		BID	23	
00463	1 04 01261	190		INTG	TAB	
00464	0 35 01243	191		STA	H0G11	
00465	0 76 00063	192		LDA	MEAN	
00466	1 03 01244	193		LIMB	H0G11+1	
00467	0 55 01303	194		ADD	P16	
00470	0 35 01245	195		STA	H0G11+2	
00471	0 76 00064	196		LDA	STDEV	
00472	1 03 01246	197		LIMB	H0G11+3	
00473	1 00 01243	198		TYPE	H0G11	
00474	0 43 00652	199	FASET	BRM	BPTEST	
00475	0 53 01342	200		SKN	FA	ALL FLAG
00476	0 01 00500	201		BRU	**2	
00477	0 01 00237	202		BRU	ST4	
00500	0 61 01326	203		MIN	CHNO	INCREMENT CHAN. NO.
00501	0 76 01317	204		LDA	DACHNS	
00502	0 73 01326	205		SKC	CHNO	
00503	0 01 00237	206		BRU	ST4	
00504	0 53 00045	207		SKN	FG	
00505	0 01 00507	208		BRU	SIGMA	
00506	0 01 00457	209		BRU	GAMMA1	
00507	0 76 01326	210	SIGMA	LDA	CHNO	CHANNEL NUMBER
00510	0 02 00001	211		ROV		
00511	1 72 00027	212		BID	23	
00512	1 04 01262	213		INTG	CARRET	
00513	0 35 01216	214		STA	H0G10+2	
00514	0 76 01326	215		LDA	CHNO	
00515	0 43 00702	216		BRM	LOCATE	

00601	2	35	00001	271	STA	MAX.2	
00602	2	73	00002	272	SKG	MIN.2	
00603	2	35	00002	273	STA	MIN.2	
00604	0	56	40040	274	RSH*	SIZE	AT 13
00605	0	35	00057	275	STA	T2	
00606	0	66	00012	276	RSH	10	AT 23
00607	0	35	00056	277	STA	T1	
00610	0	73	01300	278	SKG	P8	
00611	0	01	00613	279	BRU	**2	INCREMENT
00612	0	76	01300	280	LDA	P8	DISTRIBUTION
00613	0	73	01272	281	SKG	N8	TABLE
00614	0	76	01272	282	LDA	N8	
00615	0	55	01336	283	ADD	MINDIF	
00616	0	35	00617	284	STA	**1	
00617	2	61	00017	285	MIN	DIF.2	
00620	0	46	00003	286	CLR		
00621	0	76	00056	287	LDA	T1	
00622	0	73	01304	288	SKG	P63	SET DEVIATION
00623	0	01	00625	289	BRU	**2	BANDWIDTH=64
00624	0	76	01304	290	LDA	P63	
00625	0	73	01267	291	SKG	N64	
00626	0	76	01270	292	LDA	N53	
00627	0	66	00007	293	RSH	7	
00630	0	36	00060	294	STR	T3	
00631	0	46	00014	295	XAB		COMPUTE X SQUARE
00632	0	75	00023	296	LDR	ZERO	SET R=0
00633	0	64	00060	297	MUL	T3	
00634	0	75	00023	298	LDR	ZERO	
00635	0	46	00014	299	XAB		
00636	3	30	00003	300	DPA	SUMXSQ.2	
00637	2	35	00004	301	STA	SUMXSQ+1.2	
00640	2	36	00003	302	STR	SUMXSQ.2	
00641	0	46	00003	303	CLR		
00642	0	76	00057	304	LDA	T2	ACCUMULATE X
00643	0	73	00026	305	SKG	NEGONE	
00644	0	75	00026	306	LDR	NEGONE	
00645	0	46	00014	307	XAB		
00646	3	30	00005	308	DPA	SUMX.2	
00647	2	35	00006	309	STA	SUMX+1.2	
00650	2	36	00005	310	STR	SUMX.2	
00651	0	51	00567	311	BRP	ACCUM	RETURN
			312	*			
			313	*		BREAKPOINT TEST	
			314	*			
00652	0	00	00000	315	BPTTEST	PZF	
00653	0	40	20400	316	BPT	1	
00654	0	01	00660	317	BRU	BPTA	
00655	0	40	20200	318	BPT	2	
00656	0	01	00664	319	BRU	BPTB	
00657	0	51	00652	320	BRR	BPTTEST	
00660	0	40	20400	321	BPTA	1	
00661	0	01	00660	322	BRU	*-1	
00662	0	02	00000	323	DISW		DISCONNECT W
00663	0	01	00237	324	BRU	ST4	

00664	0 40 20200	325	BPTB	RPT	2	
00665	0 01 00664	326		BRU	*-1	
00666	0 02 00000	327		DISW		
00667	0 01 00377	328		BRU	ST7	
		329	*			
		330	*	RANDOM	NUMBER GENERATOR	
		331	*			
00670	0 00 00000	332	RANDOM	PZE		
00671	0 46 30003	333		CLR		
00672	0 76 00701	334		LDA	SEED	
00673	0 67 20013	335		LCY	11	
00674	0 55 00701	336		ADD	SEED	
00675	0 55 00700	337		ADD	CONST	
00676	0 35 00701	338		STA	SEED	
00677	0 51 00670	339		BRR	RANDOM	
00700	23416555	340	CONST	OCT	23416555	
00701	0 00 00000	341	SEED	PZE		
00702	0 00 00000	342	LOCATE	PZE		
00703	0 35 00055	343		STA	TEMP	
00704	0 75 00023	344		LDR	ZERO	
00705	0 67 00001	345		LSH	1	
00706	0 55 00055	346		ADD	TEMP	
00707	0 67 00003	347		LSH	3	
00710	0 55 01335	348		ADD	INDEX	
00711	0 35 00055	349		STA	TEMP	
00712	0 71 00055	350		LDX	TEMP	
00713	0 51 00702	351		BRR	LOCATE	
		352	*			
00714	0 00 00000	353	SCALE	PZE		
00715	0 76 01326	354		LDA	CHNO	
00716	0 43 00702	355		BRM	LOCATE	
00717	2 76 00006	356		LDA	SUMX+1.2	COMPUTE MEAN
00720	2 75 00005	357		LDR	SUMX.2	
00721	0 67 00001	358		LSH	1	
00722	2 65 00000	359		DIV	N.2	
00723	0 35 00063	360		STA	MEAN	
00724	0 75 00023	361		LDR	ZERO	
00725	0 64 00063	362		MUL	MEAN	MEAN SQUARE
00726	0 35 00054	363		STA	MEANSQ+1	
00727	0 36 00053	364		STB	MEANSQ	
00730	2 76 00004	365		LDA	SUMXSQ+1.2	
00731	2 75 00003	366		LDR	SUMXSQ.2	
00732	2 55 00000	367		DIV	N.2	
00733	0 66 00015	368		RSH	13	
00734	1 31 00053	369		DPS	MEANSQ	
00735	1 35 00000	370		DSO		
00736	0 73 00026	371		SKG	NEGONE	
00737	0 46 30003	372		CLR		
00740	0 35 00064	373		STA	STDEV	STANDARD DEVIATION
00741	0 46 30003	374		CLR		
00742	0 76 00063	375		LDA	MEAN	
00743	0 67 40040	376		LSH*	SIZE	
00744	0 35 00063	377		STA	MEAN	
00745	0 51 00714	378		BRR	SCALE	

			379	*			
			380	*	TYPEWRITER OUTPUT. ALPHA NUMERIC		
			381	*			
			382	TYPE	POPD	10000000	
00746	0	37	00061		STX	TX1	
00747	0	40	21000		BRTW		BUFFER READY
00750	0	01	00747		BRU	*-1	
00751	0	02	02641		TYPW	1.4	ENABLE OUTPUT
00752	0	75	00026		LDB	NEGONE	
00753	0	71	00000		LDX	0	
00754	2	71	00000		LDX	0.2	
00755	2	12	00000		MIW	0.2	OUTPUT
00756	0	41	00757		BRX	**1	INCREMENT LOC
00757	2	76	00000		LDA	0.2	NEXT WORD TEST
00760	0	70	01250		SKM	6BITS	DONE
00761	0	01	00755		BRU	*-4	OUTPUT AGAIN
00762	0	71	00061		LDX	TX1	
00763	0	02	14000		TOPW		TERMINATE OUTPUT
00764	0	51	00000		BRR	0	
			398	*			
			399	*	DECIMAL INPUT		
			400	*			
			401	DECI	POPD	10100000	
00765	0	76	00026		LDA	NEGONE	SET OFLAG
00766	0	01	00770		BRU	SIFG	
			403		POPD	10200000	
			404	DECF	CLR		
00767	0	46	30003		STA	OFLAG	RESET OFLAG
00770	0	35	00052		LDA	0	
00771	0	76	00000		STA	T3	
00772	0	35	00060		BRTW		BUFFER READY
00773	0	40	21000		BRU	*-1	
00774	0	01	00773		LDX	N10000	WAIT 40 MS
00775	0	71	01265		BRX	*	
00776	0	41	00776		RKBW	1.1	
00777	0	02	02001		LDX	N4	
01000	0	71	01273	TEMTRZ	CLR		
01001	0	46	30003		LDA	NEGONE	
01002	0	76	00026		STR	FG.2	
01003	2	36	00045		STA	OFLAG.2	
01004	2	35	00052		BRX	*-2	
01005	0	41	01003		LDA	N6	
01006	0	76	01275		STA	T1	
01007	0	35	00056		WIMCH	T2	INPUT CHAR
01010	0	32	00057		LDR	6BITS	
01011	0	75	01250		LDA	T2	
01012	0	76	00057		ETR	6BITS	
01013	0	14	01250		LDX	N5	
01014	0	71	01274		SKM	CHTABL+5.2	
01015	2	-4	L1265		BRX	*-1	
01016	0	41	01015		BRU	**6.2	
01017	2	01	01025		BRU	TEMTRZ	/
01020	0	01	01000		BRU	**1	*
01021	0	01	01022		BRU	TERMIN	!
01022	0	01	01060				

			487	*			
			488	LIMB	P&PD	10300000	CONVERT TO DECIMAL
01107	0 37	00061	489		STX	TX1	
01110	0 71	00000	490		LDX	0	
01111	0 37	00062	491		STY	TA1	
01112	1 72	00015	492		BID	13	
01113	0 14	01252	493		ETR	18BITS	
01114	0 55	01262	494		ADD	CARRT	CARRAGE RETURN
01115	0 71	00062	495		LDX	TA1	
01116	2 71	00000	496		LDX	0.2	
01117	2 35	00001	497		STA	1.2	
01120	2 36	00000	498		STR	0.2	
01121	0 71	00061	499		LDX	TX1	
01122	0 51	00062	500		BRR	TA1	
			501	*			
			502	*		DECIMAL TO DECIMAL INTEGER	
			503	*			
			504	INTG	P&PD	10400000	
01123	0 53	00000	505		SKN	0	
01124	0 01	01127	506		BRU	*+3	
01125	0 76	01332	507		LDA	OVFL+1	
01126	0 75	01331	508		LDR	OVFL	
01127	0 36	00056	509		STR	T1	
01130	0 75	01250	510		LDR	6BITS	
01131	0 70	01263	511		SKM	PERIOD	
01132	0 01	01144	512		BRU	INTG1	
01133	0 73	01333	513		SKG	ZTEST	
01134	0 73	01334	514		SKG	ZTEST+1	
01135	0 01	01140	515		BRU	*+3	
01136	0 54	01263	516		SUR	PERIOD	
01137	0 67	20006	517		LCY	6	
01140	0 14	01252	518		ETR	18BITS	
01141	0 55	40000	519		ADD*	0	
01142	0 75	00056	520		LDR	T1	
01143	0 51	00000	521		BRR	0	
01144	0 14	01252	522	INTG1	ETR	18BITS	
01145	0 55	01254	523		ADD	SPACE	
01146	0 75	00056	524		LDR	T1	
01147	0 66	20006	525		RCY	6	
01150	0 01	01127	526		BRU	INTG+4	
01151	52246121		527	HDG1	BCI	4.1D/A CHANNELS	
01152	12233021						
01153	45452543						
01154	62121212						
01155	00000077	528			OCT	77	
01156	52212423	529	HDG2		BCI	3.1ADC SIZE	
01157	12623171						
01160	25121212						
01161	00000077	530			OCT	77	
01162	52446712	531	HDG3		BCI	3.1MX CHANNEL	
01163	23302145						
01164	45254312						
01165	00000077	532			OCT	77	
01166	52622321	533	HDG4		BCI	3.1SCAN COUNT	

01167	45122346				
01170	64456312				
01171	00000077	534		OCT	77
01172	52433144	535	HDG6	BCI	2.1LIMITS
01173	31636212				
01174	00000077	536		OCT	77
01175	52233021	537	HDG7	BCI	3.1CHANNEL
01176	45452543				
01177	12121212				
01200	00000077	538		OCT	77
01201	52264651	539	HDG8	BCI	2.1FORMAT
01202	44216312				
01203	00000077	540		OCT	77
01204	52233021	541	HDG9	BCI	7.1CHANNEL#MEAN BIAS#STD DEV 1
01205	45452543				
01206	72442521				
01207	45122231				
01210	21627262				
01211	63241224				
01212	25651252				
01213	00000077	542		OCT	77
01214	52233021	543	HDG10	BCI	3.1CHANNEL
01215	45452543				
01216	12121212				
01217	62232145	544	HDG10A	BCI	3.SCAN
01220	12121212				
01221	12121212				
01222	44216712	545	HDG10B	BCI	3.MAX
01223	12121212				
01224	12121212				
01225	44314512	546	HDG10C	BCI	3.MIN
01226	12121212				
01227	12121212				
01230	44252145	547	HDG10D	BCI	5.MEAN BIAS
01231	12223121				
01232	62121212				
01233	12121212				
01234	12121212				
01235	62632412	548	HDG10E	BCI	5.STD DEV
01236	24256512				
01237	12121212				
01240	12121212				
01241	12121212				
01242	00000077	549		OCT	77
01243	12121212	550	HDG11	BCI	5.
01244	12121212				
01245	12121212				
01246	12121212				
01247	12121212				
01250	00000077	551	6BITS	OCT	77
01251	0 01 00200	552	RESTRT	BRU	ST1
	00000	553	N	BOOL	0
	00001	554	MAX	BOOL	1
	00002	555	MIN	BOOL	2

00003	556	SUMXSQ	BOOL	3
00005	557	SUMX	BOOL	5
00017	558	DIF	BOOL	17
00023	559	ZERO	BOOL	23
00024	560	ONE	BOOL	24
00025	561	SIGN	BOOL	25
00026	562	NEGONE	BOOL	26
00040	563	SIZE	BOOL	40
00041	564	DFLAG	BOOL	41
00042	565	CHARS	BOOL	42
00043	566	IOSUM	BOOL	43
00044	567	SUM	BOOL	44
00045	568	FG	BOOL	45
00047	569	AFLAG	BOOL	47
00050	570	PFLAG	BOOL	50
00051	571	MINFG	BOOL	51
00052	572	OFLAG	BOOL	52
00053	573	MEANSQ	BOOL	53
00055	574	TEMP	BOOL	55
00056	575	T1	BOOL	56
00057	576	T2	BOOL	57
00060	577	T3	BOOL	60
00061	578	TX1	BOOL	61
00062	579	TA1	BOOL	62
00063	580	MEAN	BOOL	63
00064	581	STDEV	BOOL	64

01072	77777700	582	18BITS	OCT	77777700
01073	00002000	583	14BIT	OCT	2000
01254	00000012	584	SPACE	OCT	12
01255	00000044	585	M	OCT	44
01256	00000024	586	D	OCT	24
01257	00000051	587	R	OCT	51
01260	00000061	588	CHTABL	OCT	61
01261	00000072	589	TAB	OCT	72
01262	00000052	590	CARRET	OCT	52
01263	00000033	591	PERIOD	OCT	33
01264	00000040	592		OCT	40
01265	00000021	593	A	OCT	21
01266	77754360	594	M10000	DEC	-10000
01267	77777700	595	N64	DEC	-64
01270	77777701	596	N63	DEC	-63
01271	77777750	597	N24	DEC	-24
01272	77777770	598	N8	DEC	-8
01273	77777774	599	N4	DEC	-4
01274	77777773	600	N5	DEC	-5
01275	77777772	601	N6	DEC	-6
01276	77777776	602	N2	DEC	-2
01277	00000006	603	P6	DEC	6
1300	00000010	604	P8	DEC	8
1301	00000011	605	P9	DEC	9
1302	00000016	606	P14	DEC	14
1303	00000020	607	P16	DEC	16
1304	00000077	608	P63	DEC	63
1305	00000001	609	POWER	DEC	1.10.100.1000.10000.100000.1000000

/
*
!
.
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01306	00000012			
01307	00000144			
01310	00001780			
01311	00023420			
01312	00303240			
01313	03641100			
01314	0 00 00000	610	ADCRIZ PZF	
01315	0 00 00000	611	INCNO PZF	
01316	0 00 00000	612	FIELD PZF	
01317	0 00 00000	613	DACHNS PZF	
01320	0 00 00000	614	MYLOC PZF	
01321	0 00 00000	615	SCNO PZF	
01322	0 00 00000	616	SCNO1 PZF	
01323	0 00 00000	617	UPPERL PZF	
01324	0 00 00000	618	LOWERL PZF	
01325	0 00 00000	619	POINT PZF	
01326	0 00 00000	620	CHNO PZF	
01327	0 00 00000	621	DATA PZF	
01330	0 00 00000	622	EXPECT PZF	
01331	63464612	623	OVFL BCI	2.T95 LRG.
01332	43512733			
01333	12122233	624	ZTEST OCT	12122233
01334	12121232	625	OCT	12121232
01335	0 00 02377	626	INDEX PZF	-32*24+2048-1
01336	2 61 00017	627	MINDIF MIN	DIF.2
01337	0 00 00000	628	ENDAT PZF	
01340	0 00 00000	629	RFLAG PZF	
01341	0 00 00000	630	FE PZF	
01342	0 00 00000	631	FA PZF	
01343	00002000	632	014 OCT	2000
01344	20000000	633	181 OCT	20000000

			634		PAGE				
			635	*					
			636	* 920	SCAN.	CLOSED LOOP ANALOG STATISTICAL TEST PRG.			
			637	*					
01345	0 02	30000	638	SCAN	EDM	30000			
01346	0 76	01324	639		LDA	LOWERL		LOWER LIMIT	
01347	0 35	01330	640		STA	EXPECT			
01350	0 43	01427	641		BRM	EDMCMP			
01351	0 40	20400	642	SCAN1	BPT	1		COMPUTE D/A EDM	
01352	0 01	00660	643		BRU	BPTA		R.P. 1 TEST	
01353	0 40	20200	644		BPT	2			
01354	0 01	00664	645		BRU	BPTB		R.P. 2 TEST	
01355	0 02	33012	646	EDMA	EDM	33012			
01356	0 13	01330	647		PAT	EXPECT		DA OUTPUT SELECT	
01357	0 20	00000	648		NAP			OUTPUT	
01360	0 02	33002	649		EDM	33002		DELAY	
01361	0 13	01441	650		PAT	CHNOA		MX INPUT SELECT	
01362	0 67	20020	651		LCY	16			
01363	0 02	33001	652		EDM	33001		ADC CONVERT DELAY	
01364	0 33	01327	653		PIN	DATA		INPUT	
01365	0 43	00567	654		BRM	ACCUM			
01366	0 53	01341	655		SKN	FE		ACCUMULATE DATA	
01367	0 01	01405	656		BRU	SCAN2			
01370	0 61	01322	657	SCANS	MIN	SCN01			
01371	0 53	01322	658		SKN	SCN01			
01372	0 01	00377	659		BRU	ST7		DONE. GO TO OUTPUT	
01373	0 53	01340	660		SKN	RFLAG			
01374	0 01	01417	661		BRU	SCAN3		TO RANDOM	
01375	0 76	01315	662		LDA	INCNO		RAMP EXPECTED	
01376	0 55	01330	663		ADD	EXPECT			
01377	0 73	01323	664		SKG	UPPERL			
01400	0 01	01403	665		BRU	**3		TEST UPPER LIMIT	
01401	0 76	01324	666		LDA	LOWERL		NOT THERE	
01402	0 14	01316	667		ETR	FIELD		RESET	
01403	0 35	01330	668		STA	EXPECT			
01404	0 01	01351	669		BRU	SCAN1		RESTORE	
01405	0 61	01326	670	SCAN2	MIN	CHNO			
01406	0 76	01317	671		LDA	DACHNS		TO NEXT CHANNEL	
01407	0 73	01326	672		SKG	CHNS			
01410	0 01	01423	673		BRU	SCAN4			
01411	0 61	01355	674		MIN	EDMA			
01412	0 50	01441	675		SKR	CHNOA			
01413	0 01	01414	676		BRU	**1		REDUCE BY ONE	
01414	0 53	01340	677		SKN	RFLAG			
01415	0 01	01417	678		BRU	**2		IS IT RANDOM	
01416	0 01	01351	679		BRU	SCAN1		YES	
01417	0 43	00670	680	SCAN3	BRM	RANDOM			
01420	0 14	01316	681		ETR	FIELD		RANDOM NUMBER GEN.	
01421	0 35	01330	682		STA	EXPECT			
01422	0 01	01351	683		BRU	SCAN1		OUTPUT VALUE	
01423	0 46	30003	684	SCAN4	CLR			R.P. TESTS	
01424	0 35	01326	685		STA	CHNO		RESET CH. NO. AND EDM	
01425	0 43	01427	686		BRM	EDMCMP			
01426	0 01	01370	687		BRU	SCANS		TEST COUNT OF SCAN	

01427	0 00 00000	588	EGMCMP	PZF		
01430	0 76 01326	689		LDA	CHNB	
01431	0 55 01440	690		ADD	EGMI	
01432	0 35 01355	691		STA	EGMA	
01433	0 76 00026	692		LDA	NEGNE	D/A EGM
01434	0 54 01326	693		SUP	CHNS	
01435	0 54 01320	694		SUP	MXLOC	
01436	0 35 01441	695		STA	CHNSA	
01437	0 51 01427	696		BRP	EGMCMP	MX CHANNEL
01440	0 02 33012	697	EGMI	EGM	33012	RETURN
01441	0 00 00000	698	CHNSA	PZF		
	00000	699		END		

18BITS	01252	ADCSIZ	01314	BPTST	00652	CARRET	01262
TABL	01260	DACHNS	01317	DIVIDE	01076	EGMCMP	01427
EXPECT	01330	GAMMA1	00457	HDG10A	01217	HDG10P	01222
HDG10C	01225	HDG10D	01230	HDG10E	01235	JMINUS	01056
JPRINT	01046	LOCATE	00702	LOWERL	01324	MEANSQ	00053
MINDIF	01336	N10000	01266	NEGONE	00026	PERIOD	01263
RANDOM	00670	RESTRT	01251	SINGLE	00340	STASUM	01067
SUMXSD	00003	TEMTBZ	01000	TERMIN	01060	UPPERL	01323
10SUM	00043	14BIT	01253	6BITS	01250	ACCUM	00567
AFLAG	00047	CHARS	00042	CHNOA	01441	CLALL	00343
CLEAR	00354	CONST	00700	CTEST	00561	DATCL	00336
DFLAG	00041	ENDAT	01337	FASET	00474	FIELD	01316
GAMMA	00451	HDG10	01214	HDG11	01243	INCNO	01315
INDEX	01335	INTG1	01144	MINFG	00051	MXLOC	01320
RFLAG	00052	PFLAG	00050	POINT	01325	POWER	01305
RFLAG	01340	SCALE	00714	SCAN1	01351	SCAN2	01405
SCAN3	01417	SCAN4	01423	SCAN5	01370	SCNO1	01322
SIGMA	00507	SPACE	01254	STDEV	00064	WIMCH	01010
ZTEST	01333	RPTA	00660	BPTR	00664	CHNO	01326
DATA	01327	DECF	00767	DECI	00765	ERM1	01440
ERMA	01355	HDG1	01151	HDG2	01156	HDG3	01162
HDG4	01166	HDG6	01172	HDG7	01175	HDG8	01201
HDG9	01204	INTG	01123	LIMB	01107	MEAN	00063
OVFL	01331	SCAN	01345	SCNO	01321	SEED	00701
SET7	00430	SIFG	00770	SIGN	00025	SIZE	00040
ST1A	00202	ST5A	00276	ST5B	00305	ST6A	00325
ST6B	00317	ST7A	00421	STRA	00441	SUMX	00005
AMP	00055	TYPE	00746	ZERO	00023	191	01344
DIF	00017	MAX	00001	MIN	00002	N24	01271
N63	01270	N64	01267	B14	01343	ONE	00024
P14	01302	P16	01303	P63	01304	ST1	00200
ST2	00210	ST3	00231	ST4	00237	ST5	00250
ST6	00311	ST7	00377	ST8	00432	STR	00540
STZ	00334	SUM	00044	TA1	00062	TA2	01261
TX1	00061	FA	01342	FE	01341	FG	00045
N2	01276	N4	01273	N5	01274	N6	01275
N8	01272	P6	01277	P8	01300	P9	01301
T1	00056	T2	00057	T3	00060	A	01265
D	01256	M	01255	N	00000	R	01257