Internal Maintenance Specification

MACRO ASSEMBLER 3.0 Update

MSOS 4.0 Operating System

M126A

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SECTION I

GENERAL INTERNAL OUTLINE OF 1700 MACRO ASSEMBLER

1. New Features of the 1700 Macro Assembler

A. Suppression of sequence errors when an * is encountered in column 73 (no sequence errors from inserts or deletes made by COSY).

B. Date will be listed in the heading on each page except for the table at the end.

C. Suppression of page ejects under no list (NLS).

1.1 Internal Flow of the 1700 Macro Assembler

The Macro Assembler is written in 5 segments. One segment is the controlling routine, ASSEM; the other four segments are the three passes of the assembler and TABLST.

1.1.1 Segment ASSEM

ASSEM is the controlling program of the assembler. The beginning of each pass contains this program. The program is also on the program library as a separate relocatable program which is loaded when *ASSEM is typed in.

Each ASSEM is the same length. The commands in each ASSEM are the same except for an EQU defining the symbol PS, the W1 and W2 parameters of the GTFILE request, and the ADC at the end of the program.

The function of ASSEM is to read in the passes of the assembler and start execution of the pass read in. It also checks to make sure the absolute base of the pass read in is correct. ASSEM overlays itself when each pass is read in. This is why each ASSEM is the same length and has about the same coding. Each pass of the assembler exits to ASSEM at completion of the pass.

1.1.1.1 ASSEM as a Separate Program

In this program PS is set to minus zero. Because it is negative, the first time switch in common storage is zeroed out. Also, because it is zero, it tells the program to read in PASS1 of the assembler. W1 and W2 in the GTFILE request are zero, meaning the whole permanent file of PASS1 will be read in.

1.1.1.2 ASSEM in PASS1

In this program PS is set to one which tells the program to read in PASS2. W1 and W2 in the GTFILE request are zero, meaning the whole permanent file of PASS2 will be read in.

1.1.1.3 ASSEM in PASS2

In this program PS is set to two which tells the program to read in PASS3. In the GTFILE request W1 is set to one and W2 is set to the length of PASS3. W2 is used within PASS2 to set to determine the starting address of the symbol table. If the length of PASS3 is changed, W2 in this ASSEM should also be changed.

1.1.1.4 ASSEM in PASS3

In this program PS is set to three which tells the program to read in TABLST. W1 and W2 in the GTFILE request are zero, meaning the whol permanent file of TABLST will be read in.

1.1.1.5 ASSEM in TABLST

In this program PS is set to zero which tells the program to read in PASS1. W1 and W2 in the GTFILE request are zero, meaning the whole permanent file of PASS1 will be read in.

1.2 Flowchart of ASSEM

1.3 General Flowchart of PASS1

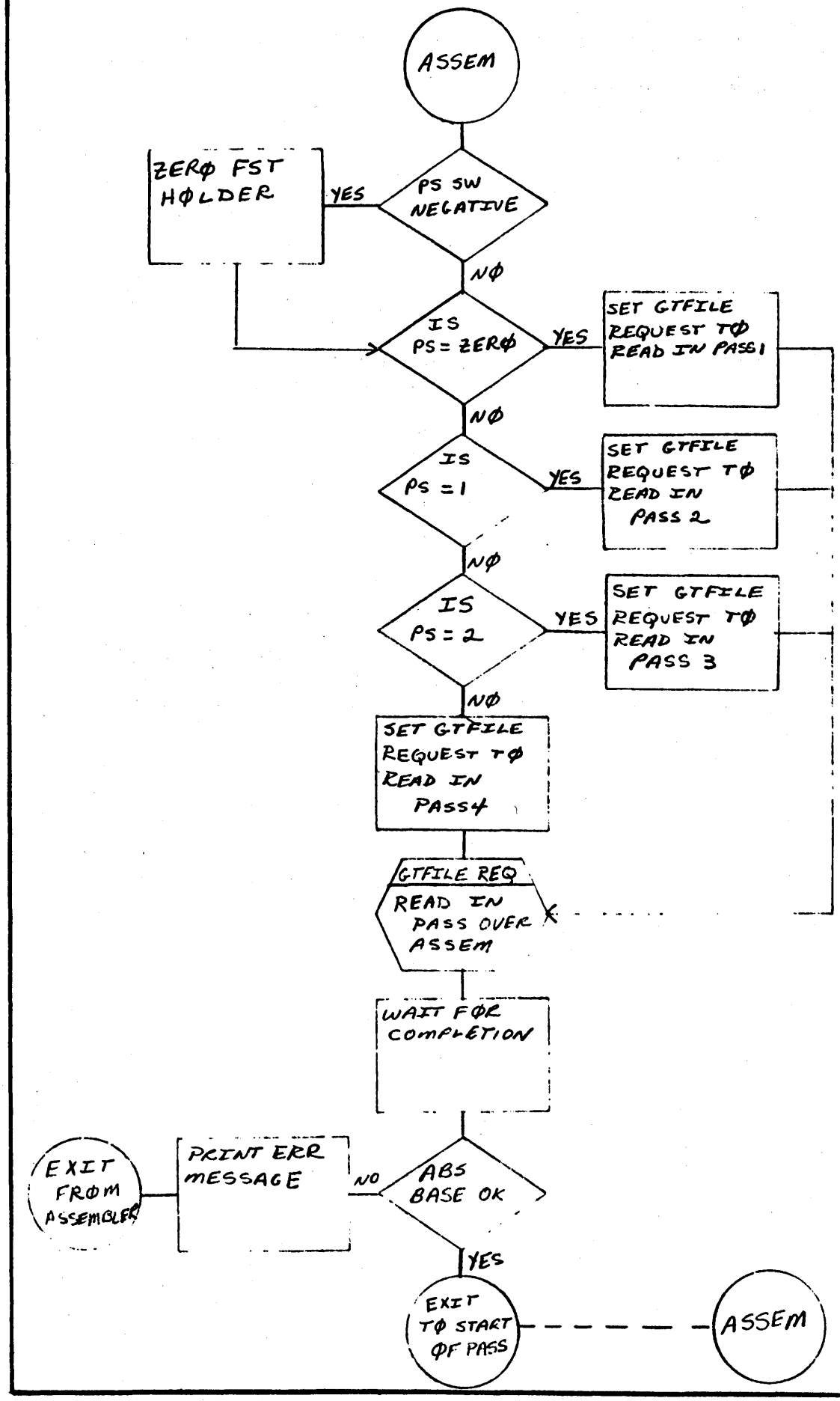
1.4 General Flowchart of PASS2

1.5 General Flowchart of PASS3

1.6 Switches and Holders Common to all Passes

Symbolic Name	Meaning
1. ERC	Holder for error count
2. FST	First time switch set by ASSEM
3. ILSCND	Contains sector number of last IL sector

	Symbolic Name	Meaning
4.	ILSCST	Contains the sector number of first IL sector
5.	L	Switch set when L option is selected
6.	LGSECT	Contains largest sector address assembler may access
7.	MM	Switch set when M option is selected
8.	P	Switch set when P option is selected
9.	SRSCST	Starting sector of mass storage scratch area used by assembler
10.	X	Switch set when X option is selected



REV	APPROVED	DATE

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

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NUMBER	1.2
ISSUE DATE	
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PROJECT MGR.	
PROJECT NAME	
TASK NO.	
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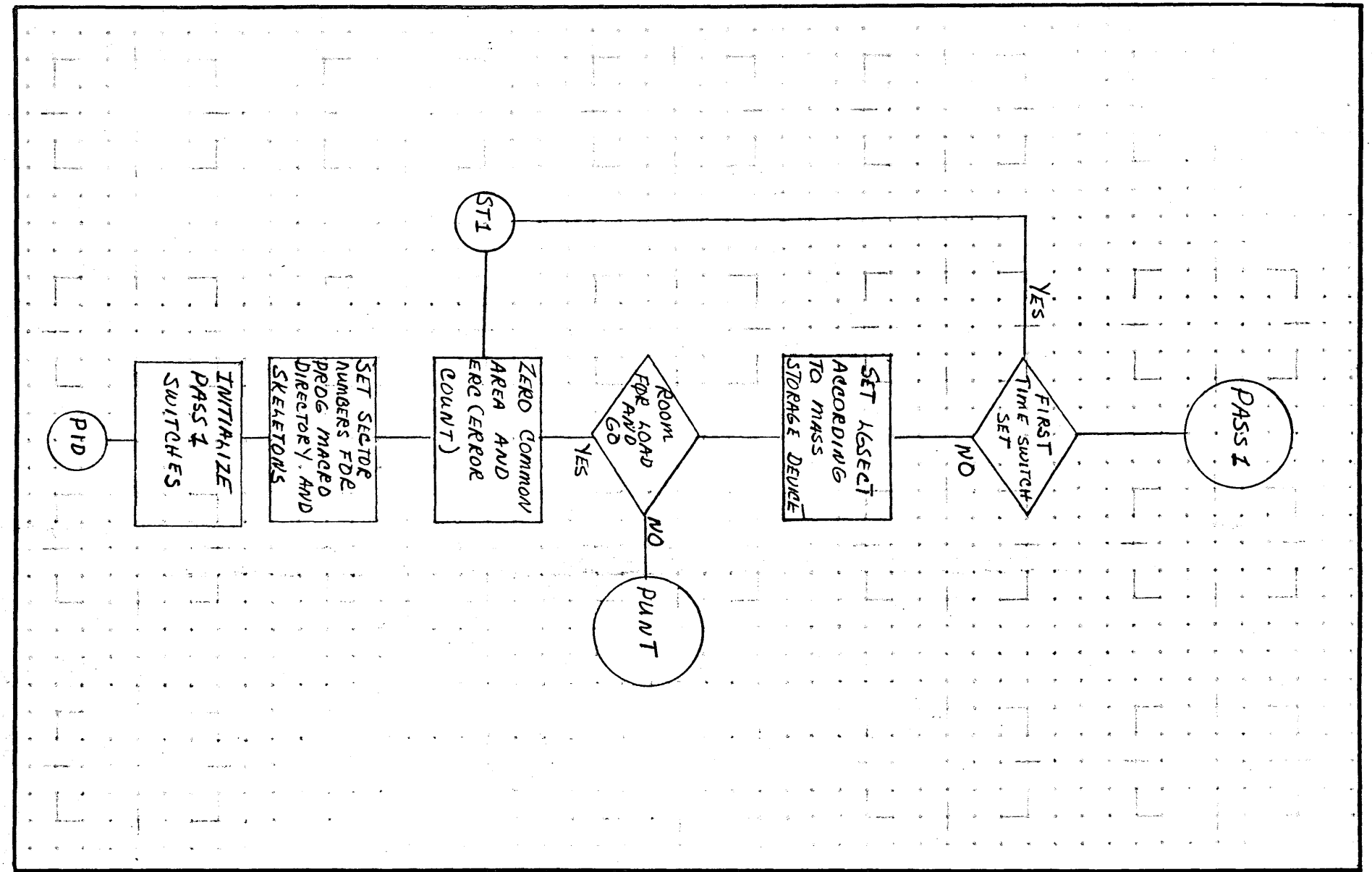

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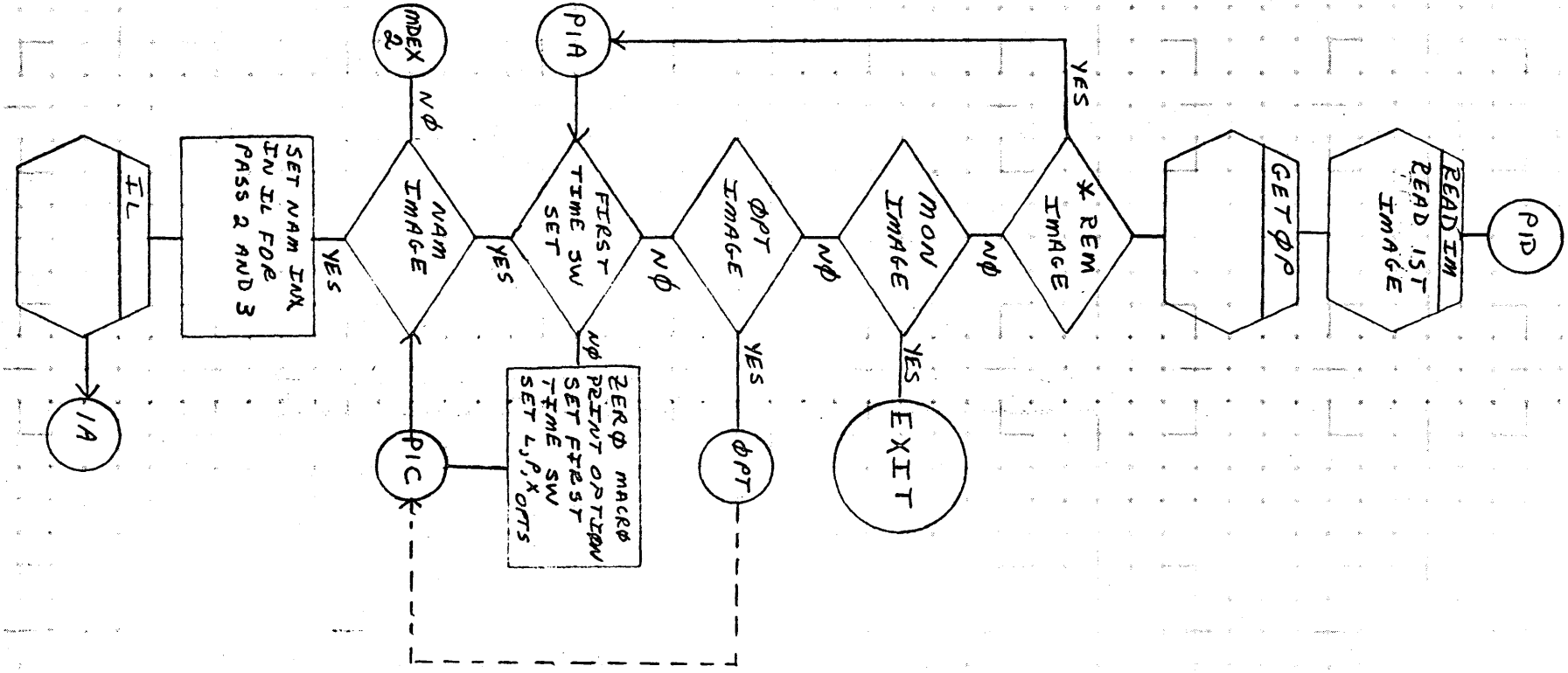

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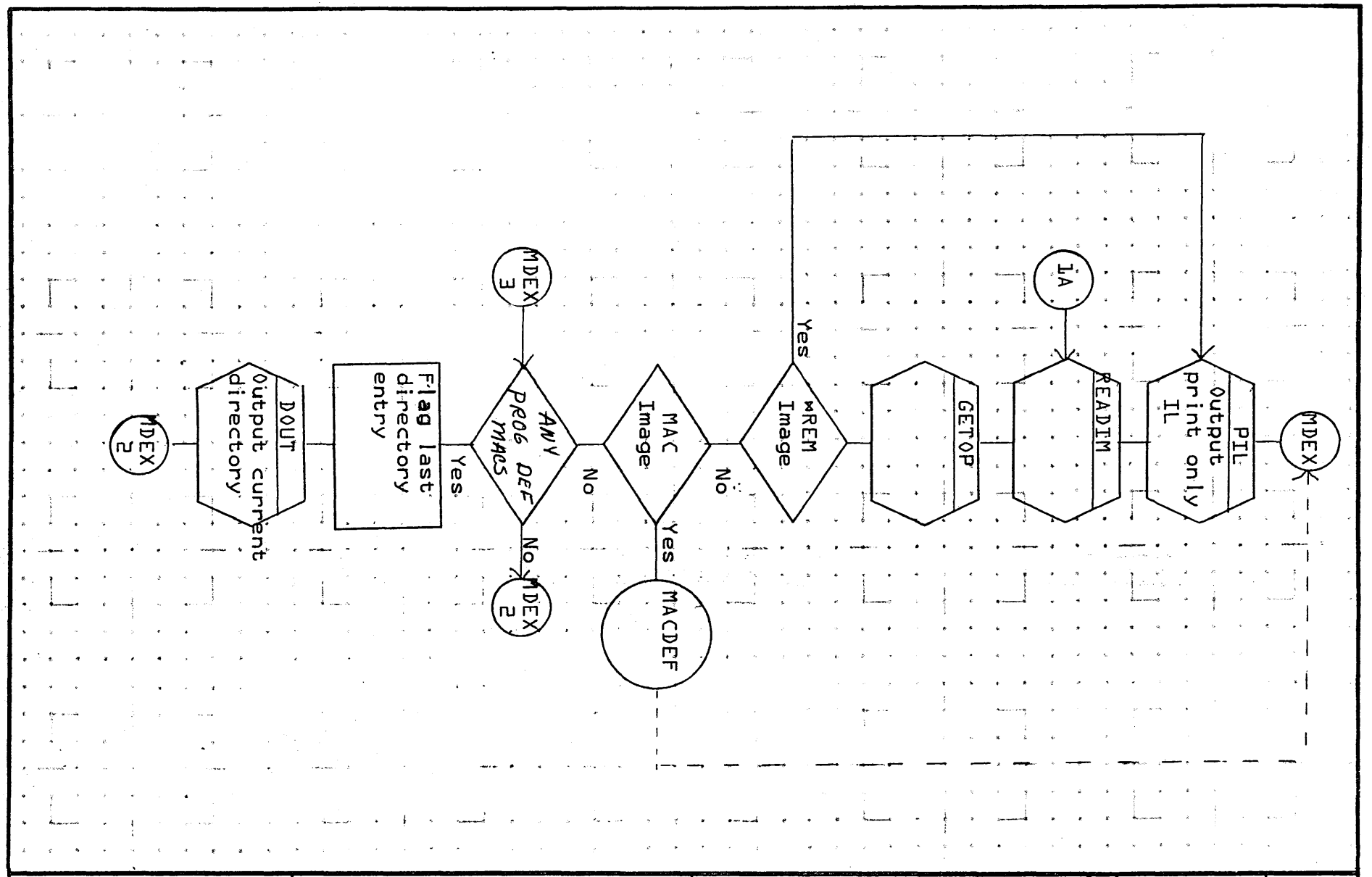

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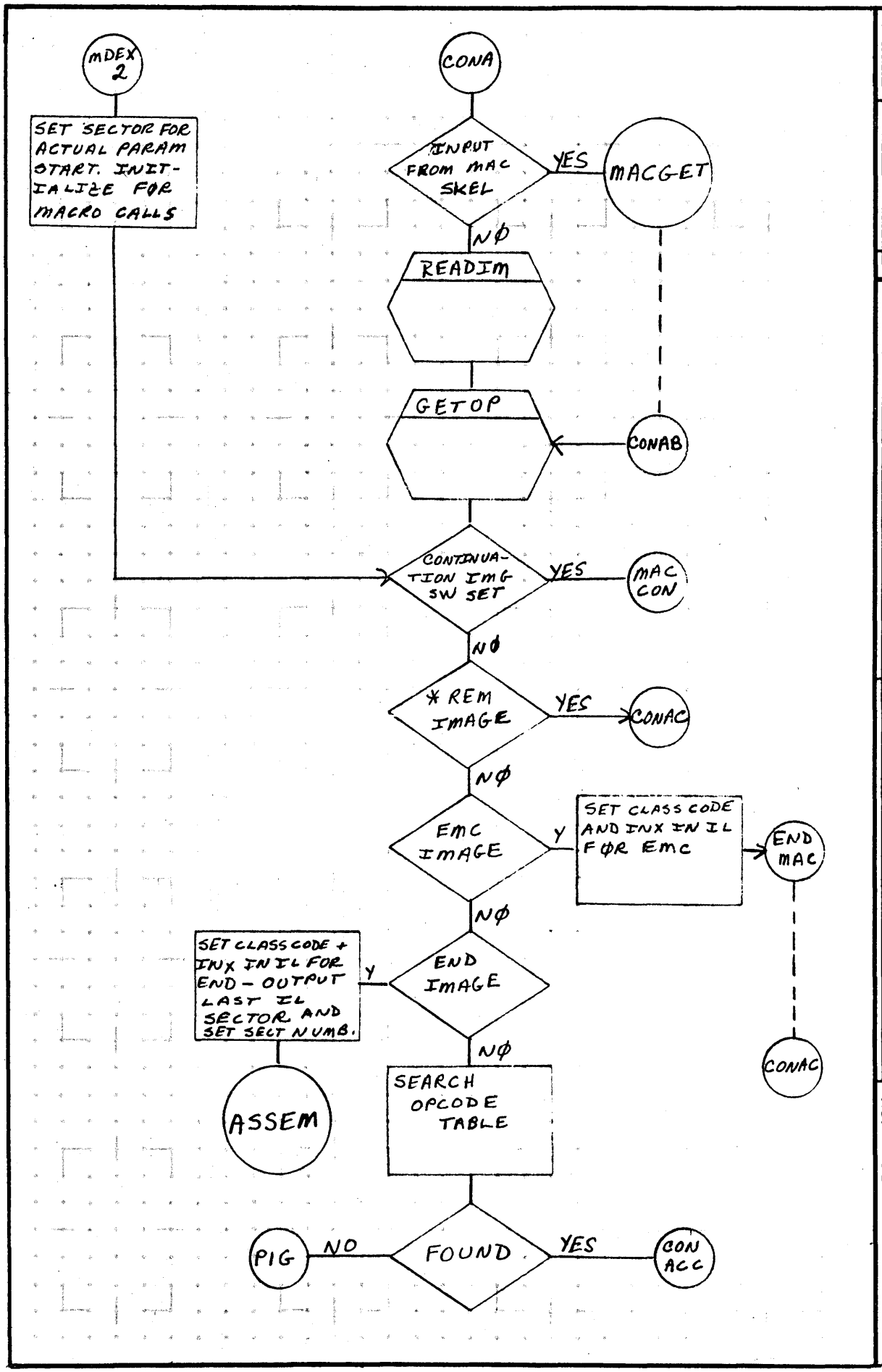

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PROJECT NO.
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TASK NO.
TASK NAME

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
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OTHER

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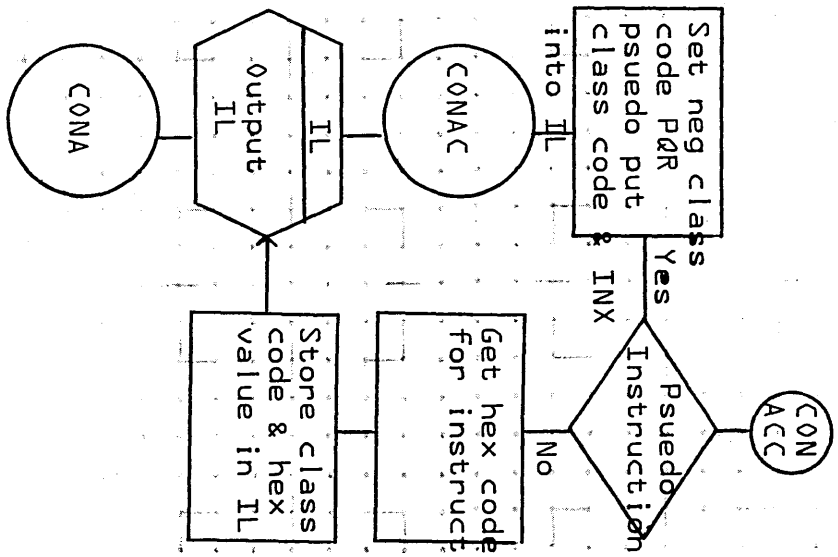

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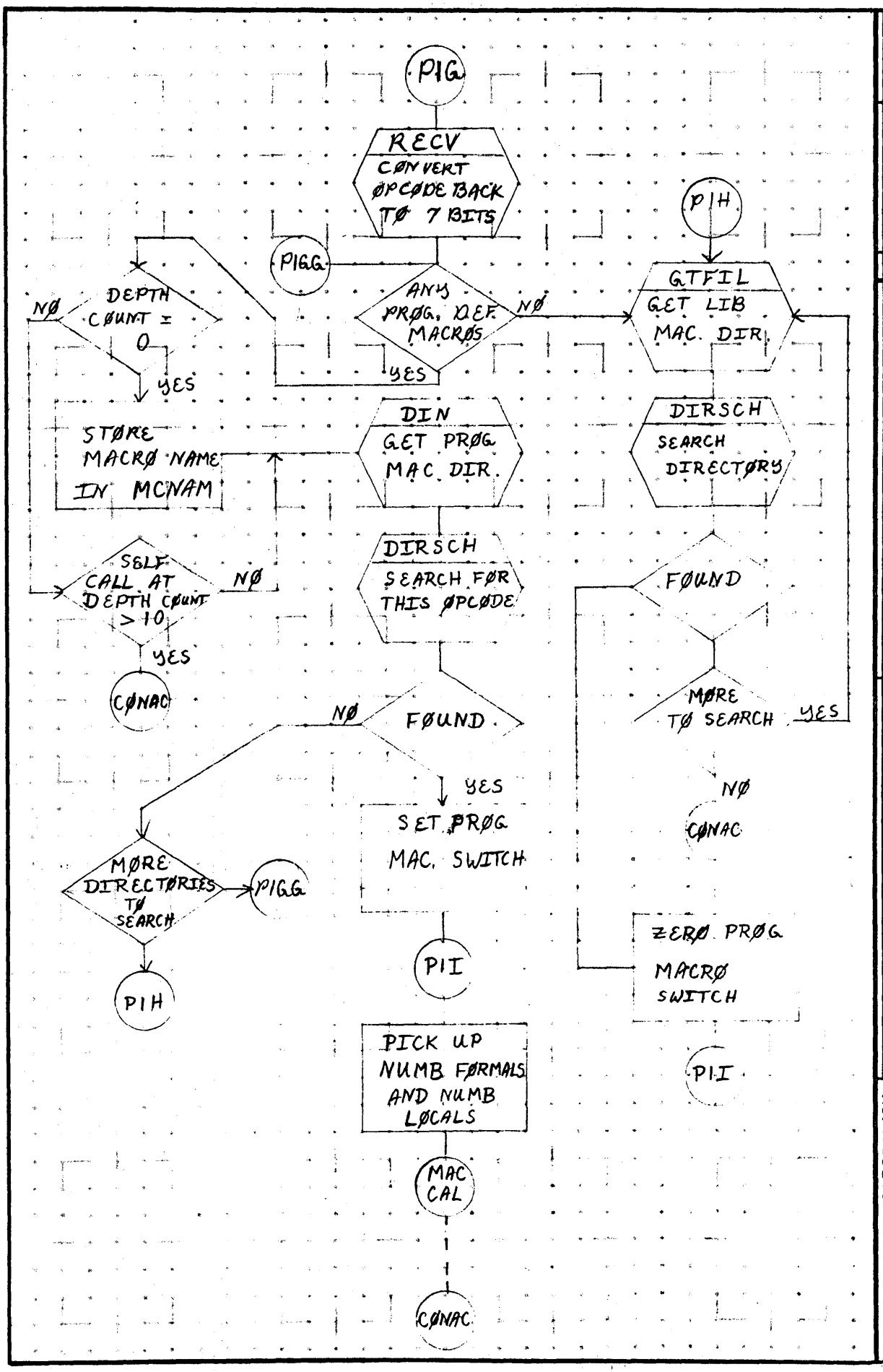

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TASK NO.					
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CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE
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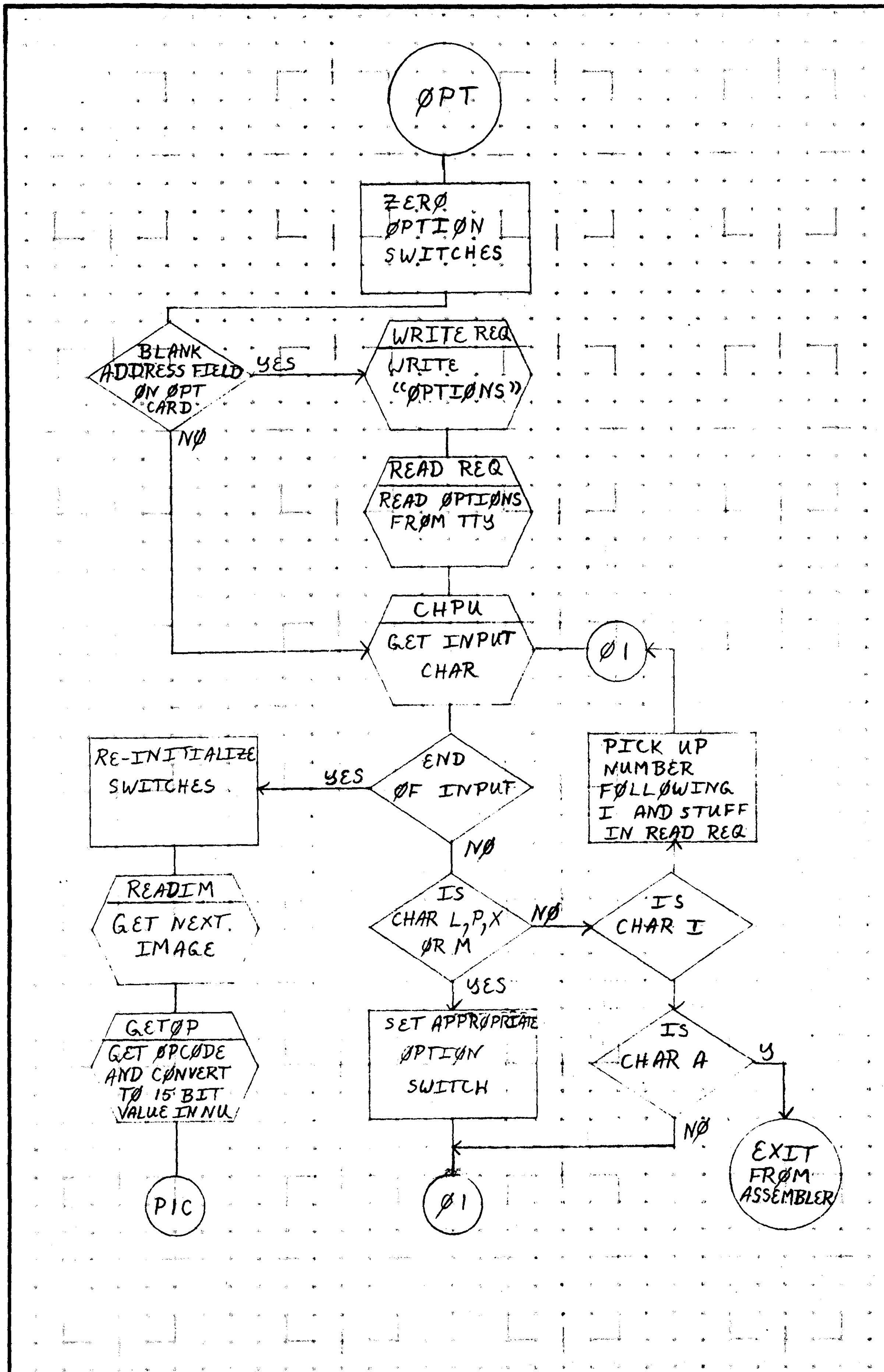

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

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NUMBER	1.3
ISSUE DATE	
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PROJECT NO.	
PROJECT MGR.	
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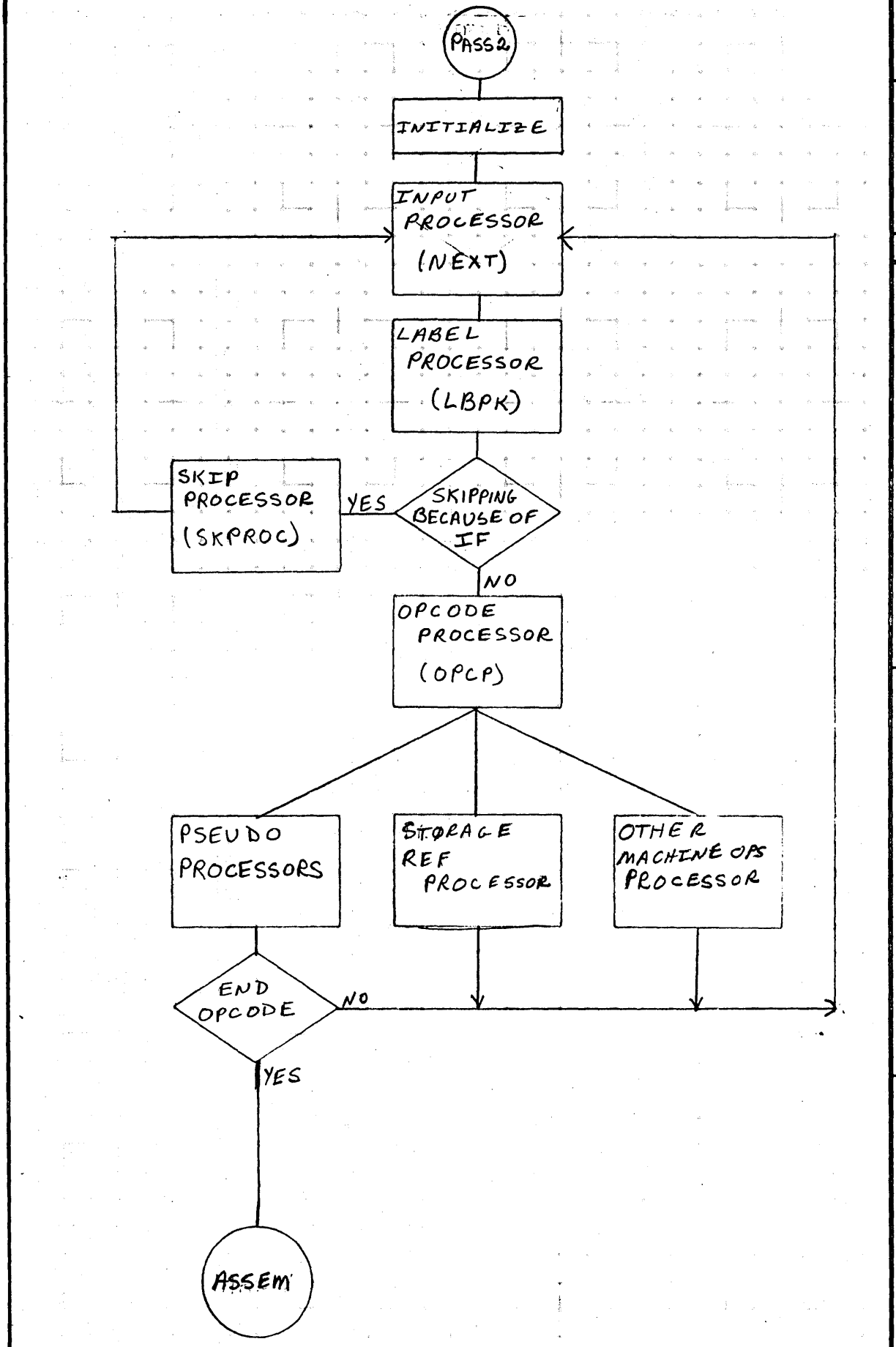

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SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

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PROJECT NAME	
TASK NO.	
TASK NAME	
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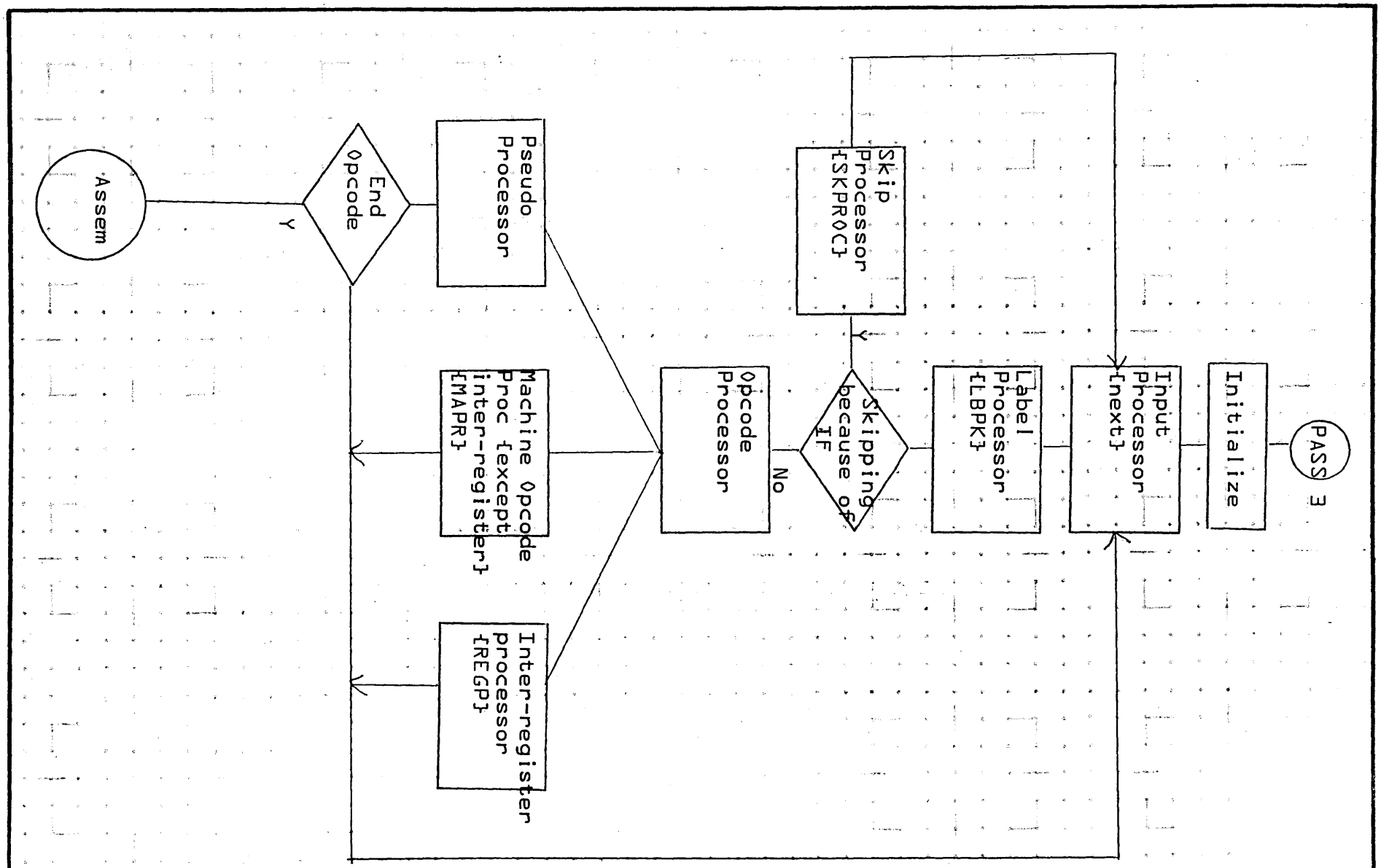

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	DRAWN BY DATE	TASK NAME			

SECTION II - PASS1

2. Pass 1 processes macro definitions, macro instructions and builds a copy of the source input on the mass storage device.

2.1 Macro Definition Routine (MACDEF)

The macro definition routine processes programmer defined macros. It builds a macro directory and skeletons on the mass storage device. The input macro skeletons are preprocessed and binary values are substituted for formal parameters and local labels.

This routine is the basis for the separate program LIBMAC which processes library macro definitions for output to the program library.

2.1.1 Flow Chart of Macro Definition Routine

2.1.2 Format of Macro Directory and Skeletons on Mass Storage

2.2 Macro Call Routine (MACCAL)

The Macro Call Routine processes macro instructions and builds the actual parameter table. Special handling is used for macros in depth and continuation images. Local labels are assigned unique values in this routine.

2.2.1 Flow Chart of Macro Call Routine

2.2.2 Actual Parameter Table Format

2.3 Macro Continuation Image Routine (MACCON)

This routine checks the legality of the continuation image opcode and exits to the Macro Call Routine.

2.3.1 Flow Chart of Macro Continuation Image Routine

2.4 Macro Get Routine (MACGET)

Macro Get substitutes actual parameters into the macro skeletons and outputs the skeletons to mass storage intermediate language.

2.4.1 Flow Chart of Macro Get Routine

2.5 End Macro Routine (ENDMAC)

This routine is used to remove the macro get mode. The routine is

entered when an EMC image is encountered. If the macro was in depth, the previous actual parameter table is read back into core.

2.5.1 Flow Chart of End Macro Routine

2.6 Macro Character Processor (MCHPR) and Character Pick Up Routines (CHPU)

The Macro Character Processor is used to process certain fields within macro images and non-macro images. It is used to pick up the opcode field symbol, formal parameters and local labels. There are two modes of operation, initial and alphanumeric. A field is processed until a terminator of blank, comma, plus, minus, or asterisk is encountered.

The character pickup routine picks up one character from the input image. If a special flag, AF, is set, the routine exits with the 7 bit value of the character. If this flag is not set, a six bit value is given for the character. If the switch IG is set at entrance, leading blanks are ignored.

2.6.1 Flow Chart of Macro Character Processor

2.6.2 Flow Chart of Character Pickup Routine

2.7 Miscellaneous Macro Subroutines

CHRPIC - This routine is used to get a character from the input source image or from the macro skeleton. It exits with the character in the A register. If the end of the image was reached, the A register is set negative at exit.

NEWPUT - This routine places characters in new images being generated by substituting parameters. If the new image is full, the A register is set negative at exit.

CRPUT - This routine is used to place a carriage return at the end of a new image.

ACTPUT - This routine places characters of actual parameters in the current actual parameter table.

ACTPIC - This routine gets characters from the actual parameter table.

SKLGET - This routine is used to read in a skeleton sector from either the scratch area or library area of the mass storage device.

GETOP - This routine is used to get the opcode of an image and convert it to a 15 bit value. The holder NU is used for the value. The routine sets this holder negative if an asterisk remark image is found.

MOVIMG - This routine is used to move a whole image into the new image buffer.

SKLOUT - This routine is used to output the current skeleton buffer to mass storage.

MER - This routine is used to print errors found in PASS1.

2.7.1 Flow Chart of Miscellaneous Macro Subroutines

2.8 Read Image Routine (READIM)

This routine reads source images from the standard input device. Each image is read into a 41 word buffer and then moved to a two image 96 word buffer. The reading is partially buffered in that the next read is initiated before the routine exits. This routine also does the sequence number checking.

2.8.1 Flow Chart of Read Image Routine

2.9 Intermediate Language Subroutines

PIL - This routine sets the print only IL bit in the 43rd word of the image. The routine calls IL to output the image.

IL - This routine outputs the IL buffer (double image input buffer) to mass storage.

ILOVFL - This routine checks for overflow of the IL area on mass storage.

2.9.1 Flow Chart of Intermediate Language Subroutines

2.9.2 Sector Format of Intermediate Language

2.10 Table of Core Allocation During PASS1

2.11 Table of Mass Storage Allocation During PASS1

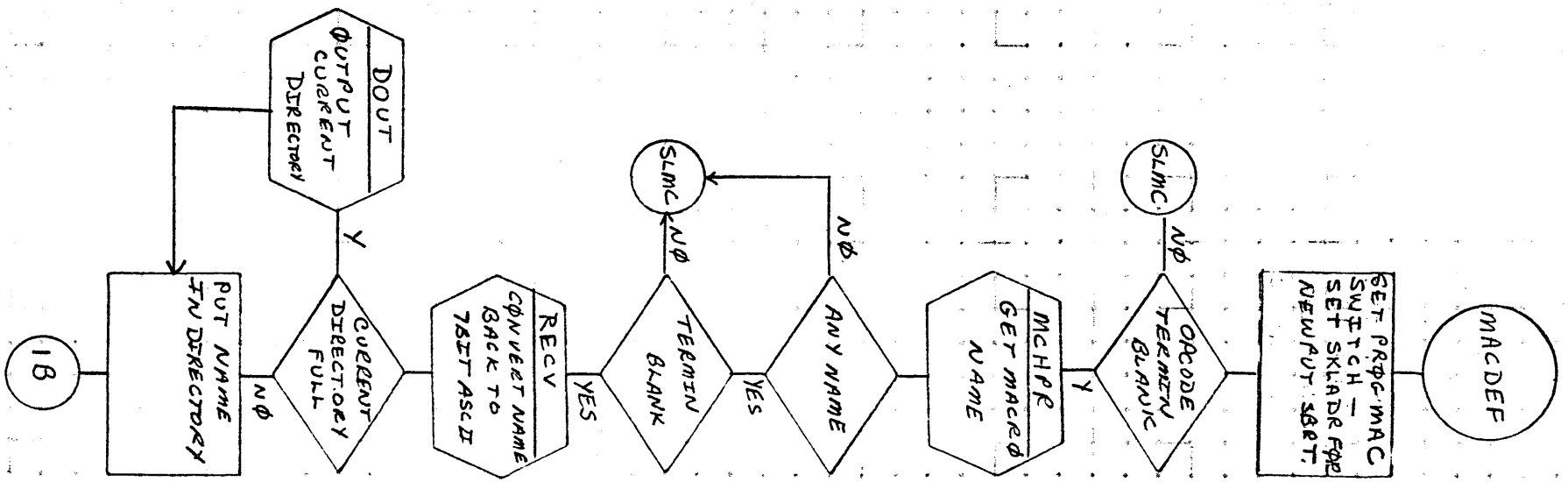
2.12 Opcode table Used in PASS1

2.13 Buffers, Switches, and Holders Used in PASS1

	SYMBOLIC NAME	MEANING
1.	ACADR	Contains address of current actual table
2.	ACC	Character counter for ACTPIC subroutine
3.	ACSECT	Sector number for next output of actual table to mass storage.

	SYMBOLIC NAME	MEANING
4.	ACTBL	First actual table. This table is always used when substituting parameters in the skeletons
5.	ACTBL2	Second actual table. Used when macro is called in depth.
6.	AF	Switch for CHPU so that 7 bit character is returned.
7.	AP	Apostrophe switch. Used in MACCAL routine
8.	BUFFSW	Input buffer switch. Indicates which half of INBUF the next image should go into.
9.	CHST	Temporary storage in NEWPUT.
10.	CM	Comma switch in MACCAL. Used to check legality of apostrophes in actual parameter list.
11.	CM1	Comma switch in MACCAL. Used to determine continuation image.
12.	CONS	Start of reserved area for switches and holders.
13.	CRPADR	Contains address of image for CHRPIC routine.
14.	CS	Character store. Contains character picked up by CHPU. Contains terminator after MCHPR has been used.
15.	CT	Character counter for CHPU subroutine.
16.	DC	Depth counter when macros are being called.
17.	DIRBUF	Used to build and search macro directories.
18.	DIRINX	Index used when building macro directory.
19.	FPRINX	Index used for formal parameter search.
20.	FSTM	First time switch for read image routine.
21.	IG	Switch set to ignore leading blanks in CHPU.
22.	ILSECT	Current IL sector number.
23.	INBUF	Double image input buffer - also used for output buffer of IL
24.	INBUF1	I/O input buffer. Images are initially read into this buffer.
25.	INPADR	Contains address of current image in INBUF1
26.	INSKBF	96 word buffer to read in skeleton sector
27.	LN	Current line number.

	SYMBOLIC NAME	MEANING
28.	LOCSW	Switch used in processing local labels.
29.	LOCTOT	Count of total local lagels in a subprogram.
30.	MSW1	Macro switch one. Tells CONA to go to MACGET routine.
31.	MSW2	Macro switch two. Indicates to CONA to go to MACCON for continuation image.
32.	NC	Character counter for NEWPUT subroutine.
33.	NL	Number local labels this macro.
34.	NOPG	Switch for programmer defined macros. If set, program has programmer defined macros.
35.	NU	Hold for converted15 bit opcode.
36.	NULSW	Switch in MACCAL and MACGET to indicate null parameters.
37.	PGSCST	Start sector for programmer macro directory.
38.	PGSECT	Current sector for programmer macro directory.
39.	PM	Switch for programmer macro when macro is called. 0 = library macro, 1 = programmer macro.
40.	PTBL	Formal parameter buffer area.
41.	RCS	Read image completion switch.
42.	SKBFSW	Skeleton buffer switch. Indicates which half of SKLBUF is being used.
43.	SKLADR	Address of current skeleton image in SKLBUF.
44.	SKLBUF	96 word buffer for skeleton sector.
45.	SKSCST	Start sector for skeletons.
46.	SKWDCT	Count kept for pointer in macro directory to skeleton sector.
47.	SQ	5 word hold for last sequence number
48.	SY	4 word hold for symbol from MCHPR
49.	TP1	Temporary storages
50.	T1	Temporary storages
51.	XMOD	Used in MCHPR - also used for temporary storage.



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DECISION TABLE ☐☐	NUMBER 2.1.1	ISSUE DATE	TASK NO.			
OTHER ☐☐	DRAWN BY	DATE	TASK NAME			

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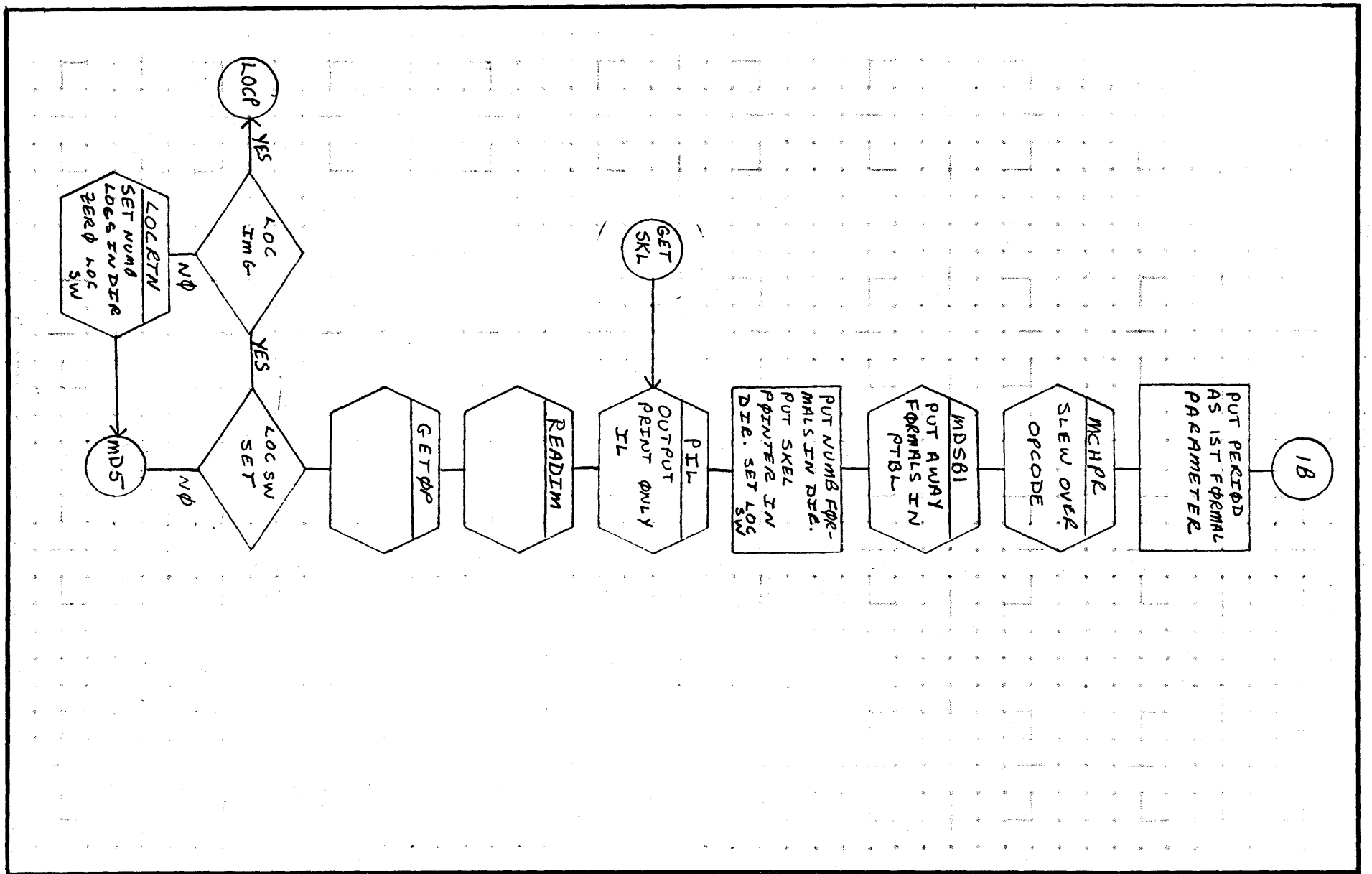

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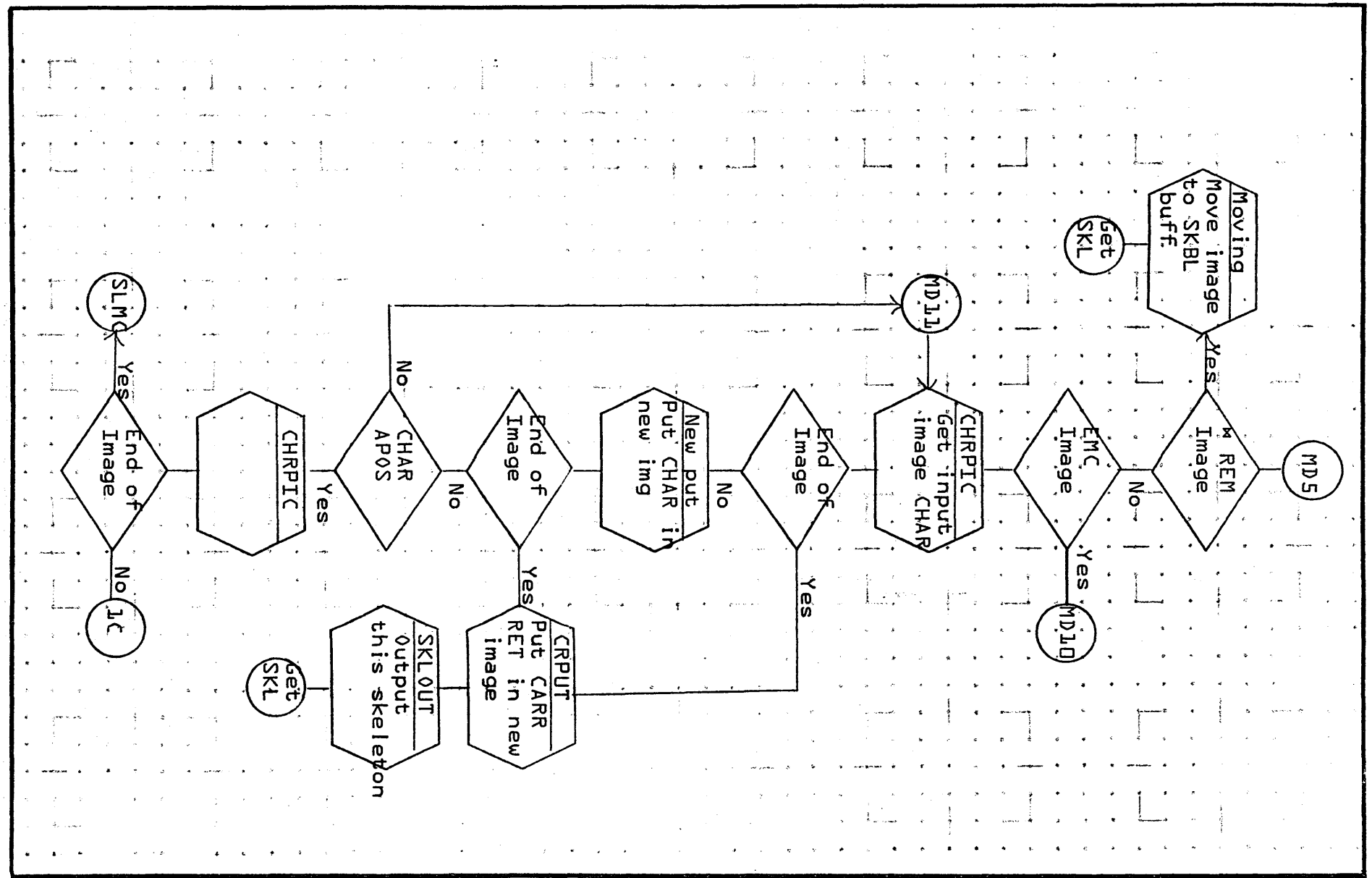

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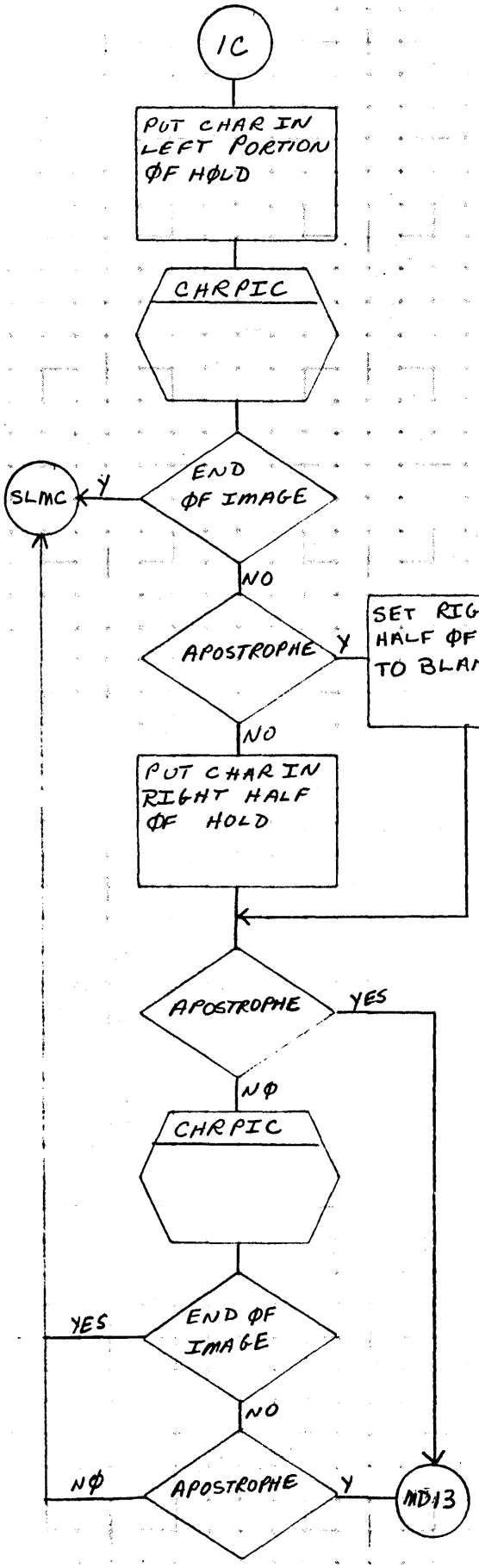

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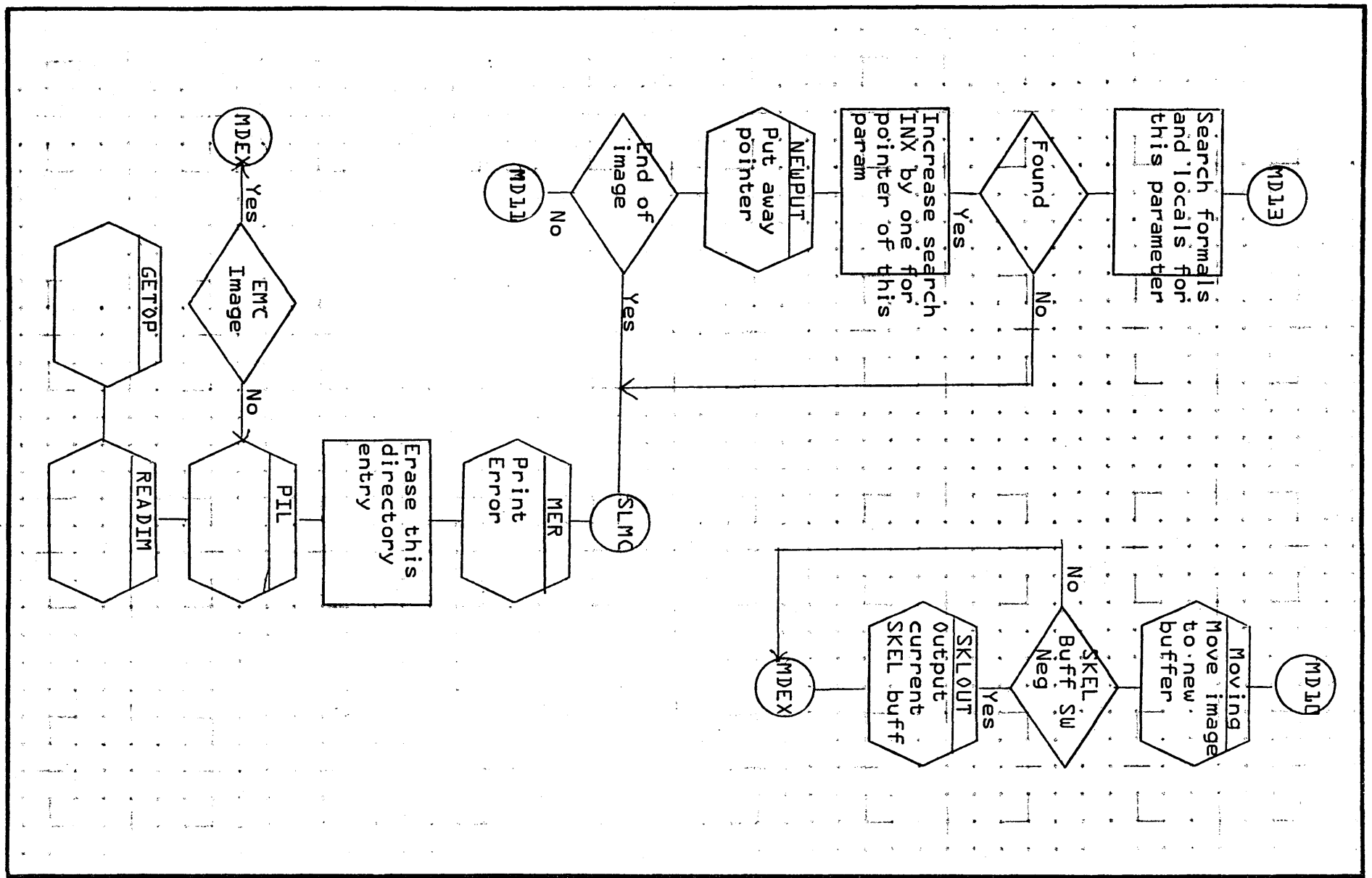

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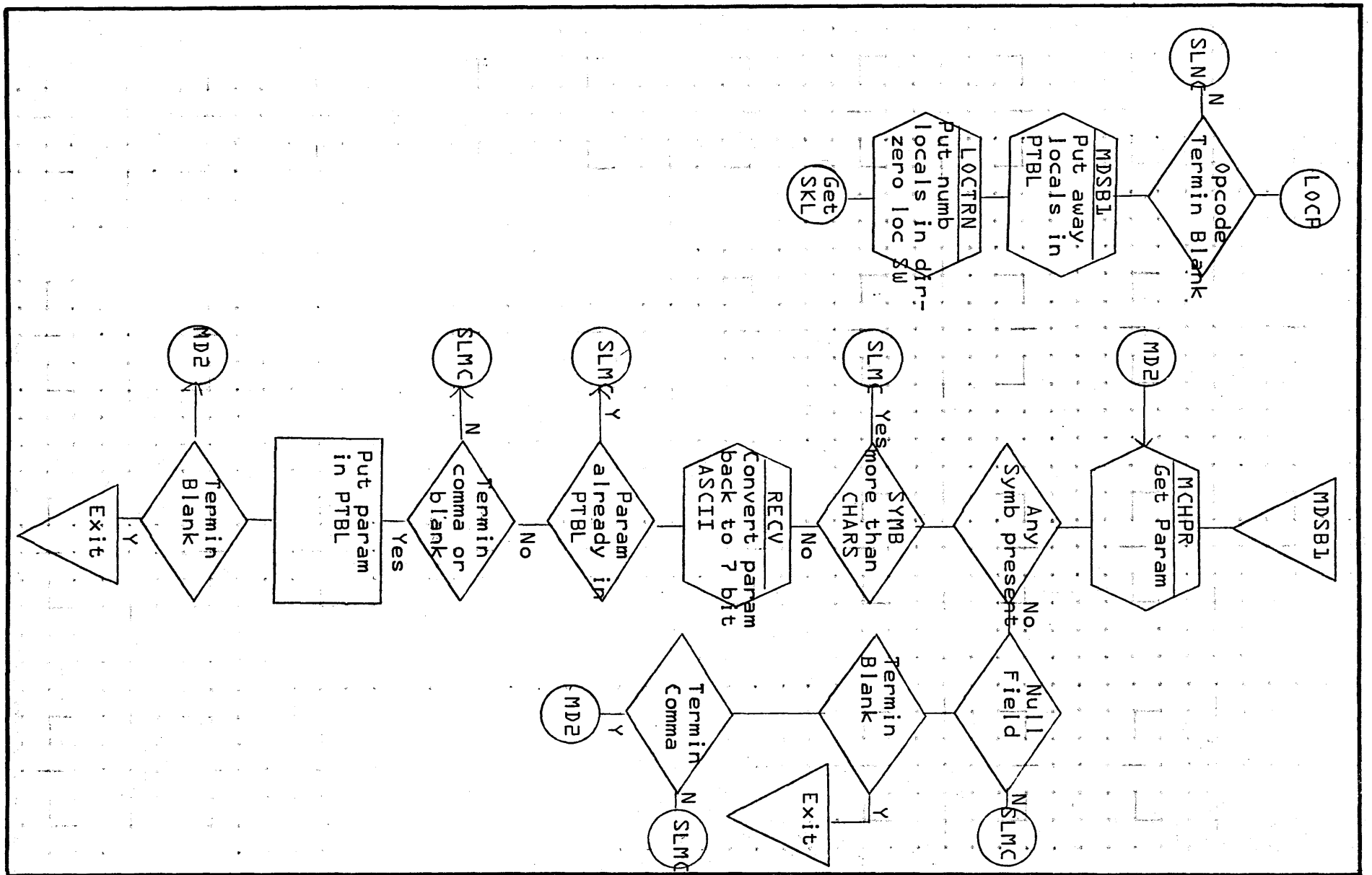

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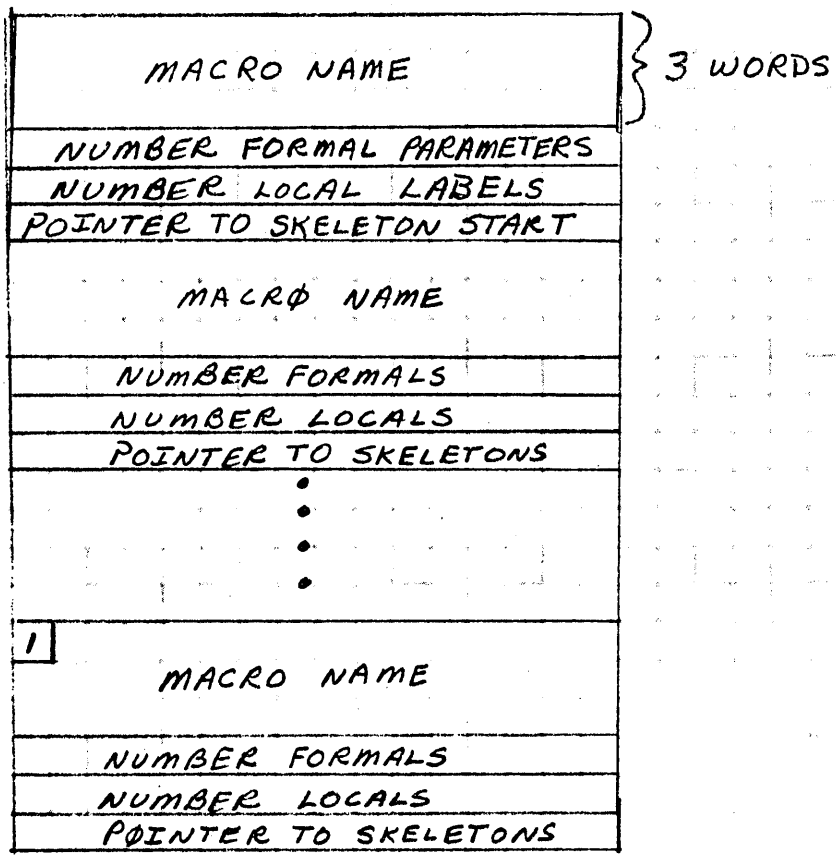
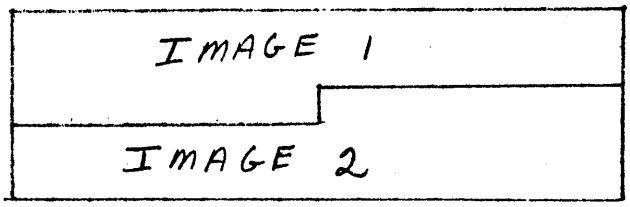
MACRO DIRECTORY FORMAT



SKELETONS



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FLOWCHART
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OTHER

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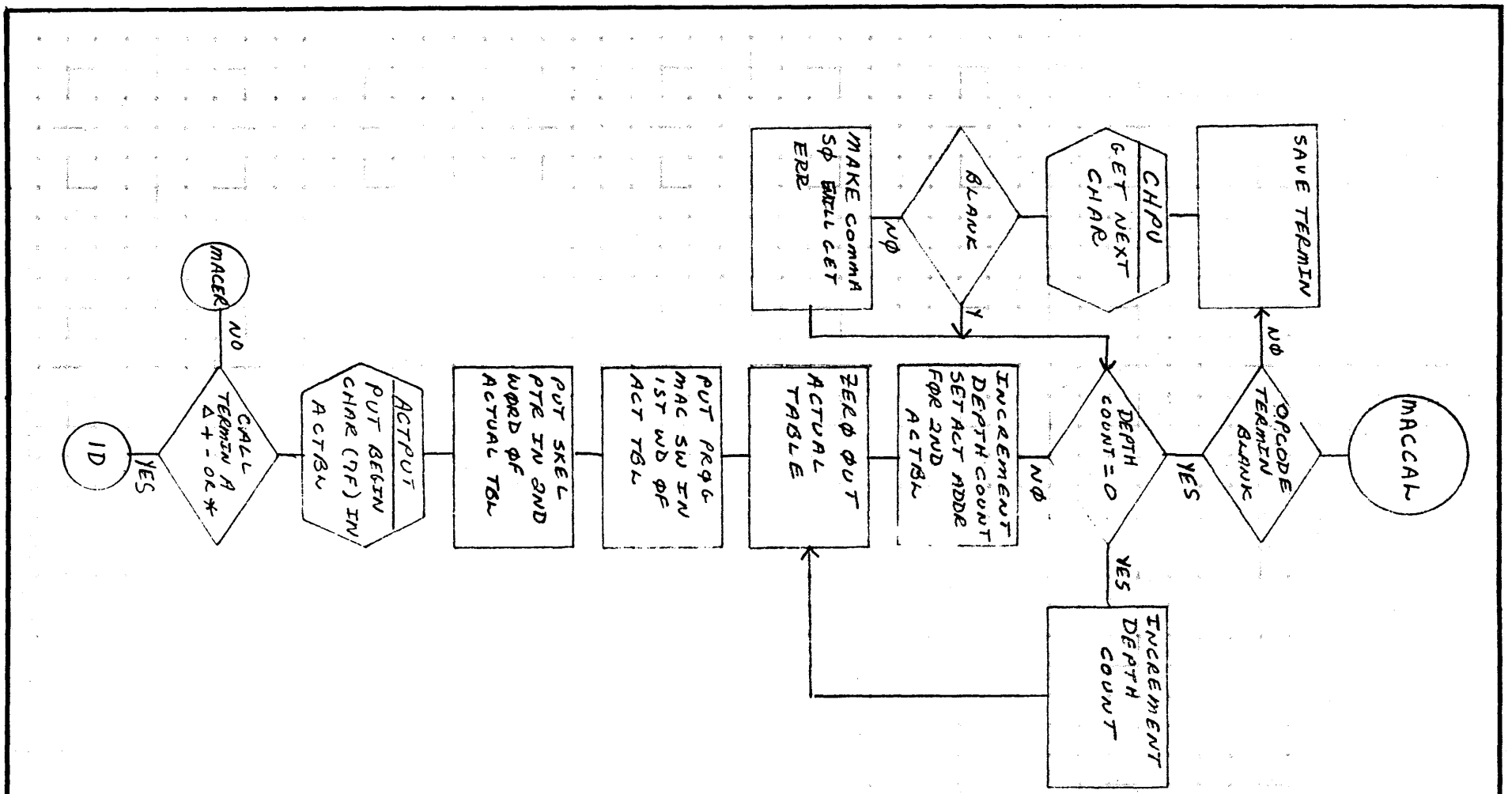

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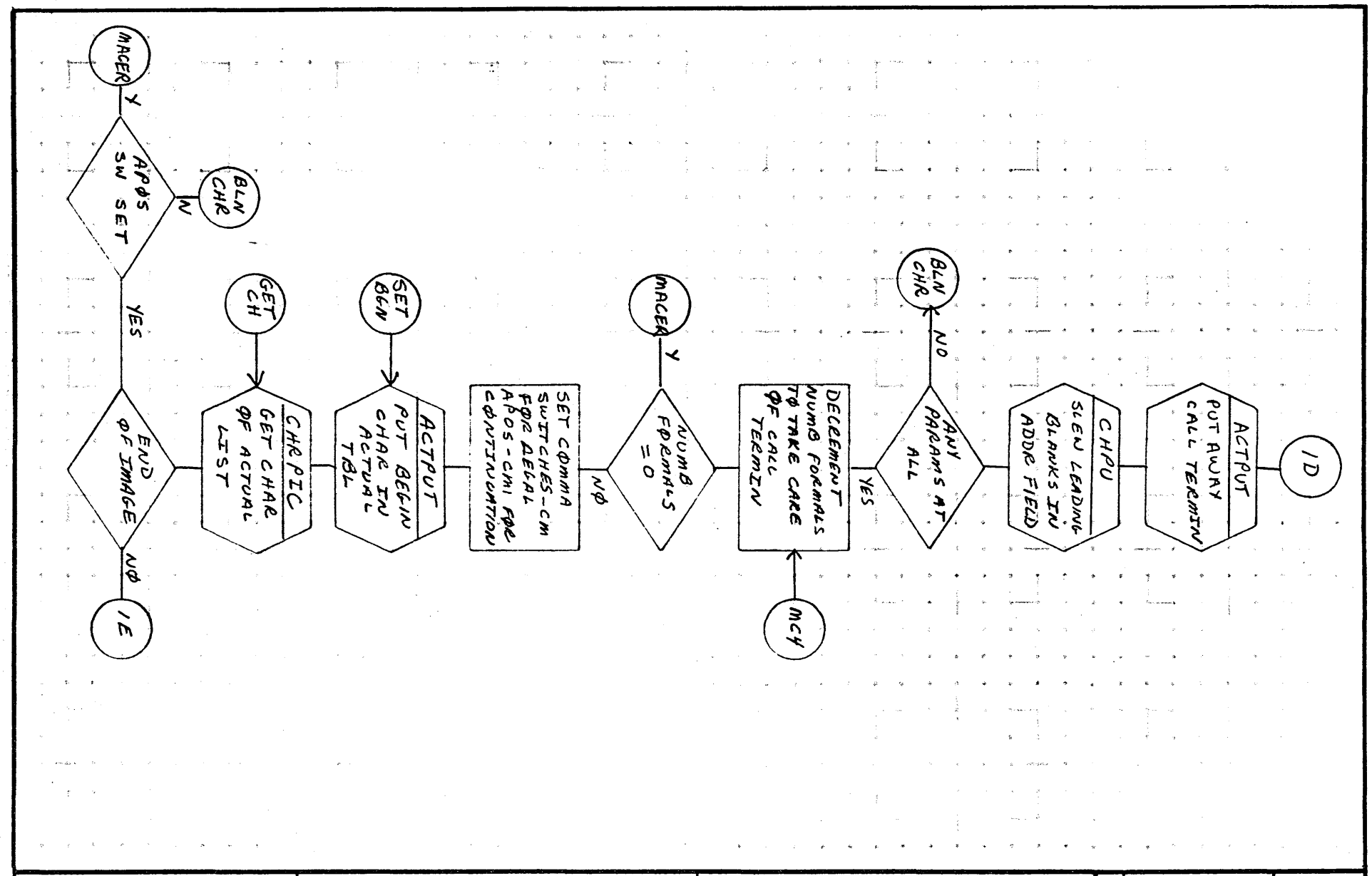
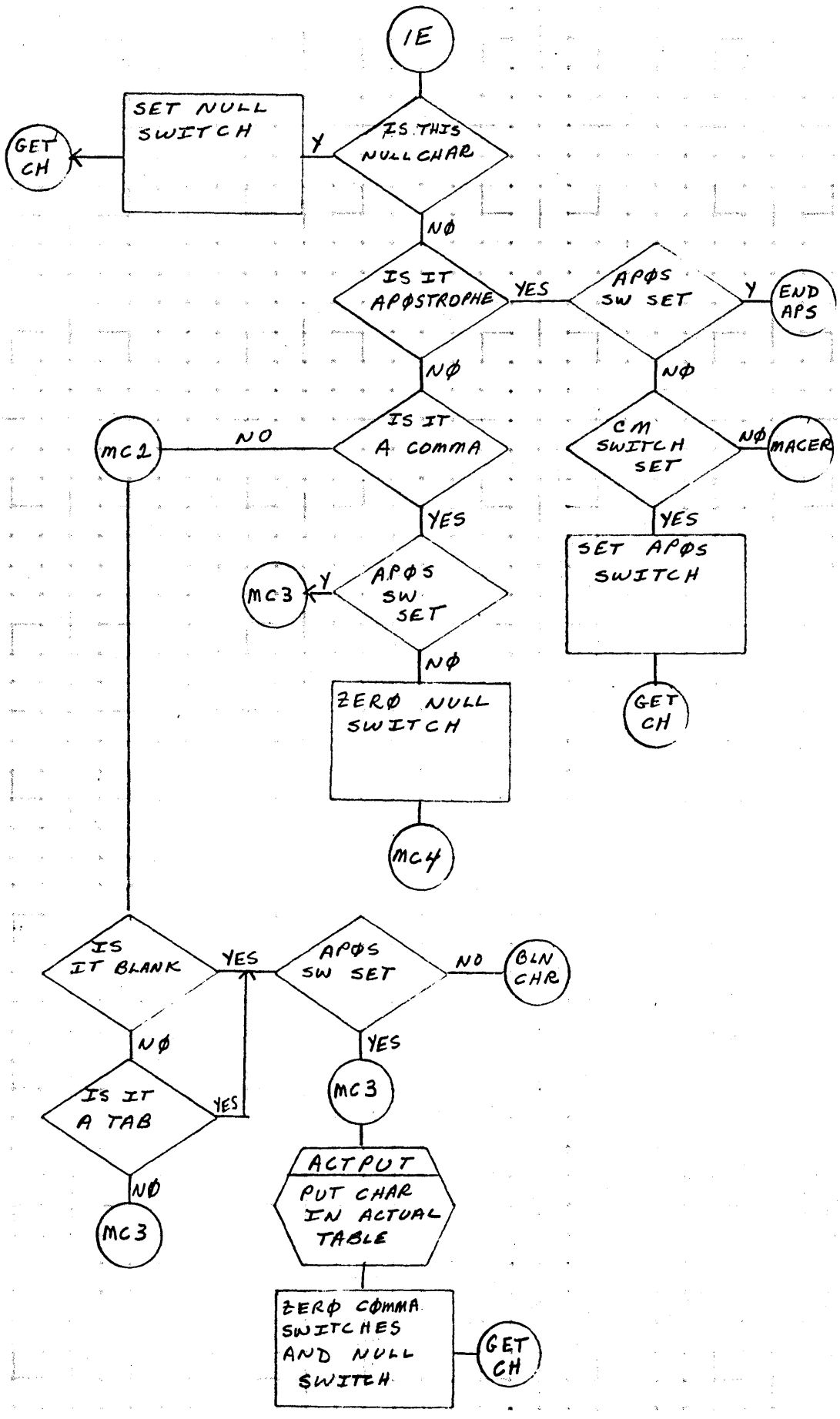
	DRAWN BY DATE	TASK NO.			
		TASK NAME			



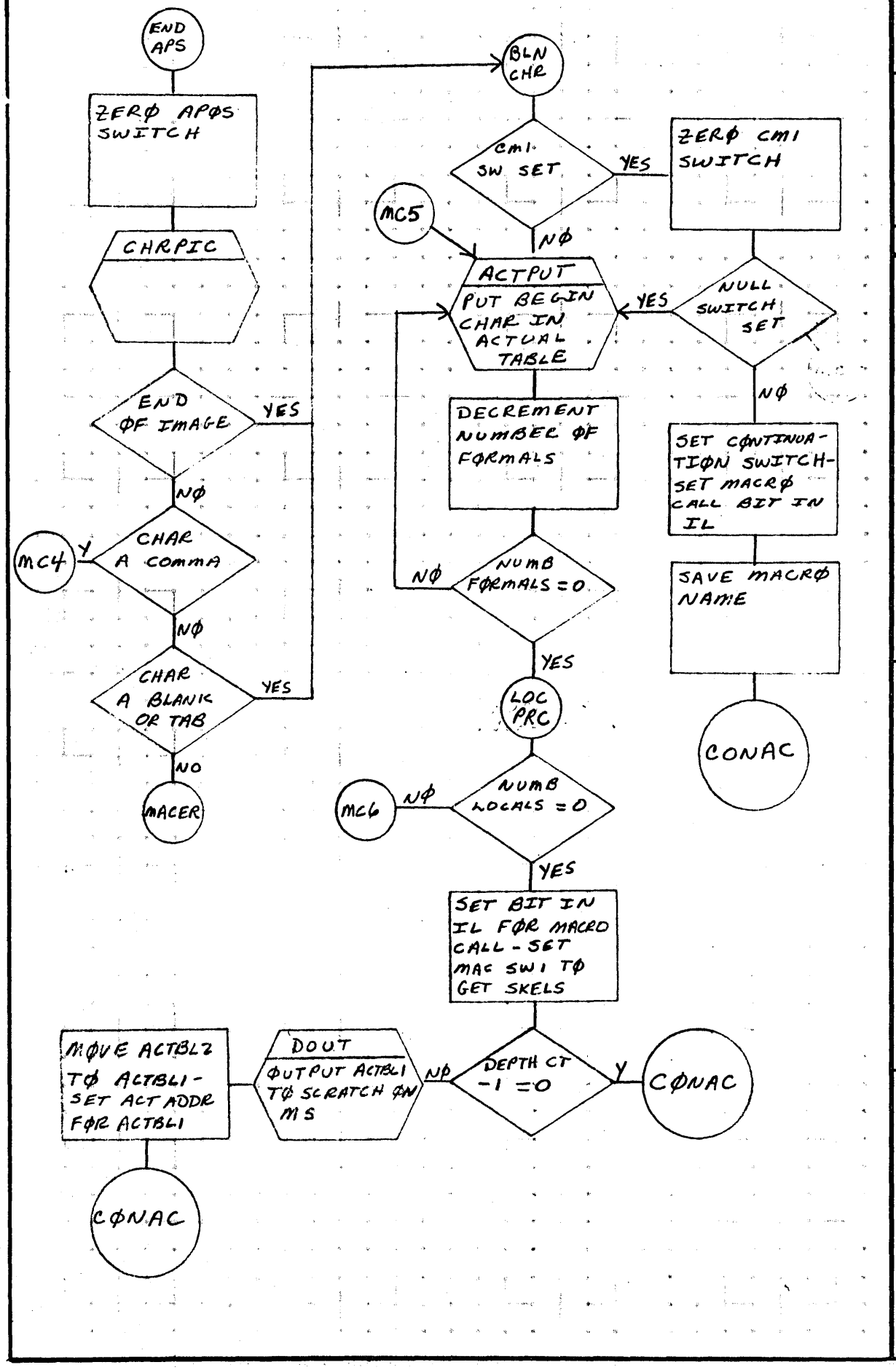
CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
SAMPLE CODE ☐	DOCUMENT TITLE MACRO CALL		PROJECT MGR.		
FLOWCHART ☐		PAGE 2 OF 5	PROJECT NAME		
DECISION TABLE ☐	NUMBER 2.2.1	ISSUE DATE	TASK NO.		
OTHER ☐	DRAWN BY	DATE	TASK NAME		

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION		REV	APPROVED	DATE
SOFTWARE DOCUMENT				
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐				
DOCUMENT CLASS	MACH. TYPE 1700	PROJECT NO.		
DOCUMENT TITLE MACRO CALL		PROJECT MGR.		
	PAGE 3 OF 5	PROJECT NAME		
NUMBER 2.2.1	ISSUE DATE	TASK NO.		
DRAWN BY	DATE	TASK NAME		

AA1385 (FOR CA127-1)



DOCUMENT CLASS	SYS	MACH./SYS	
DOCUMENT TITLE	MACRO CALL	PAGE 4 OF 5	
NUMBER	2.2.1	ISSUE DATE	
DRAWN BY		DATE	

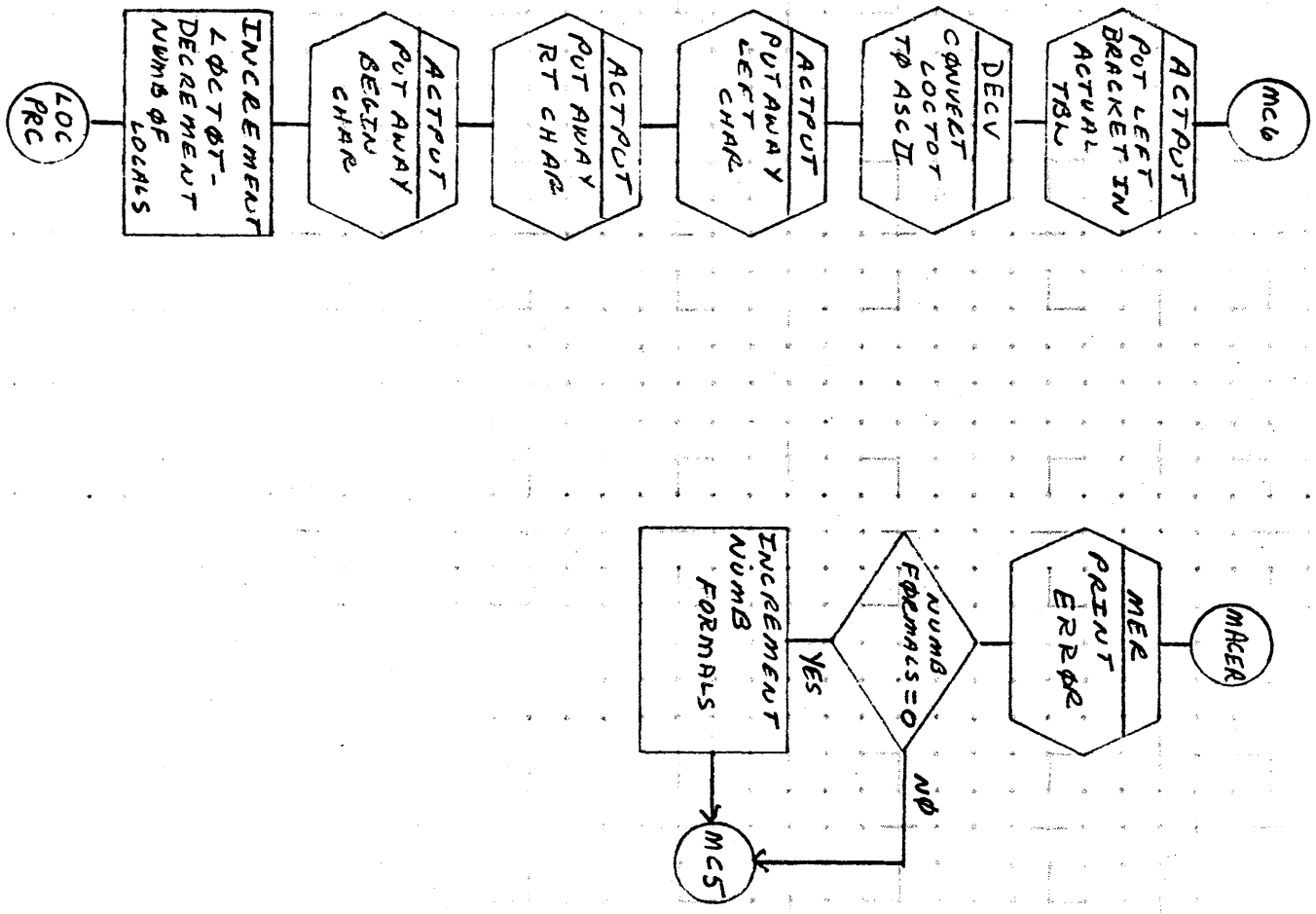
REV	APPROVED	DATE

PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

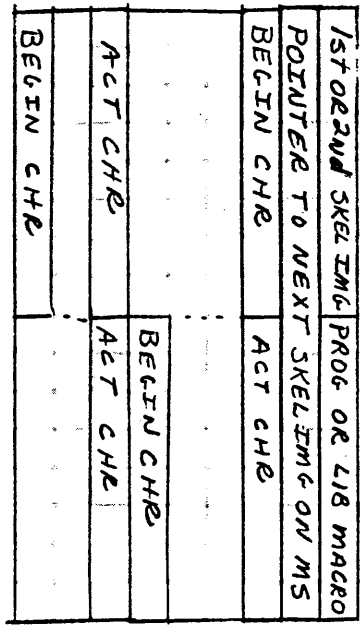
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

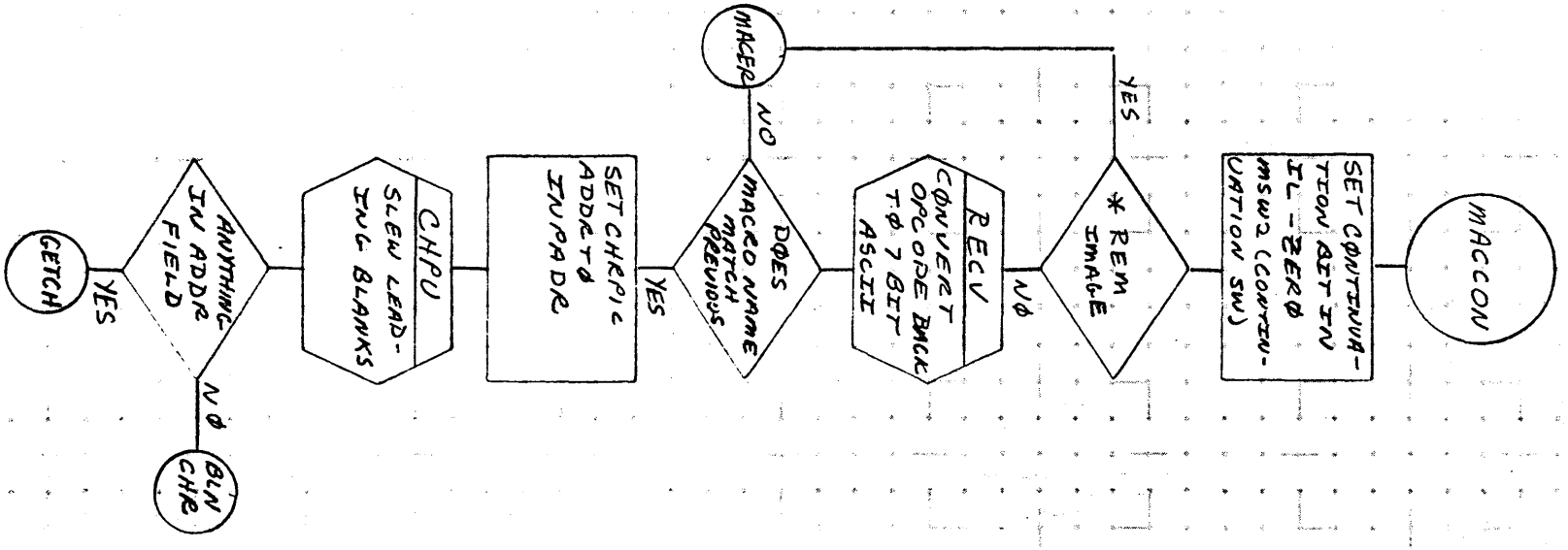
AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE MACRO CALL	PROJECT MGR.			
	PAGE 5 OF 5	PROJECT NAME			
	NUMBER 2.2.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

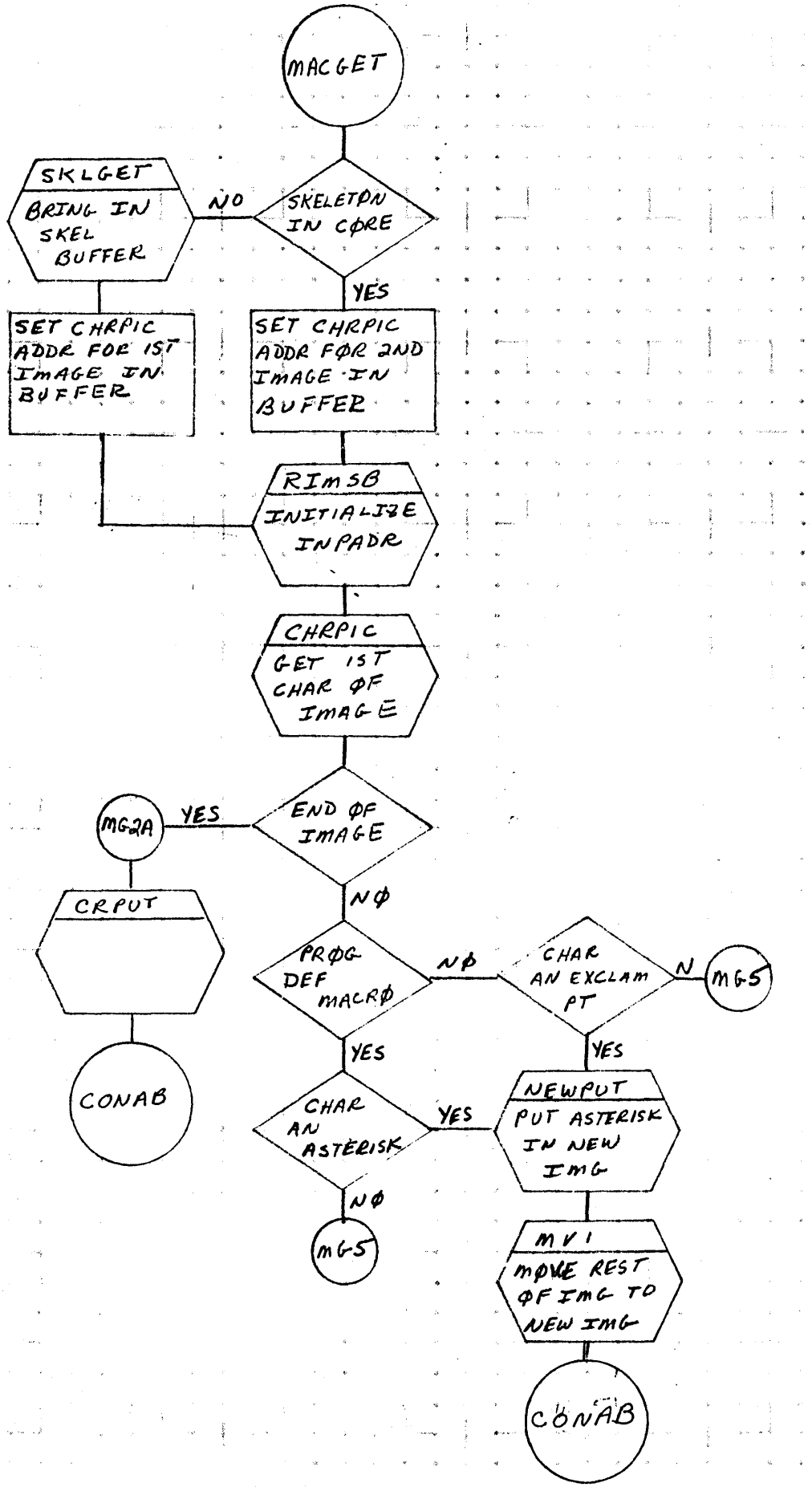


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE Actual Table Format PAGE 1 OF 1	PROJECT MGR.			
		PROJECT NAME			
	NUMBER 2.2.2 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐					
DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
DOCUMENT TITLE MACRO CONTINUATION		PROJECT MGR.			
IMAGE ROUTINE	PAGE 1 OF 1	PROJECT NAME			
NUMBER 2.3.1	ISSUE DATE	TASK NO.			
DRAWN BY	DATE	TASK NAME			

AA1385 (FORM CY CA127-1)



DOCUMENT CLASS	IMS	MACH. TYPE	1700
DOCUMENT TITLE	GET MACRO SKELETON	PAGE	1 OF 3
ROUTINE NUMBER	2.4.1	ISSUE DATE	
DRAWN BY		DATE	

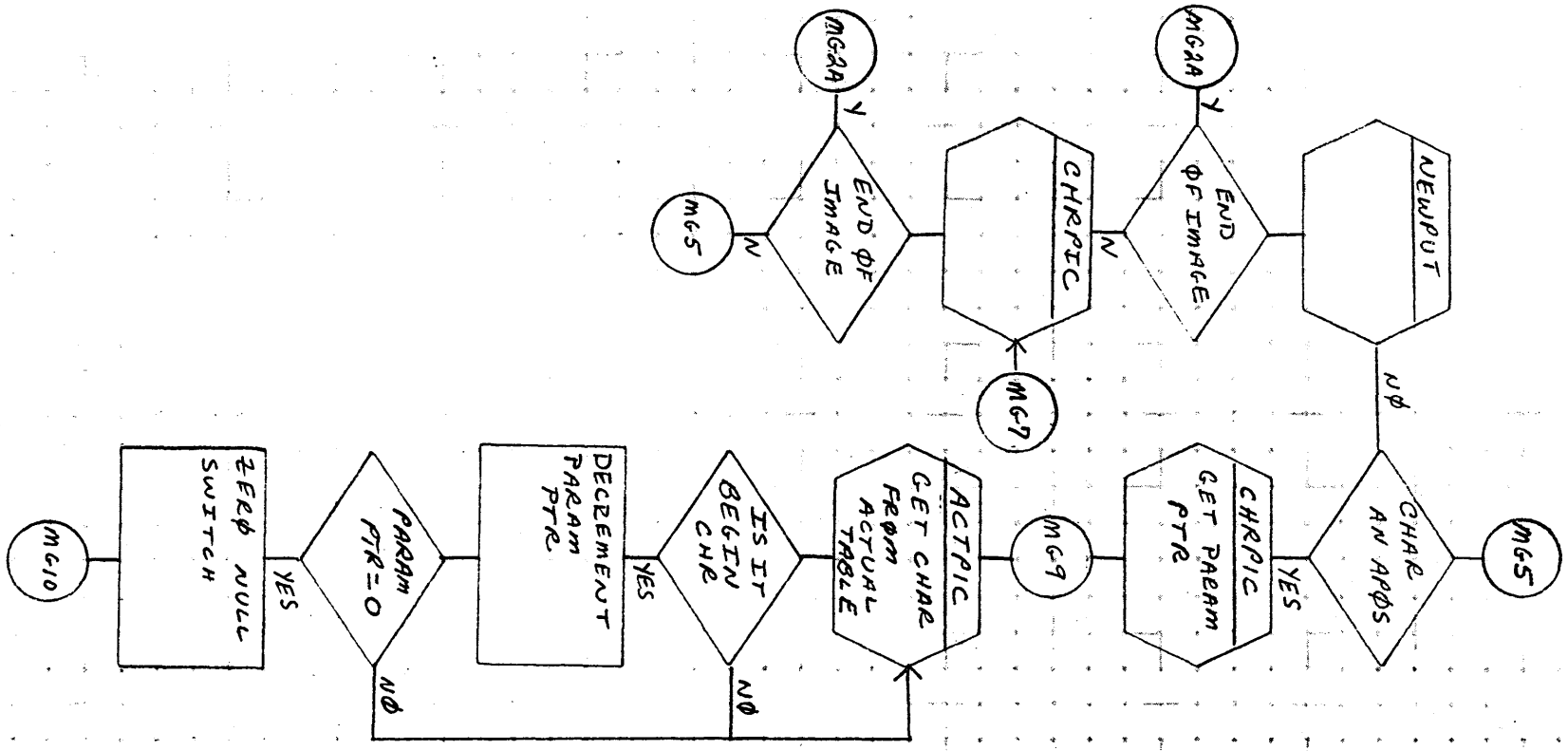
REV	APPROVED	DATE

PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

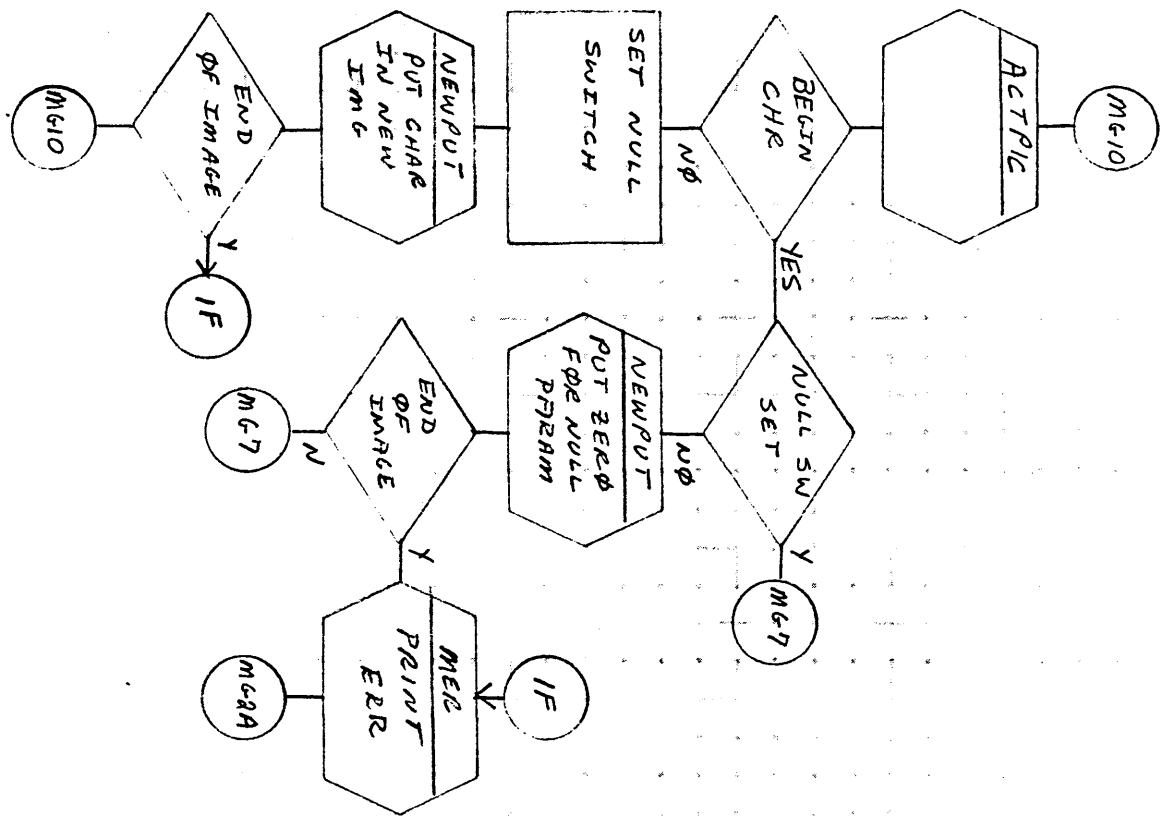
SAMPLE CODE ☐
FLOWCHART ☐
DECISION TABLE ☐
OTHER ☐

AA1385 (FORMERLY CA127-1)

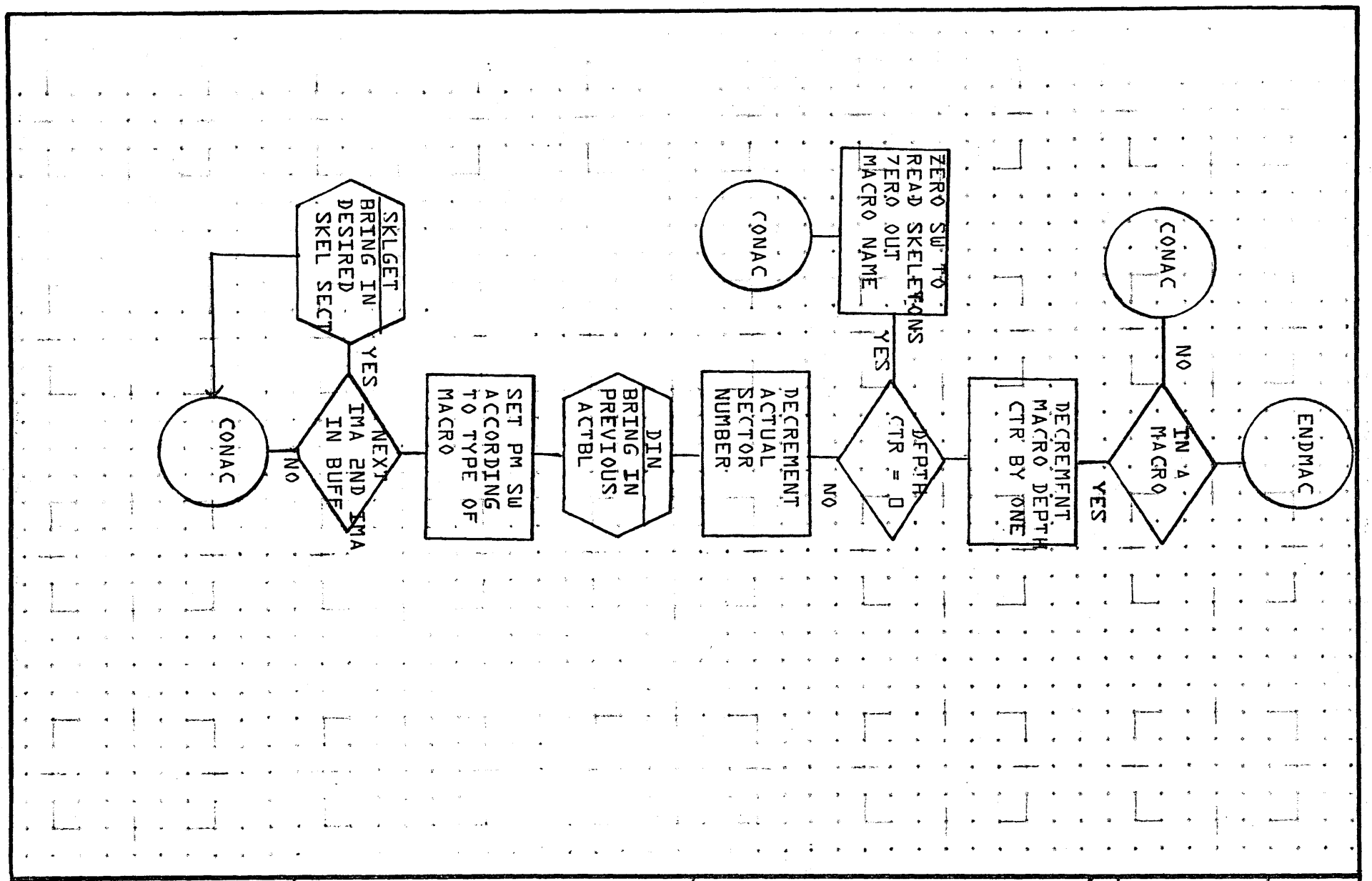


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE GET MACRO SKELETON	PROJECT MGR.			
	PAGE 2 OF 3	PROJECT NAME			
	NUMBER 2.4.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

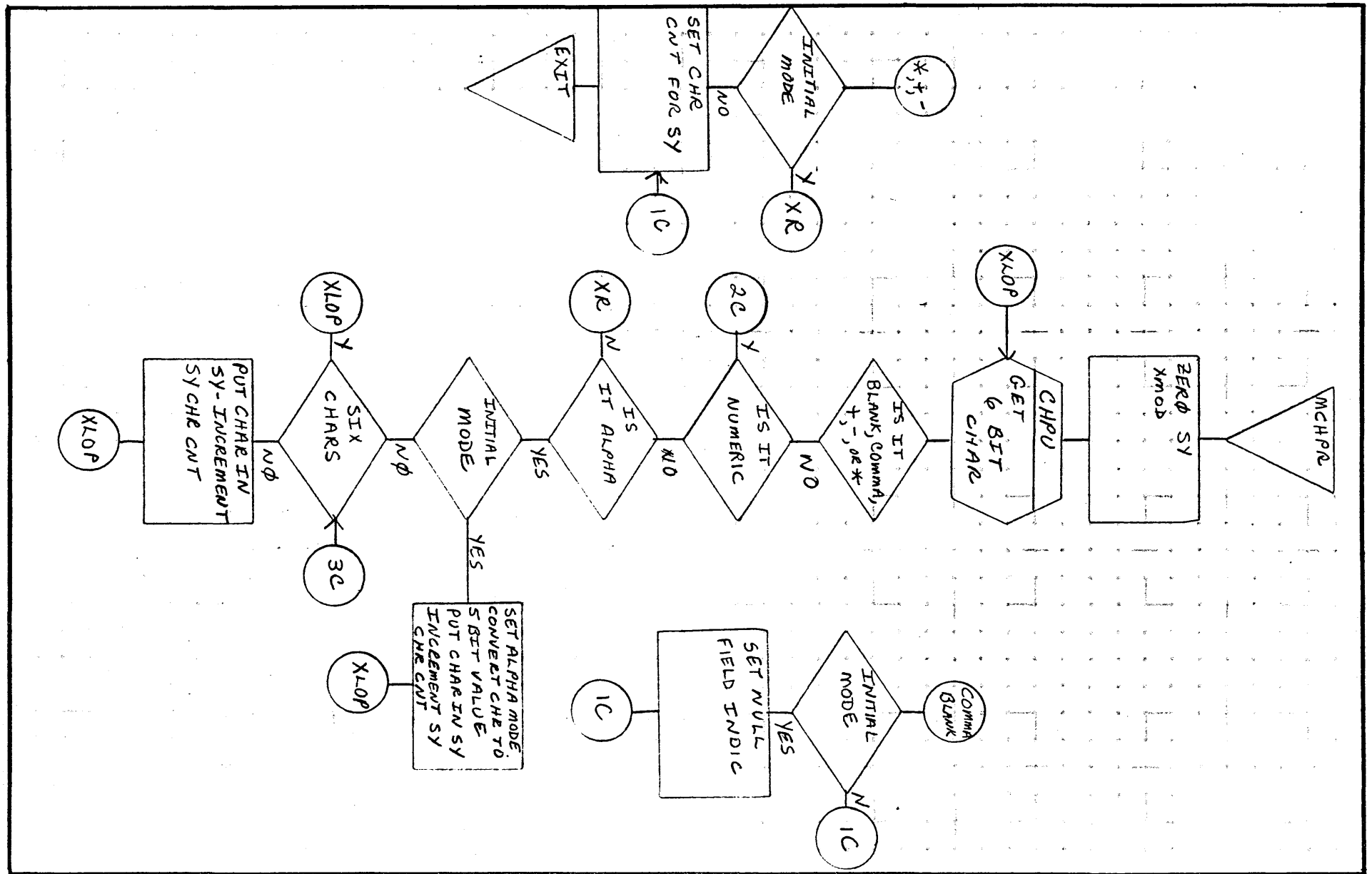
AA1385 (FOR Y CA127-1)



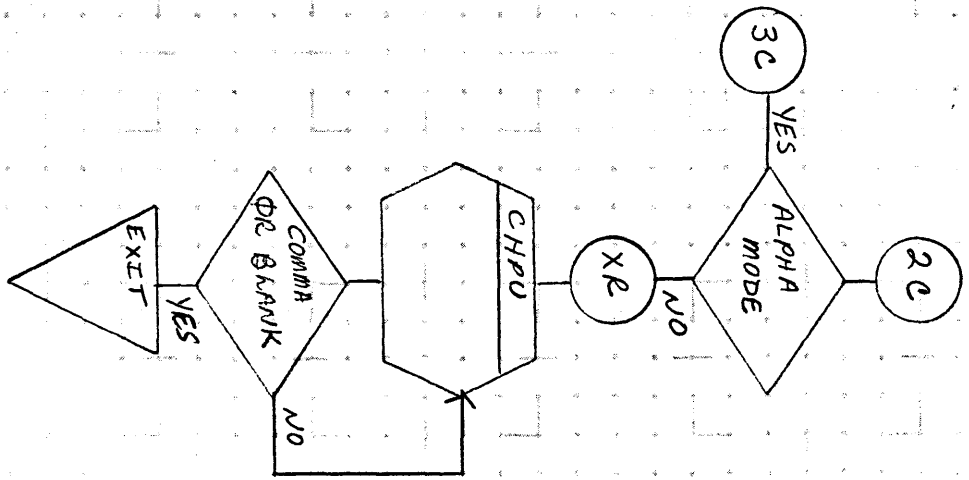
CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS 1 MS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE GET MACRO SKELETON	PROJECT MGR.			
	PAGE 3 OF 3	PROJECT NAME			
	NUMBER 2.4.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE End Macro Routine	PROJECT MGR.			
	PAGE 1 OF 1	PROJECT NAME			
	NUMBER 2.5.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

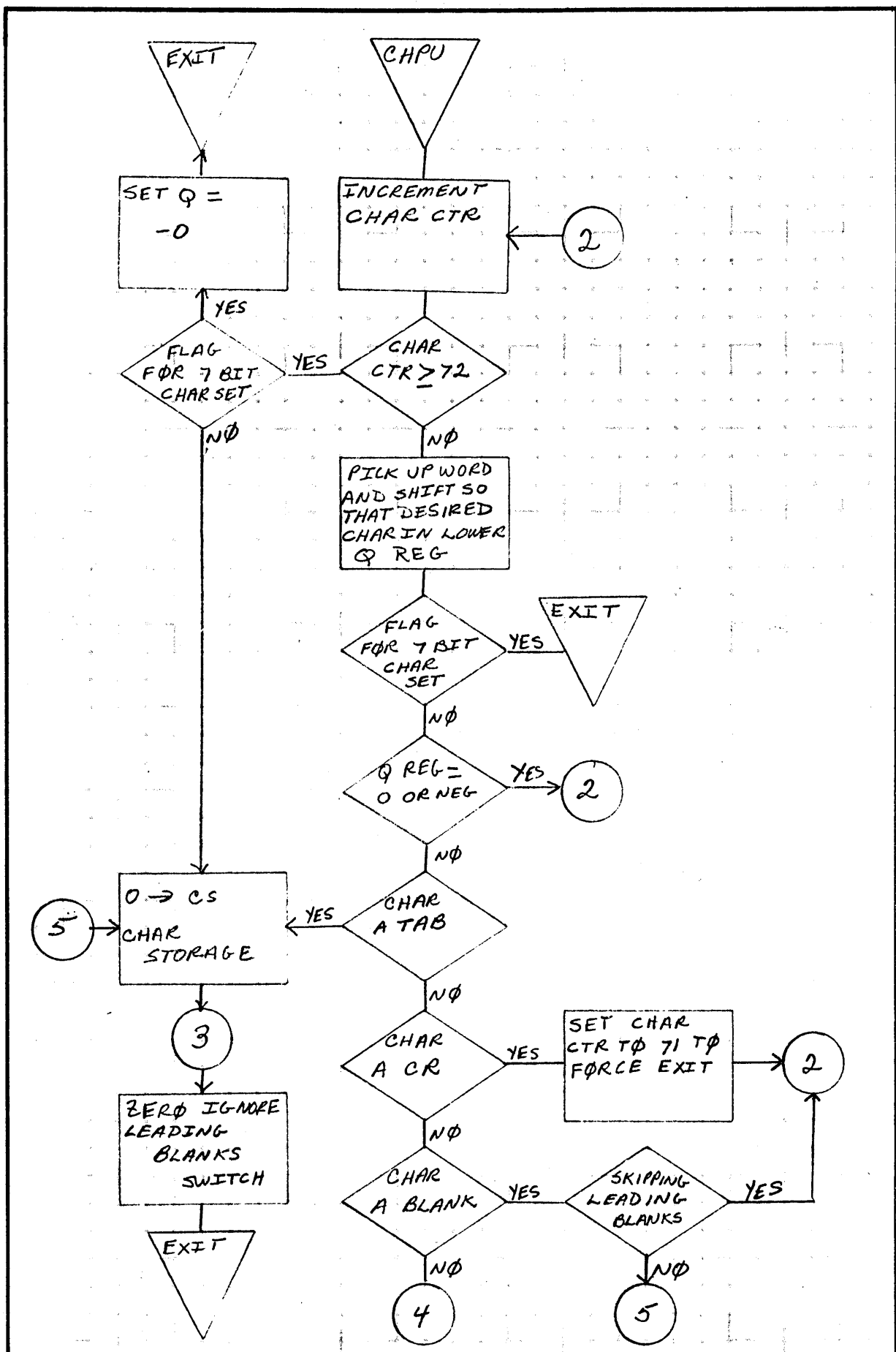


CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
SAMPLE CODE ☐	DOCUMENT TITLE Macro Character Processor		PROJECT MGR.		
FLOWCHART ☐		PAGE 1 OF 2	PROJECT NAME		
DECISION TABLE ☐	NUMBER 2.6.1	ISSUE DATE	TASK NO.		
OTHER ☐	DRAWN BY	DATE	TASK NAME		



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE Macro Character Processor PAGE 2 OF 2	PROJECT MGR.			
	NUMBER 2.6.1 ISSUE DATE	PROJECT NAME			
	DRAWN BY DATE	TASK NO.			
		TASK NAME			

AA1385 (FOR CA127-1)

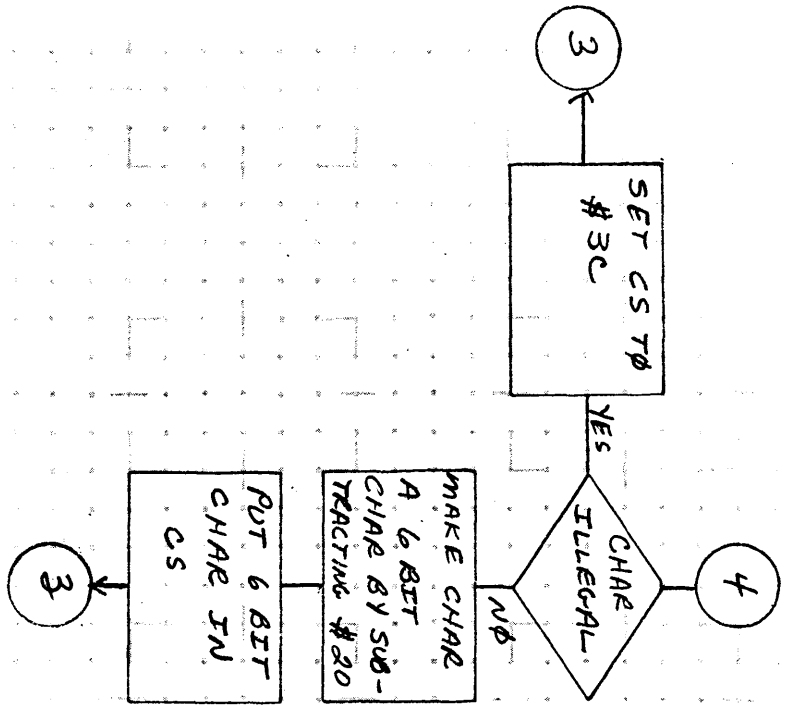


CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

REV	APPROVED	DATE

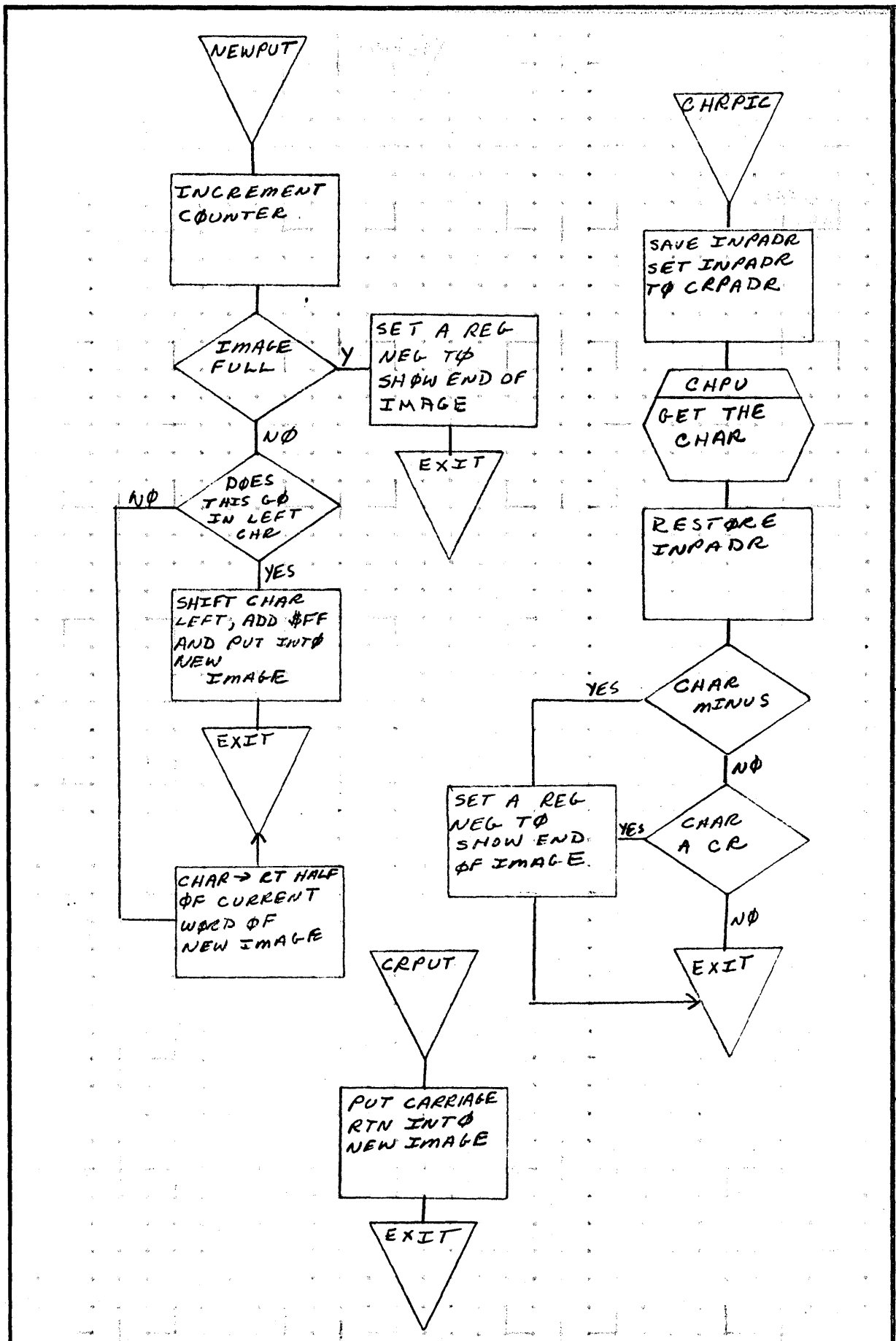
DOCUMENT CLASS: IMS
MACH. TYPE: 1700
DOCUMENT TITLE: CHARACTER PICKUP SUBROUTINE
PAGE 1 OF 2
NUMBER: 2.6.2
ISSUE DATE:
DRAWN BY:
DATE:
PROJECT NO.:
PROJECT MGR.:
PROJECT NAME:
TASK NO.:
TASK NAME:

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
	DOCUMENT TITLE CHARACTER PICKUP SUBROUTINE	PAGE 2 OF 2	PROJECT MGR.		
	NUMBER 2.6.2	ISSUE DATE	PROJECT NAME		
	DRAWN BY	DATE	TASK NO.		
			TASK NAME		

AA1385 (FORM CA127-1)



REV	APPROVED	DATE

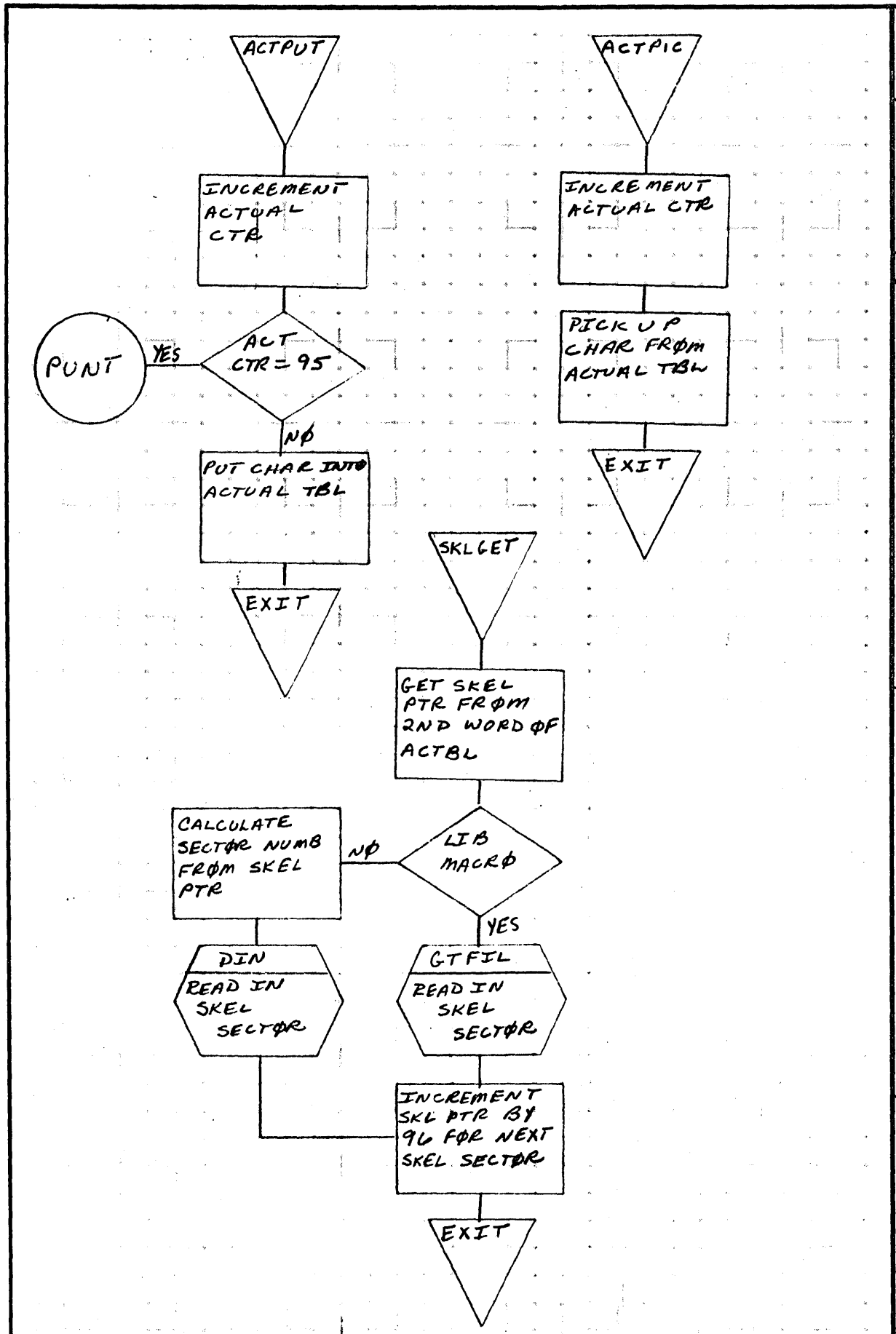
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE ☐
FLOWCHART ☐
DECISION TABLE ☐
OTHER ☐

DOCUMENT CLASS	IMS	MACH. TYPE	1700
DOCUMENT TITLE	MISCELLANEOUS MACRO	PAGE	1 OF 6
SUBROUTINES		ISSUE DATE	
NUMBER	2.7.1	DATE	
DRAWN BY			

PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

AA1385 (FORMERLY CA127-1)



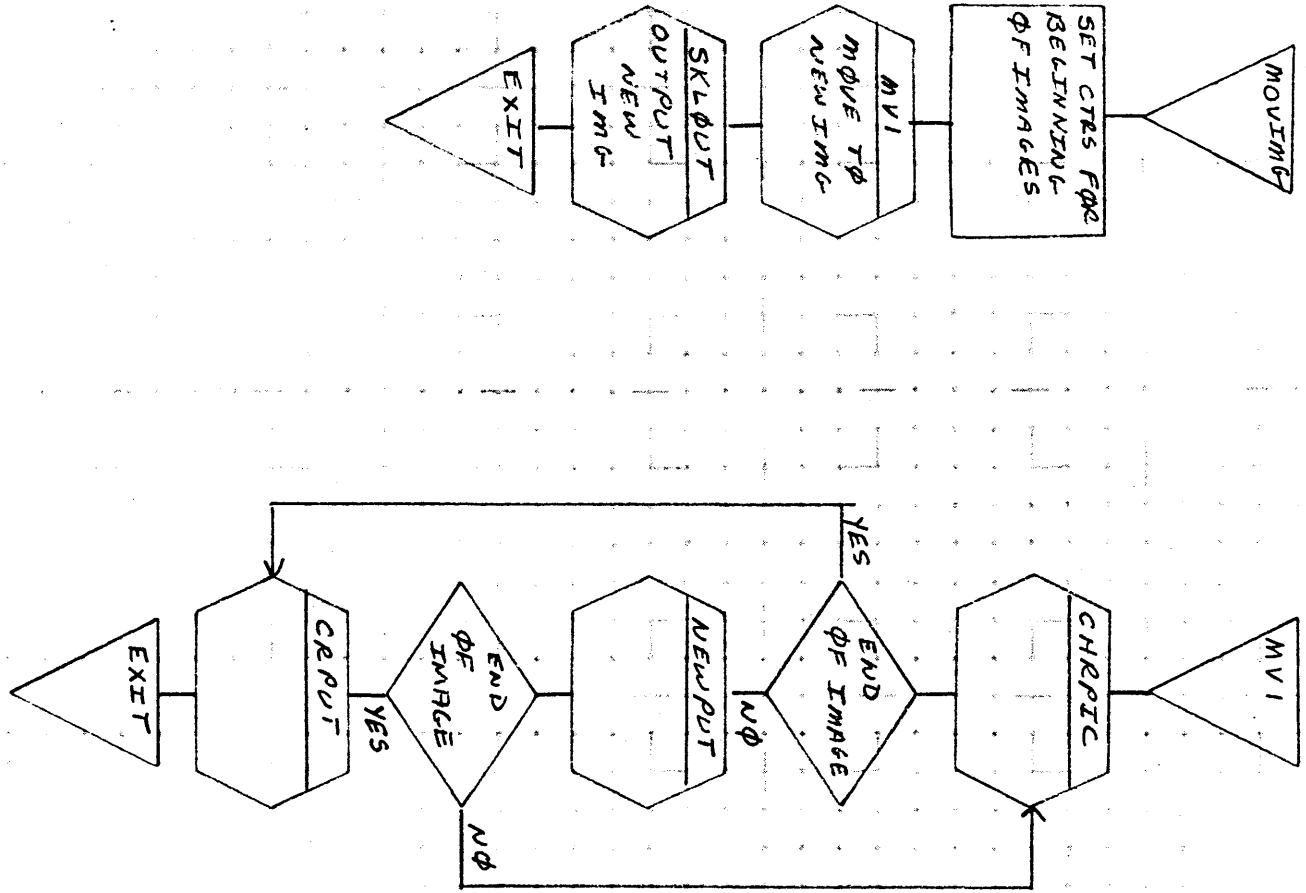
REV	APPROVED	DATE

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

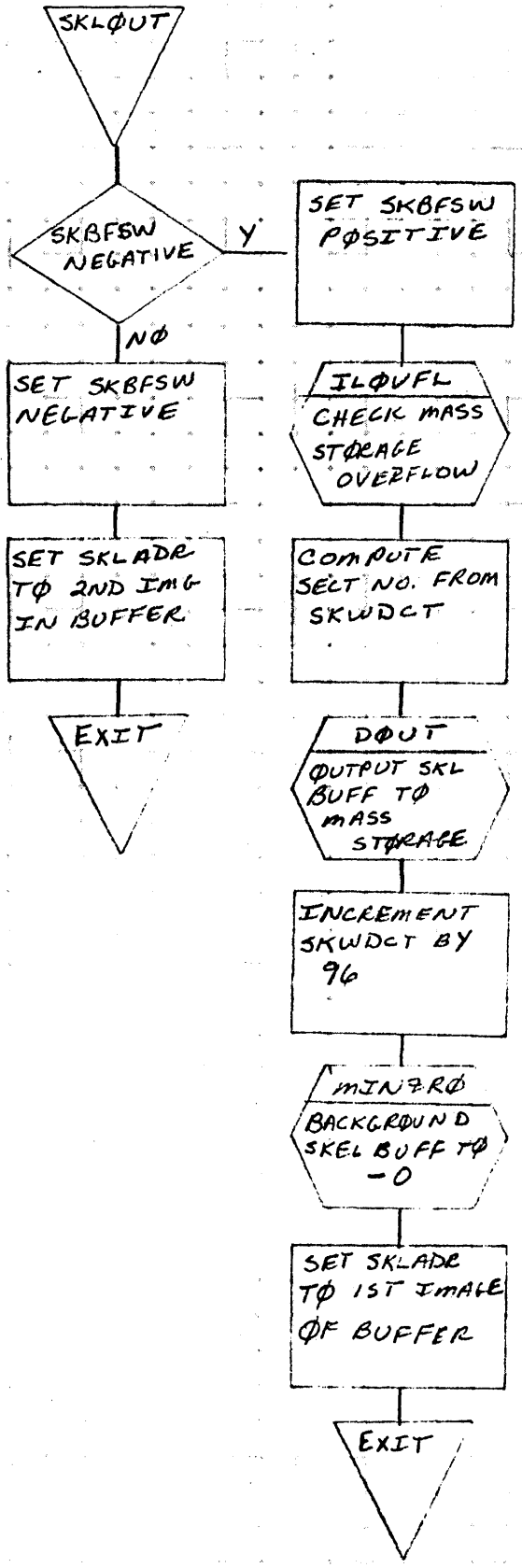
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS	IMS
DOCUMENT TITLE	Misc. Macro Specs
NUMBER	2.7.1
DRAWN BY	
MACH. TYPE	1700
PAGE	20F6
ISSUE DATE	
DATE	
PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

AA1385 (FORM) CA127-1)



CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
SAMPLE CODE ☐	DOCUMENT TITLE MISC. MACRO SBRTS		PROJECT MGR.		
FLOWCHART ☐		PAGE 3 OF 6	PROJECT NAME		
DECISION TABLE ☐	NUMBER 2.7.1	ISSUE DATE	TASK NO.		
OTHER ☐	DRAWN BY	DATE	TASK NAME		



CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

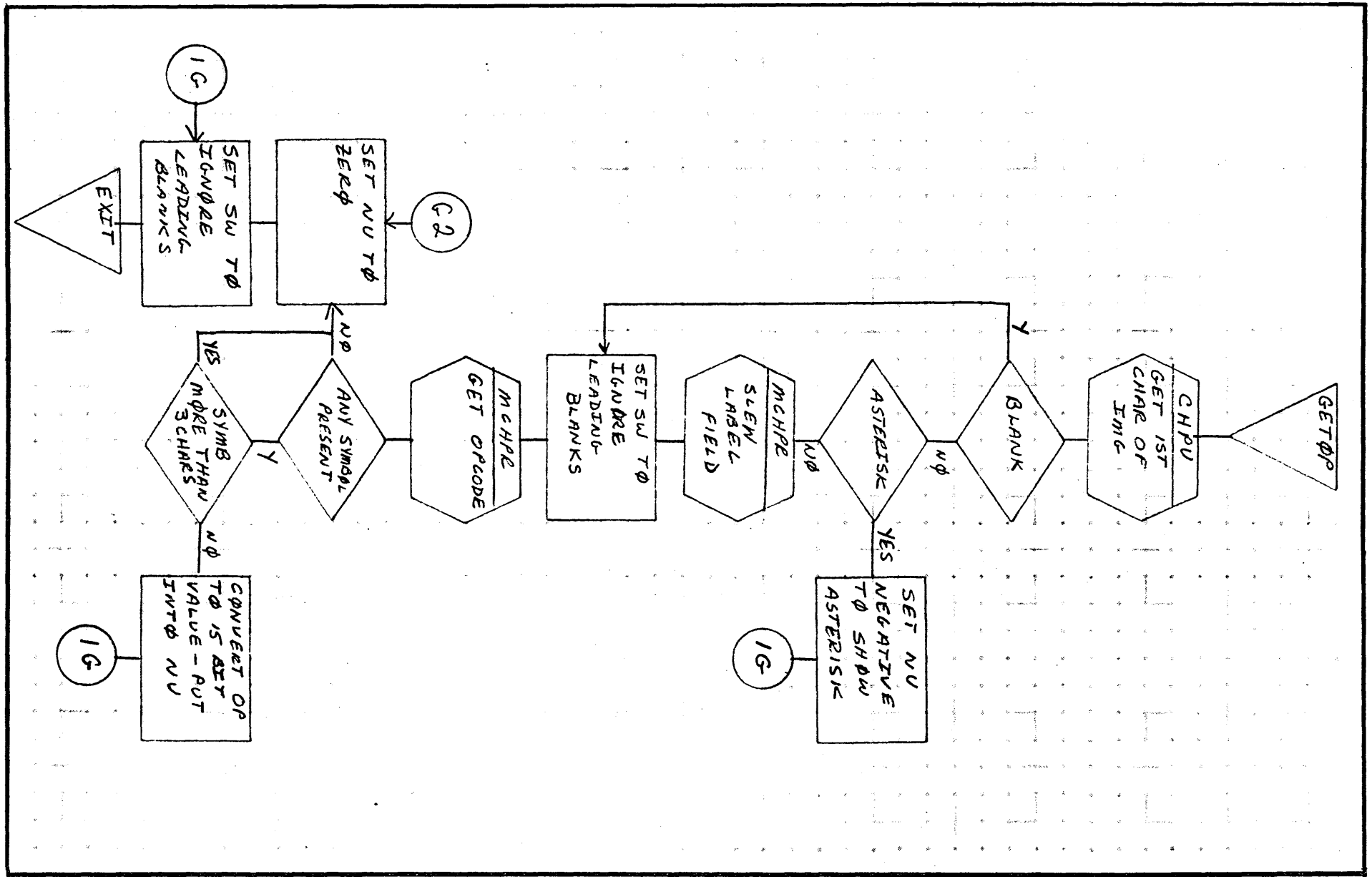
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS: IMS
MACH. TYPE: 1700
DOCUMENT TITLE: MISC. MACRO SAETS
PAGE 4 OF 6
NUMBER: 2.7.1
ISSUE DATE
DRAWN BY
DATE

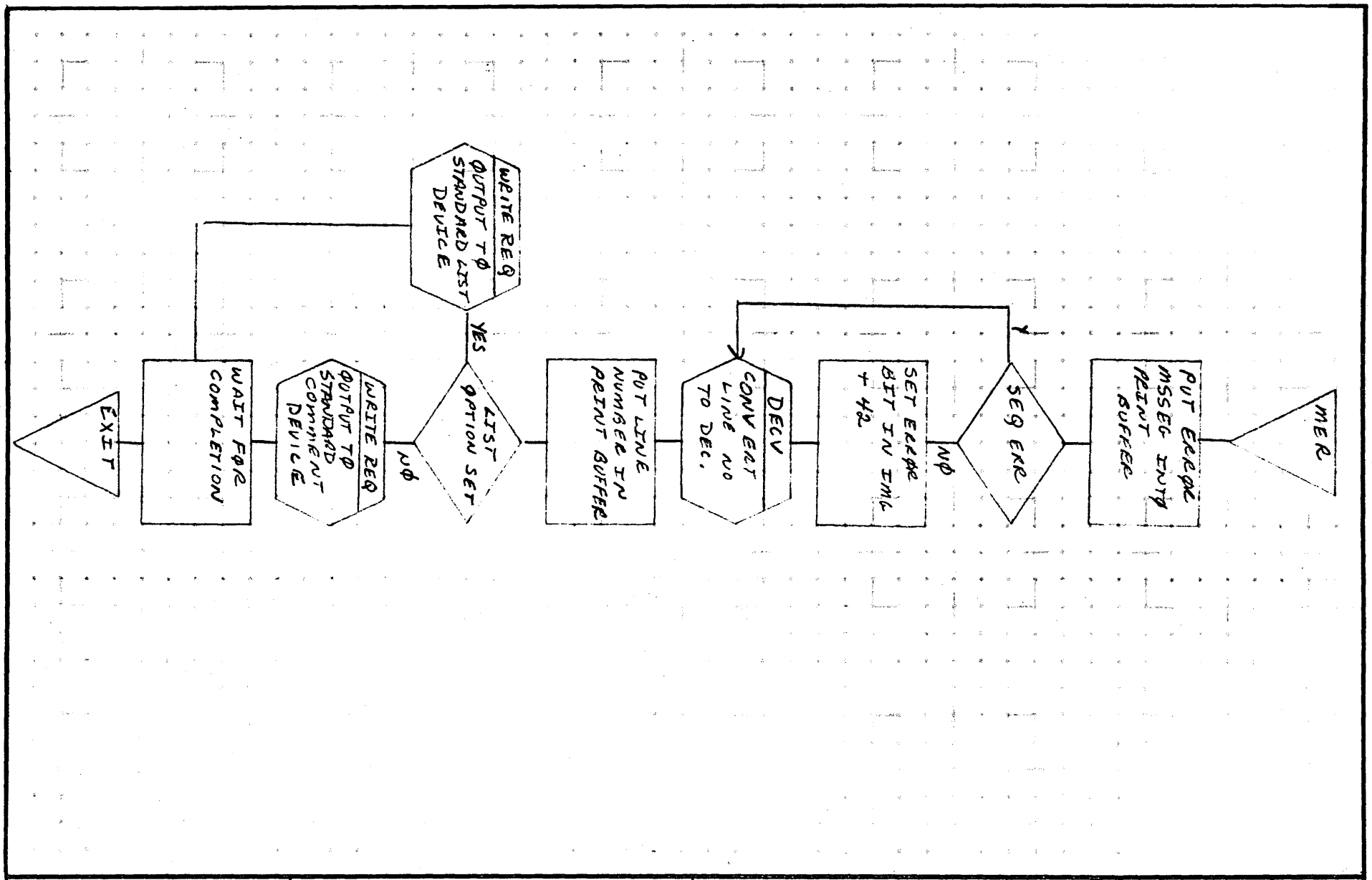
PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

REV	APPROVED	DATE

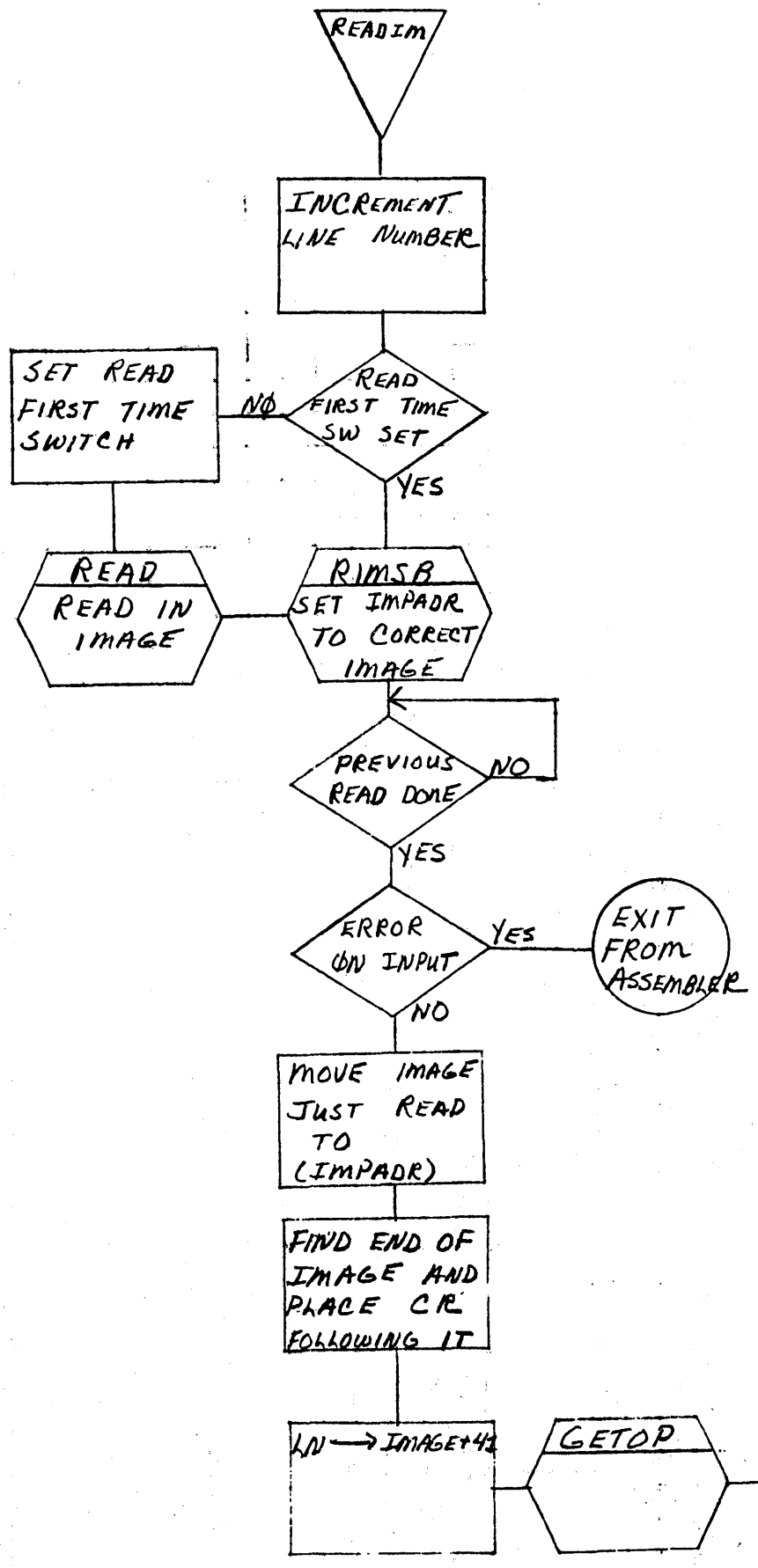
AA1385 (FOR CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS JMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE MISC. MACRO SBRTS		PROJECT MGR.			
FLOWCHART ☐☐		PAGE 5 OF 6	PROJECT NAME			
DECISION TABLE ☐☐	NUMBER 2.7.1	ISSUE DATE	TASK NO.			
OTHER ☐☐	DRAWN BY	DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
	DOCUMENT TITLE MISC. MACRO SBRTS		PROJECT MGR.		
		PAGE 6 OF 6	PROJECT NAME		
	NUMBER 2.7.1	ISSUE DATE	TASK NO.		
	DRAWN BY	DATE	TASK NAME		



REV	APPROVED	DATE

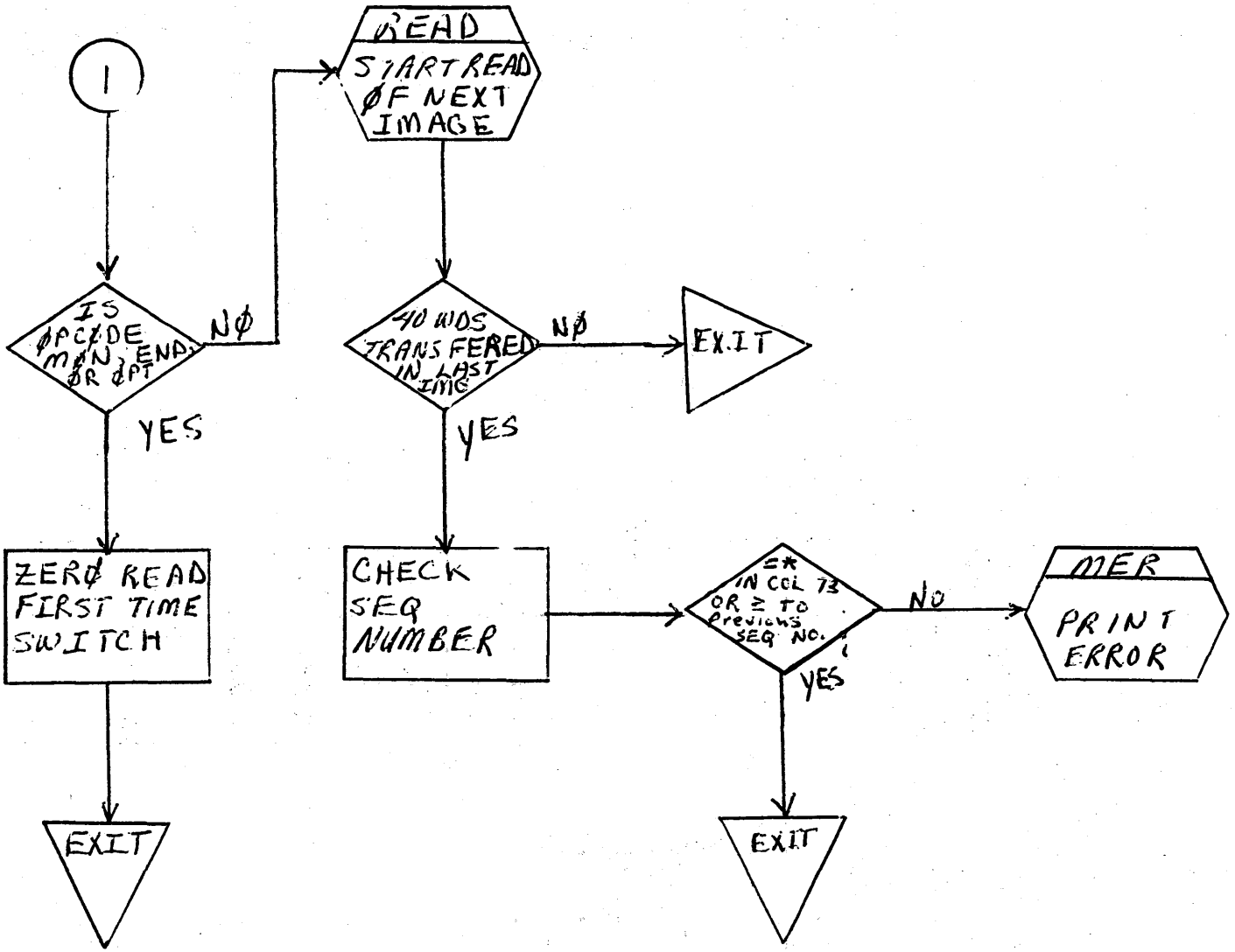
PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

DOCUMENT CLASS: IMS
MACH. TYPE: 1700
DOCUMENT TITLE: READ IMAGE ROUTINE
PAGE 1 OF 3
NUMBER
ISSUE DATE
DRAWN BY
DATE

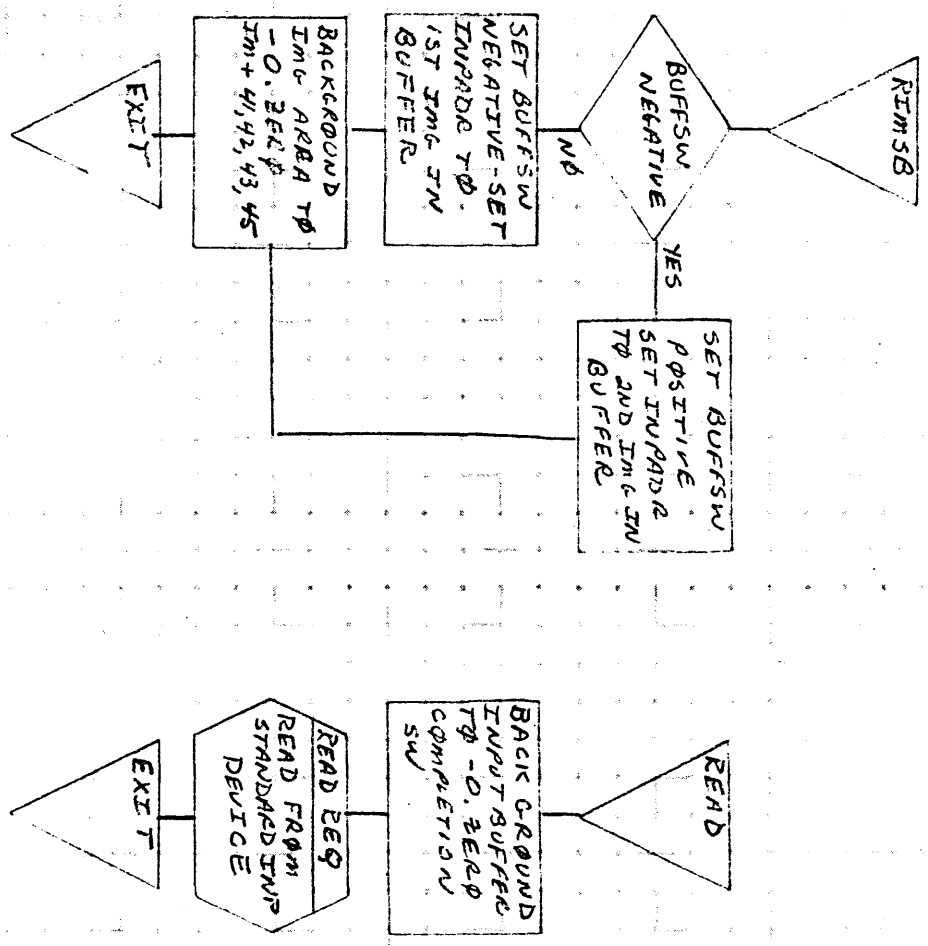
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

PRINTED IN U.S.A.

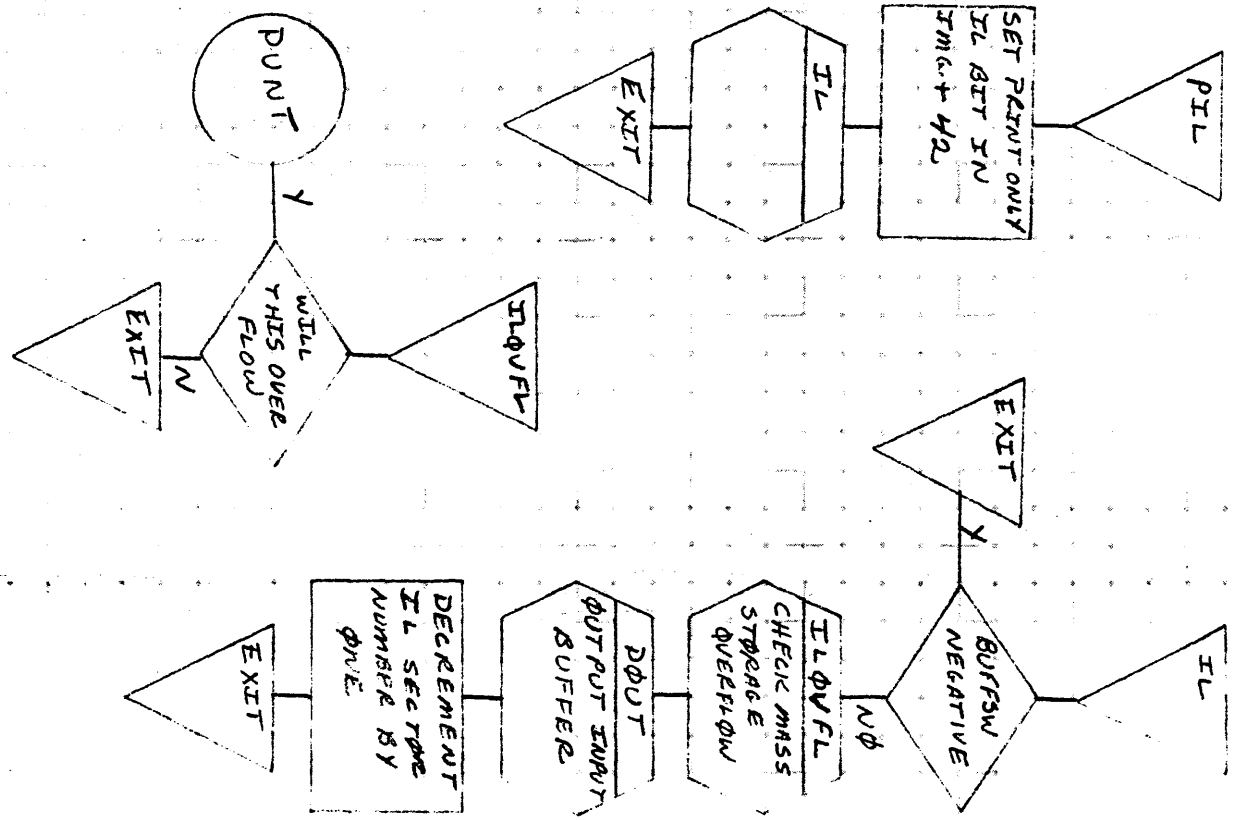
AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION						
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE READ IMAGE RTN		PROJECT MGR.			
FLOWCHART ☒		PAGE 2 OF 3	PROJECT NAME			
DECISION TABLE ☐	NUMBER 2.5.1	ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY	DATE	TASK NAME			

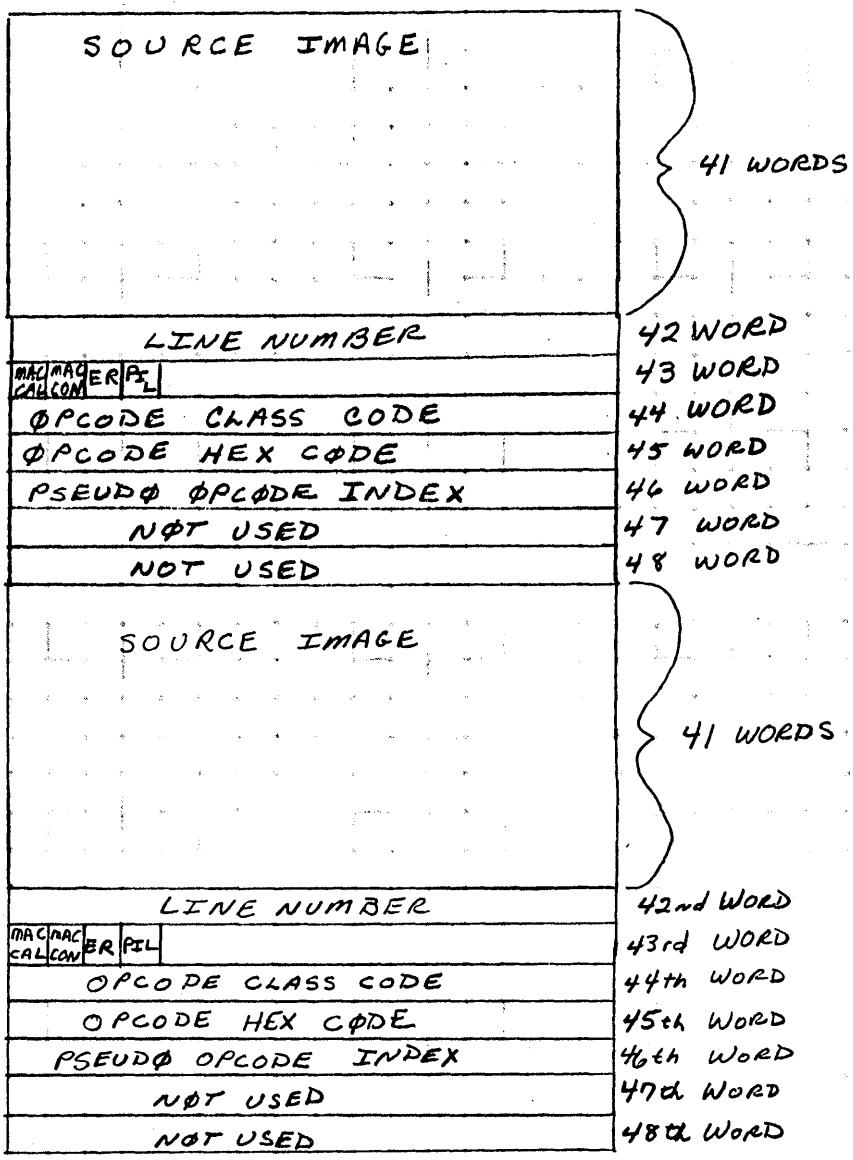


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE READ IMAGE RTN		PROJECT MGR.			
		PAGE 3 OF 3	PROJECT NAME			
	NUMBER 2.8.1	ISSUE DATE	TASK NO.			
	DRAWN BY	DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐					
DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
DOCUMENT TITLE IL SUBROUTINES	PROJECT MGR.			
PAGE 1 OF 1	PROJECT NAME			
NUMBER 2.9.1 ISSUE DATE	TASK NO.			
DRAWN BY DATE	TASK NAME			

96 WORD
IL SECTOR



REV	APPROVED	DATE

PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

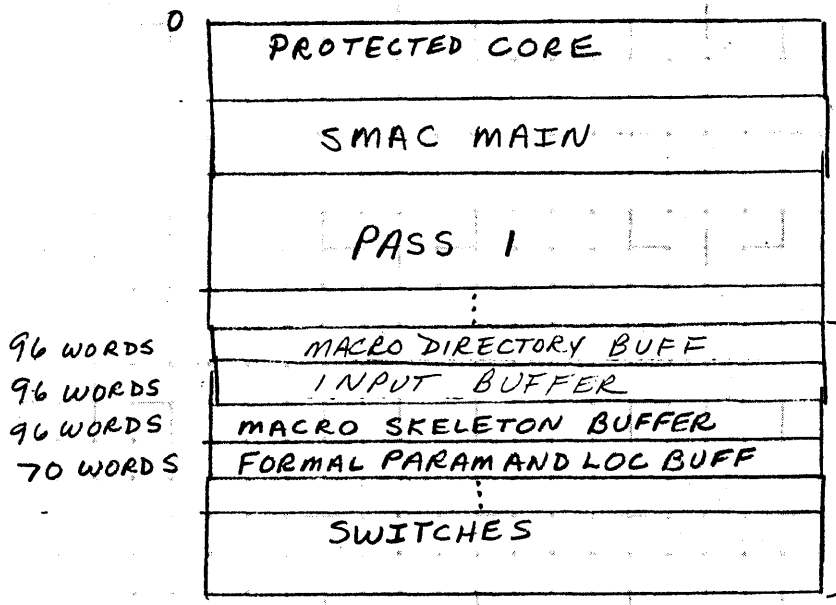
DOCUMENT CLASS: IMS
MACH. TYPE: 1700
DOCUMENT TITLE: IL Images - Sector Format
PAGE 1 OF 1
NUMBER 2.9.2
ISSUE DATE
DRAWN BY
DATE

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

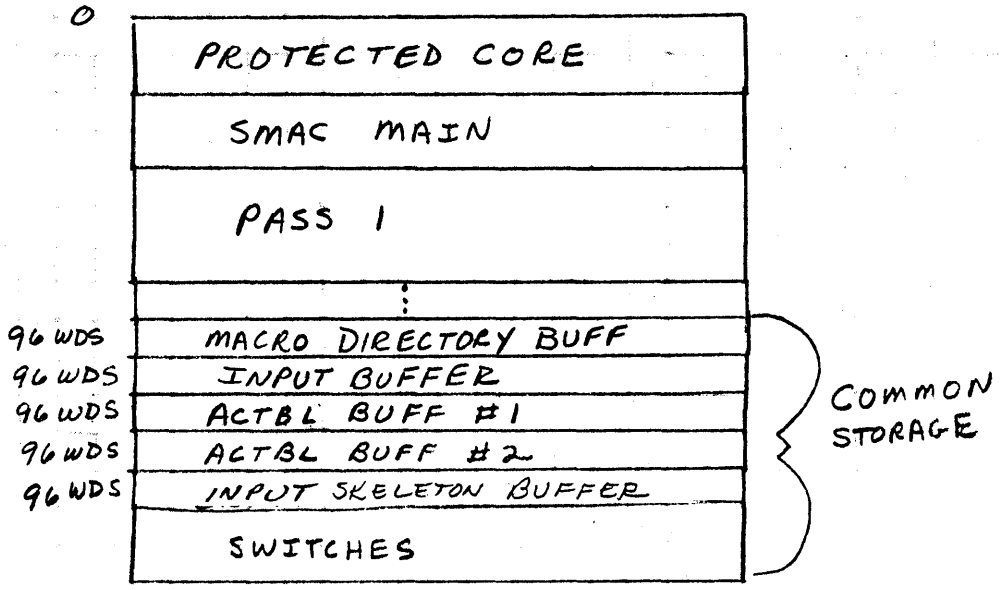
SAMPLE CODE ☐
FLOWCHART ☐
DECISION TABLE ☐
OTHER ☐

AA1385 (FORMERLY CA127-1)

CORE ALLOCATION DEFINE TIME



CORE ALLOCATION CALL TIME



REV	APPROVED	DATE

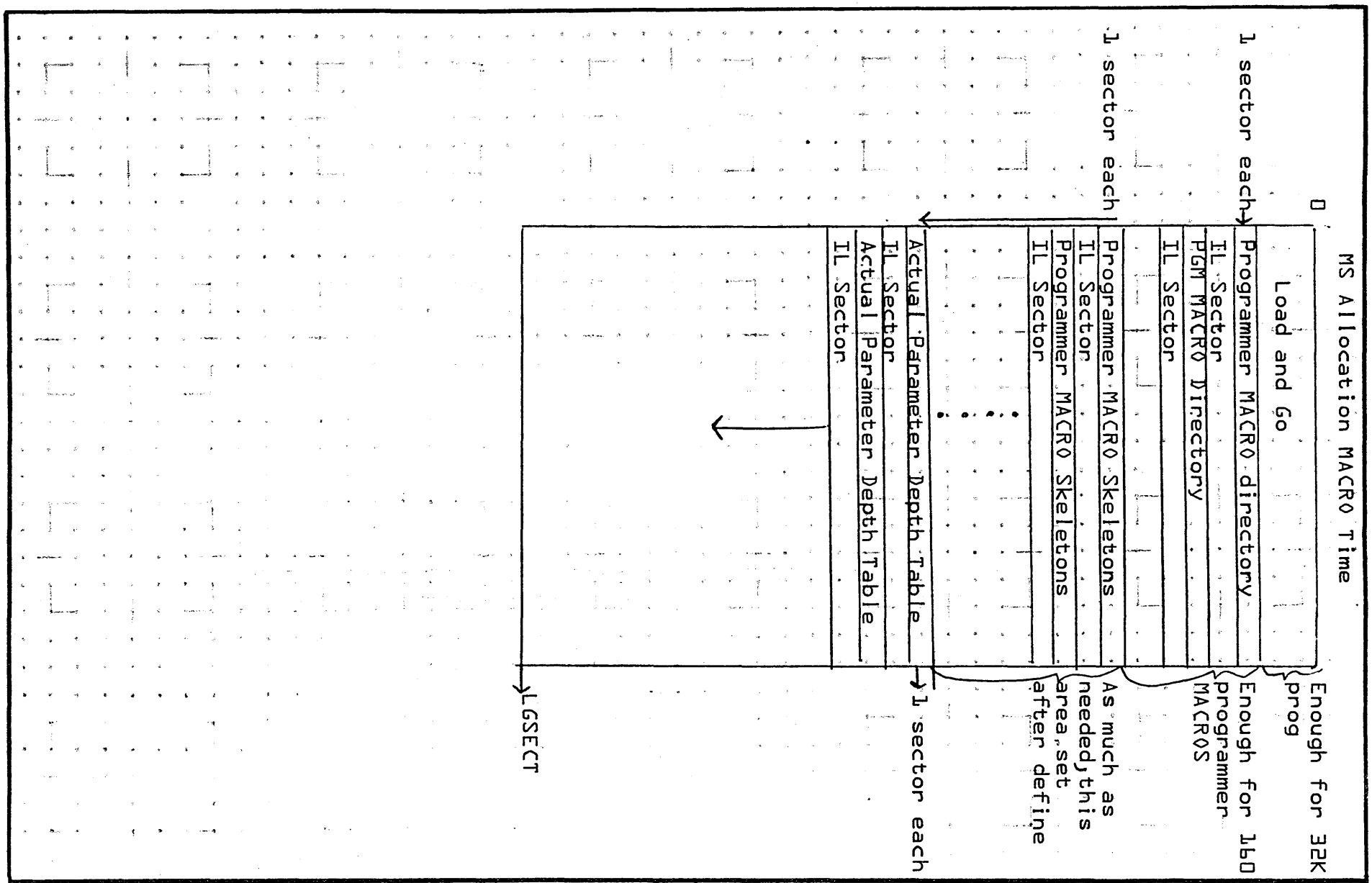
PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

DOCUMENT CLASS	MACH. TYPE IMS 1700
DOCUMENT TITLE	CORE ALLOCATION PASS 1
	PAGE 1 OF 1
NUMBER 2.10	ISSUE DATE
DRAWN BY	DATE

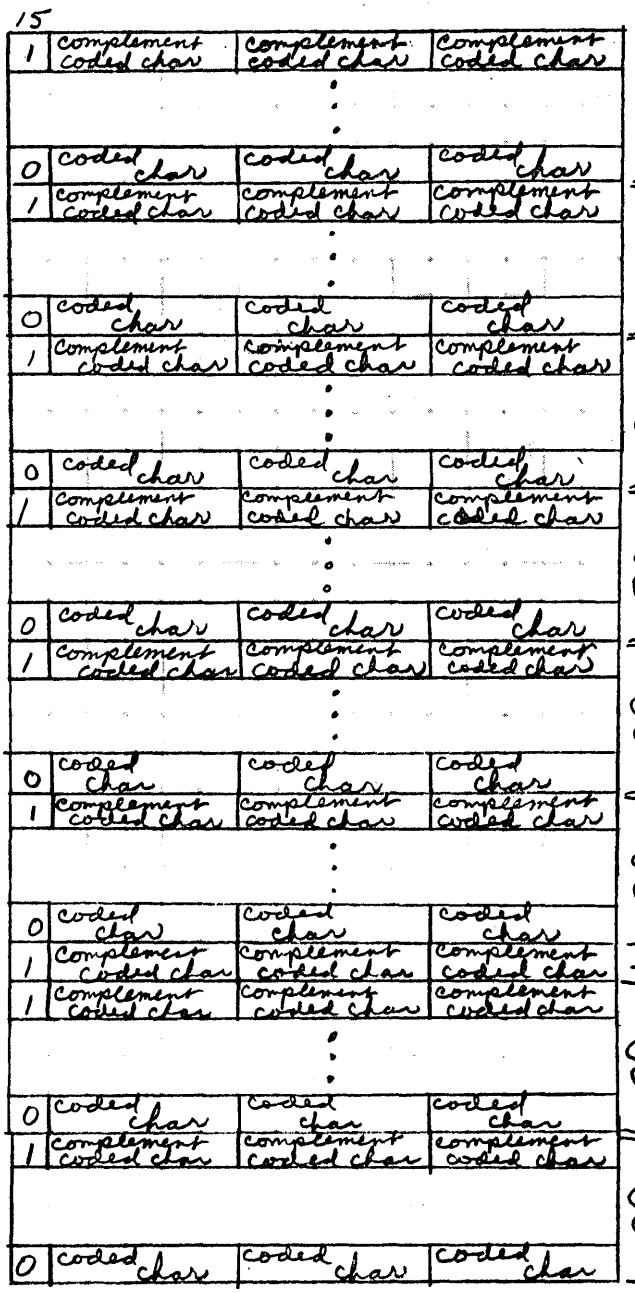
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE ☐
FLOWCHART ☐
DECISION TABLE ☐
OTHER ☐

AA1388 (FORMERLY CA127-1)



CONTROL DATA CORPORATION						
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE MS Allocation		PROJECT MGR.			
FLOWCHART ☐	MACRO Time	PAGE 1 OF 1	PROJECT NAME			
DECISION TABLE ☐	NUMBER 2.11	ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY	DATE	TASK NAME			



REV	APPROVED	DATE

PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

DOCUMENT CLASS: IMS
MACH. TYPE: 1700
DOCUMENT TITLE: Opcode Table
PAGE 1 OF 1
NUMBER: 2.12
ISSUE DATE
DRAWN BY
DATE

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

AA1385 (FORM CA127-1)

SECTION III - PASS 2

3. Pass 2 builds the symbol table, processes the conditional assembly pseudo instructions, IFA and IFC, and processes the NAM record.

Symbol table entries consist of labels, externals, entry points, and symbols defined in the address fields of the pseudo instructions BSS, BZS, EQU, COM and DAT.

3.0 Flow Chart of PASS 2 initialization

3.1 Next and Label Pickup Routines

NEXT is the cyclical return for the pass. Its function is to get the next input source image from IL.

LBPK processes the label field on the image. An asterisk remark image returns directly to NEXT. The label is stored into LA. Exit is to the Opcode Processor.

3.1.1 Flow Chart of Next and Label Pickup Routines

3.2 Opcode Processor

The opcode processor checks the legality of the opcode and its terminator. If either is illegal, the instruction is processed as an ADC pseudo instruction. The class code and pseudo opcode index are picked up from the input record. If the class code points to a pseudo opcode, exit is through a transfer vector to the appropriate pseudo processor.

If the class code points to a machine opcode, the symbol put subroutine is entered to stow the label, if any, in the symbol table. The program counter is incremented by one or two according to the type of machine instruction. Exit is to NEXT.

If, on entry to the opcode processor, the Assembler is skipping input images as a result of a conditional IF instruction, there is an immediate exit to the skip processor.

If the input image is a macro call, the macro depth switch is incremented, the label, if any, is stored in the symbol table and the program exits to NEXT.

Opcodes are divided into classes as follows:

Class 1 Machine Opcodes
Group A Storage Reference Instructions
Class 2 Machine Opcodes
Group B Storage Reference Instructions
Class 3 Machine Opcodes
Register Instructions

Class 4 Machine Opcodes
Shift Instructions
Class 5 Machine Opcodes
Skip Instructions
Class 6 Machine Opcodes
Inter-Register Transfer Instructions
Class 1 Pseudo Opcode
ADC
Class 2 Pseudo Opcodes
ORG, EQU, COM, DAT, BSS, BZS
Class 3 Pseudo Opcodes
END, ENT, EXT, ALF, NUM, DEC, VFD, IFA, IFC, EIF, EMC, LST, NLS, SPC, EJT

3.2.1 Flow Chart of Opcode Processor

3.2.2 Opcode Table Format

3.3 Skip Processor Routine

This routine is entered if images are being skipped due to an IF instruction. A macro if depth switch is kept to skip over macro instructions correctly. If an EIF is encountered the routine transfers to EIF2.

3.3.1 Flow Chart of Skip Processor

3.4 ADC, NUM and DEC Pseudo Processors

The function of these processors is to place the label in the symbol table and increment the program counter according to the number of subfields on the source image.

3.4.1 Flow Charts of ADC, NUM and DEC Pseudo Processors

3.5 ORG, ORG* Pseudo Processor

This processor sets and unsets the program counter. The counter is set on an ORG to the value of the address expression. The counter is unset when an ORG* is encountered.

3.5.1 Flow Chart of ORG Pseudo Processor

3.6 EQU Pseudo Processor

This routine makes entries in the symbol table according to values given following the symbol name. The miscellaneous pseudo subroutine D4 is used to get the name and its value.

3.6.1 Flow Chart of EQU Pseudo Processor

3.7 COM, DAT Pseudo Processor

This routine makes entries in the symbol table with relocation of common or data. A counter is kept for each type to use as output on the NAM relocatable binary image. The miscellaneous Pseudo Subroutine D4 is used to get the name and the block length associated with it.

3.7.1 Flow Chart of COM, DAT Pseudo Processor

3.8 BSS, BZS Pseudo Processor

This routine makes entries in the symbol table which are the names of blocks of reserved storage. The program counter is incremented according to the length of the block. The Miscellaneous Pseudo Subroutine D4 is used to get the name and the block length associated with it.

3.8.1 Flow Chart of BSS, BZS Pseudo Processor

3.9 ENT Pseudo Processor

This routine places entry points in the symbol table, If the symbol was already in the table, just the entry point bit in it is set. If the symbol was not in the table, it is entered with a relocation of 4 to flag an undefined entry point. The miscellaneous pseudo subroutine D1 is used to get the symbol names.

3.9.1 Flow Chart of ENT Pseudo Processor

3.10 EXT Pseudo Processor

This routine places names external to the program in the external table. If the opcode terminator was an asterisk, the entry is flagged as relative. A name encountered that is already in the external table must be the same type (relative or non-relative) as the entry in the external table. The external table is built backwards starting with the highest location in the symbol table. The miscellaneous pseudo subroutine D1 is used to get the external names.

3.10.1 Flow Chart of EXT Pseudo Processor

3.11 ALF Pseudo Processor

The function of this processor is to place the label in the symbol table and increment the program counter. If the length is determined by a number in the first subfield, the characters are not scanned. If the length is determined by an ending character, the characters are scanned to count the number of words in the character string. The subroutine ALFSB2 is used to get a character, and check for special characters.

3.11.1 Flow Chart of ALF Pseudo Processor and Subroutine ALFSB2

3.12 VFD Pseudo Processor

The function os this processor is to place the label in the symbol table and increment the program counter. A bit count is kept and when it reaches 16 or greater the program counter is incremented by one.

3.12.1 Flow Chart of VFD Pseudo Processor

3.13 IFA Pseudo Processor

This routine determines whether the condition of the IF is satisfied or not satisfied. If the condition is not satisfied, a switch is set to cause skipping of following source images. A holder is used to save the first two characters of the label field for comparison when an EIF is encountered.

3.13.1 Flow Chart of IFA Pseudo Processor

3.14 IFC Pseudo Processor

This routine determines whether the condition of the IF is satisfied or not satisfied. If the condition is not satisfied, a switch is set to cause skipping of the following source images. A holder is used to save the first two characters of the label field for comparison when an EIF is encountered.

3.14.1 Flow Chart of IFC Pseudo Processor

3.15 EIF Pseudo Processor

This routine determines whether to stop skipping cards if the skip switch is set. The first two characters of the address field are compared to a holder set by the controlling IF. If they compare, the IF switch is turned off.

3.15.1 Flow Chart of EIF Pseudo Processor

3.16 EMC Pseudo Processor

The function of this routine is to decrement the macro depth counter.

3.16.1 Flow Chart of EMC Pseudo Processor

3.17 END Pseudo Processor

This routine outputs the NAM record and initializes buffers and switches for Pass 3. Exit is through ASSEM to Pass 3.

3.17.1 Flow Chart of END Pseudo Processor

3.18 Miscellaneous Pseudo Subroutines

These routines are used to pick up subfields for some pseudo instructions. The subroutine D4 has four exits as follows:

(1) Mark - No symbol present
(2) Mark+1 - No expression in subfield
(3) Mark+2 - Non-absolute relocation
(4) Mark+3 - Normal exit

3.18.1 Flow Chart of Miscellaneous Pseudo Subroutine

3.19 Symbol Table Putaway Subroutine

This routine is used to place symbols in the symbol table. At entry the A register contains the value of the symbol and the Q register contains the relocation of the symbol. The symbol is in LA. If there is no symbol to put away, the routine exits immediately. Double definition of symbols is detected in this routine.

3.19.1 Flow Chart of Symbol Table Putaway Subroutine

3.19.2 Symbol Table Format

3.20 Symbol Table Overflow Subroutine

This routine is used to determine if there is enough room in the current symbol and external table for another entry. If there is not enough room, the current table is output to mass storage and a new table counters and addresses are initialized. A check is made for possible mass storage overflow.

3.20.1 Flow Chart of Symbol Table Overflow Subroutine

3.21 Read Image Routine

If both IL images in the sector have been processed, this routine reads in the next sector from mass storage. If the second image has not been processed, the input buffer address is bumped to the location of the second image.

3.21.1 Flow Chart of Read Image Routine

3.22 Error Routine

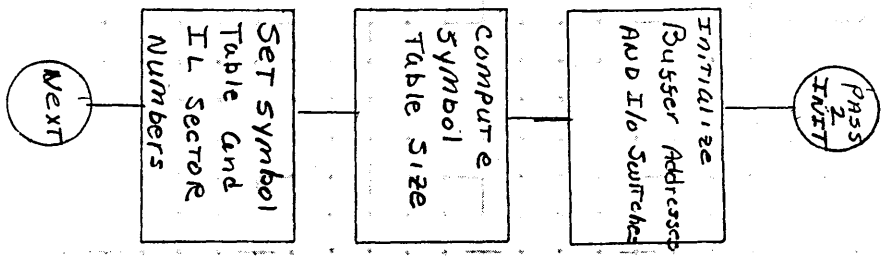
This routine outputs error messages to the standard comment medium. The error flag is also set in IL and the IL sector containing the erroneous source image is rewritten.

3.22.1 Flow Chart of Error Routine

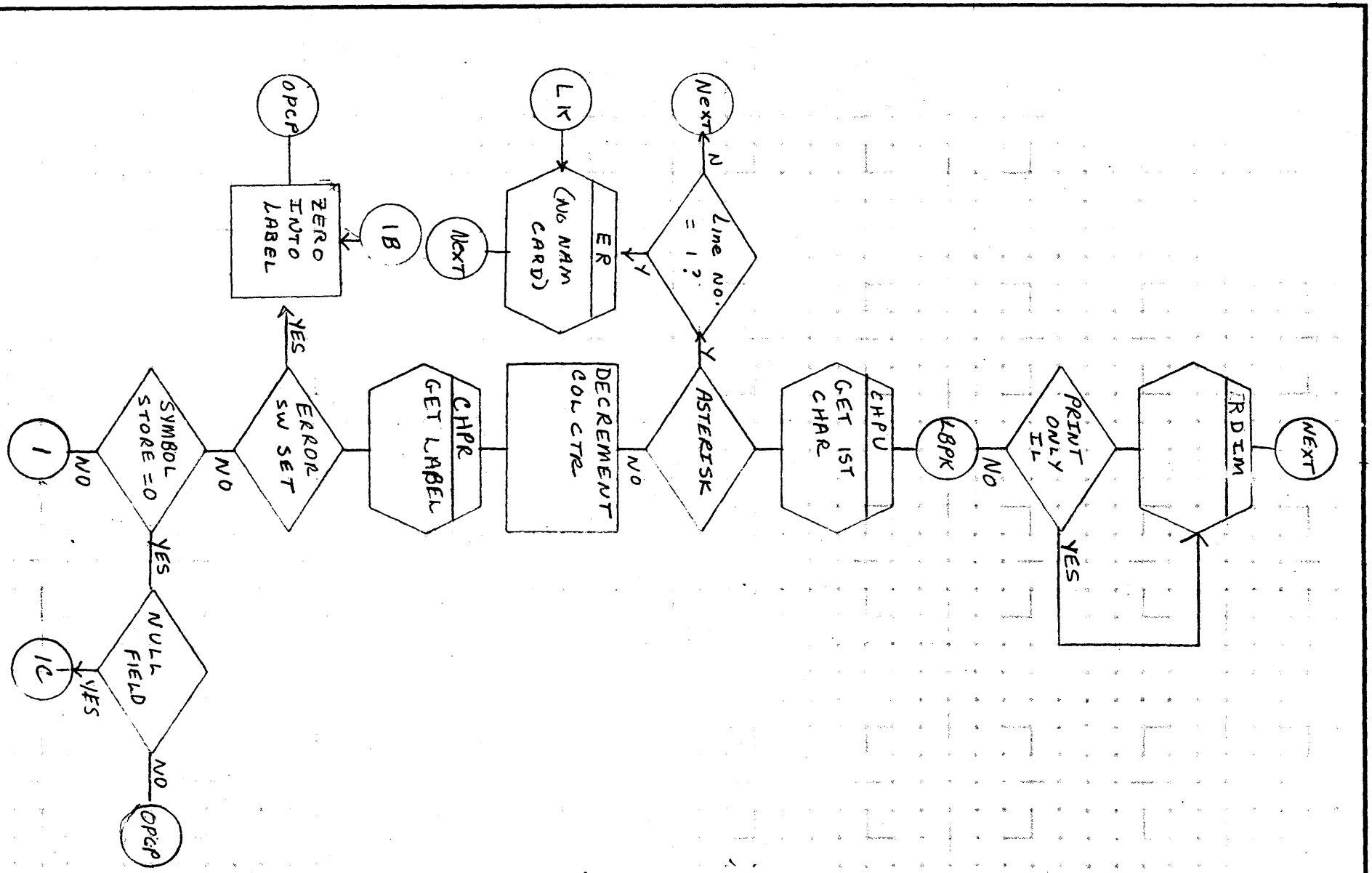
3.23 NAM Pseudo Processor

The NAM processor enters the reconversion routine to convert the symbol in the address field to ASCII and saves the converted symbol for output at the end of Pass 2. The input record is flagged for Pass 3 as a "print only IL."

3.23.1 Flow Chart of NAM Pseudo Processor

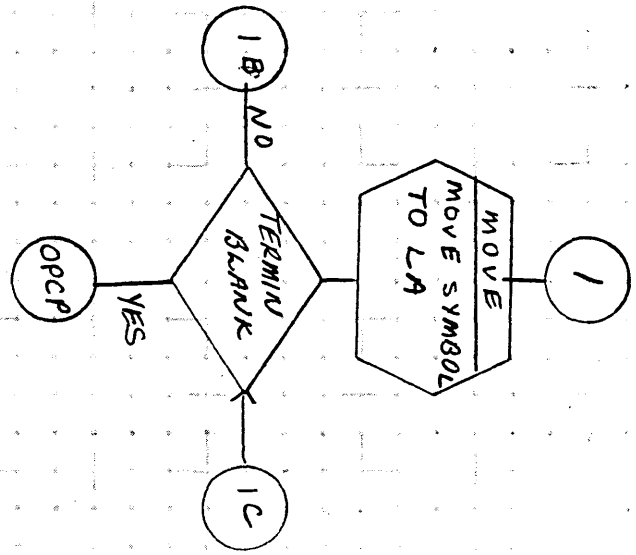


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE PASS 2 INITIALIZATION	PROJECT MGR.			
	PASS 2 PAGE 1 OF 8	PROJECT NAME			
	NUMBER 3.0 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



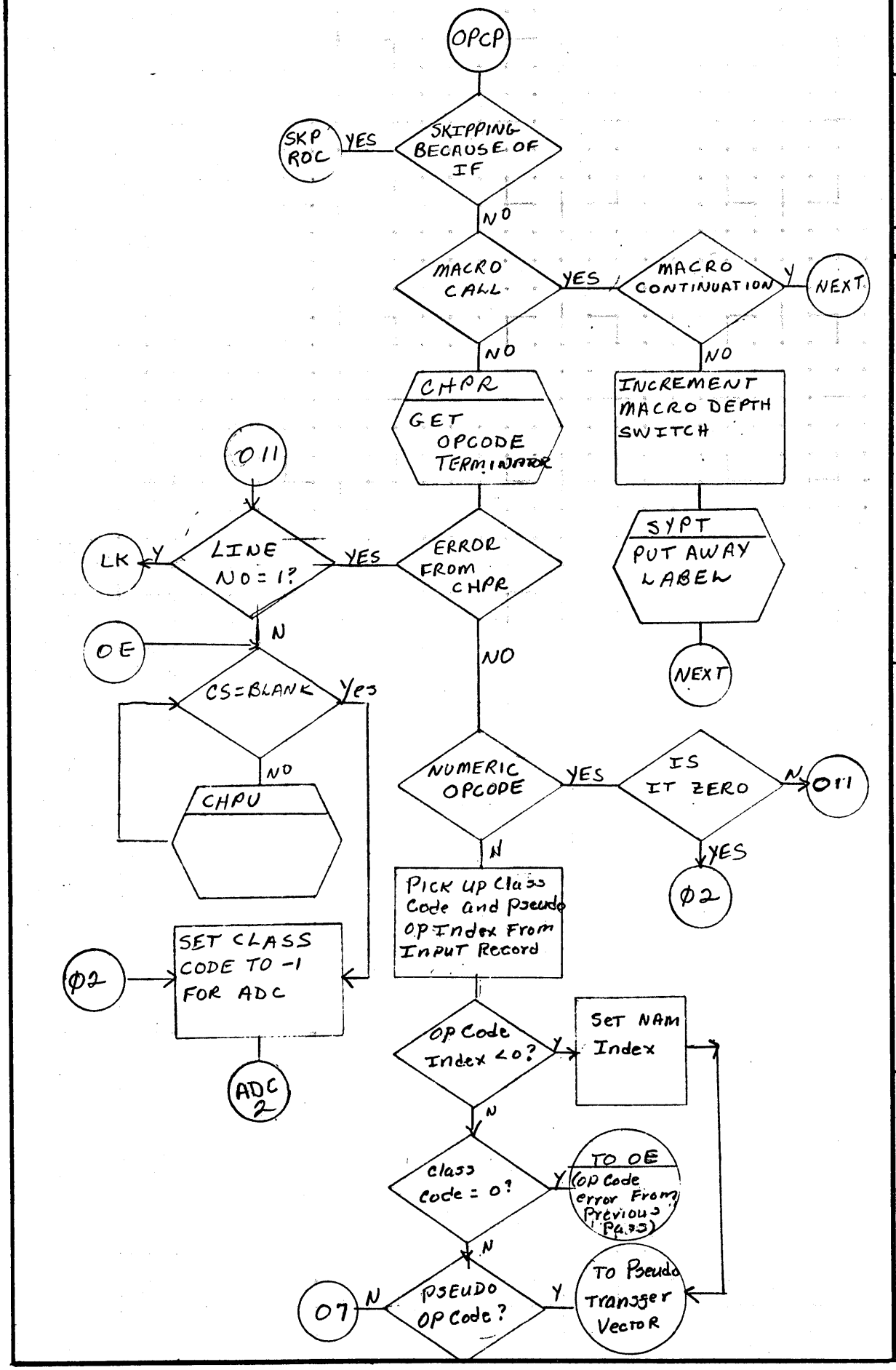
CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE NEXT AND LBPK	PROJECT MGR.			
FLOWCHART ☐	PASS 2 PAGE 1 OF 2	PROJECT NAME			
DECISION TABLE ☐	NUMBER 3.1.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE NEXT AND LBPK	PROJECT MGR.			
	PASS 2 PAGE 2 OF 2	PROJECT NAME			
	NUMBER 3.1.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



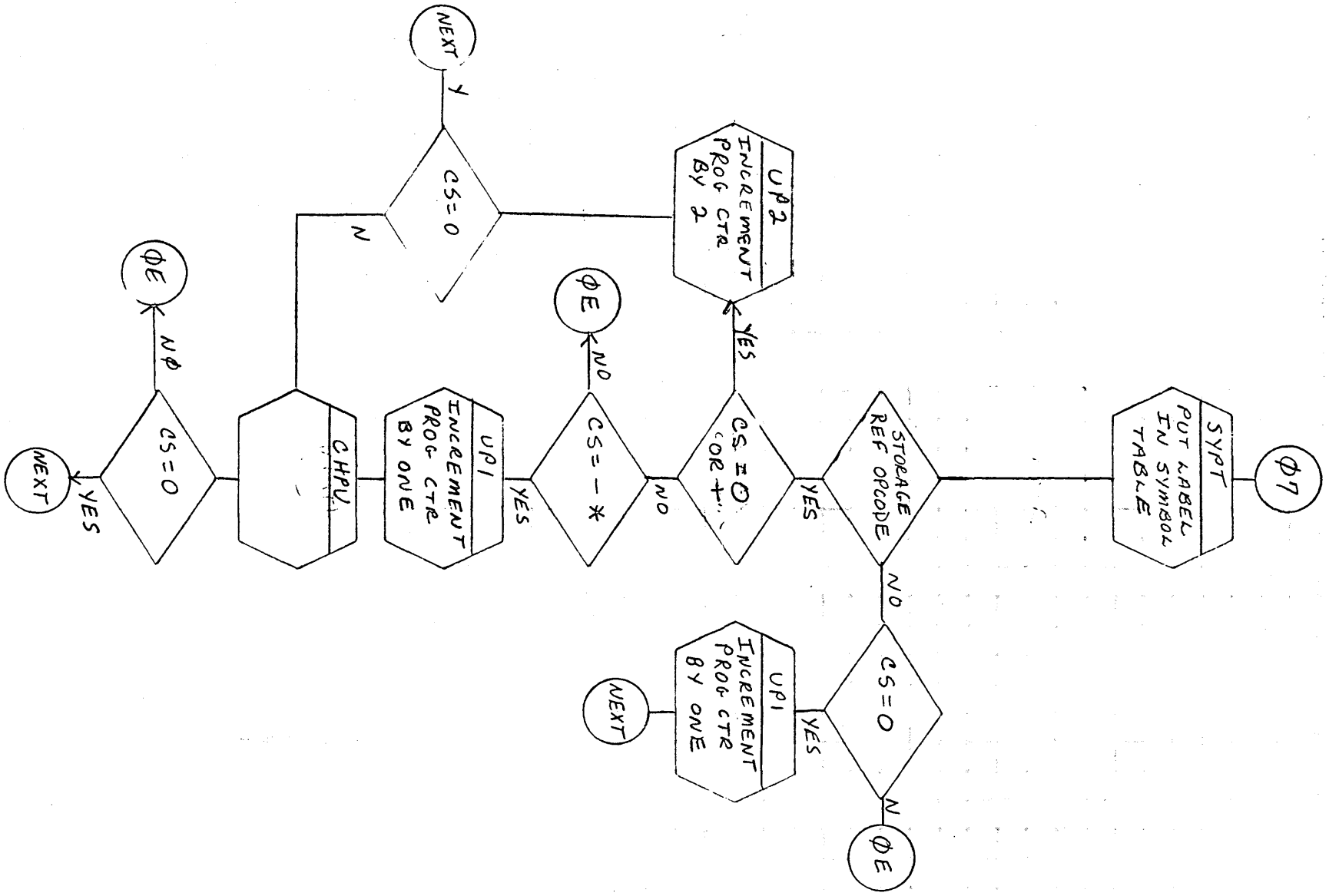
DOCUMENT CLASS		MACH. TYPE	IMS 1700
DOCUMENT TITLE	OPCODE PROCESSOR	PAGE	1 OF 2
PASS 2		ISSUE DATE	
NUMBER	3.2.1	DATE	
DRAWN BY			

REV	APPROVED	DATE

PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

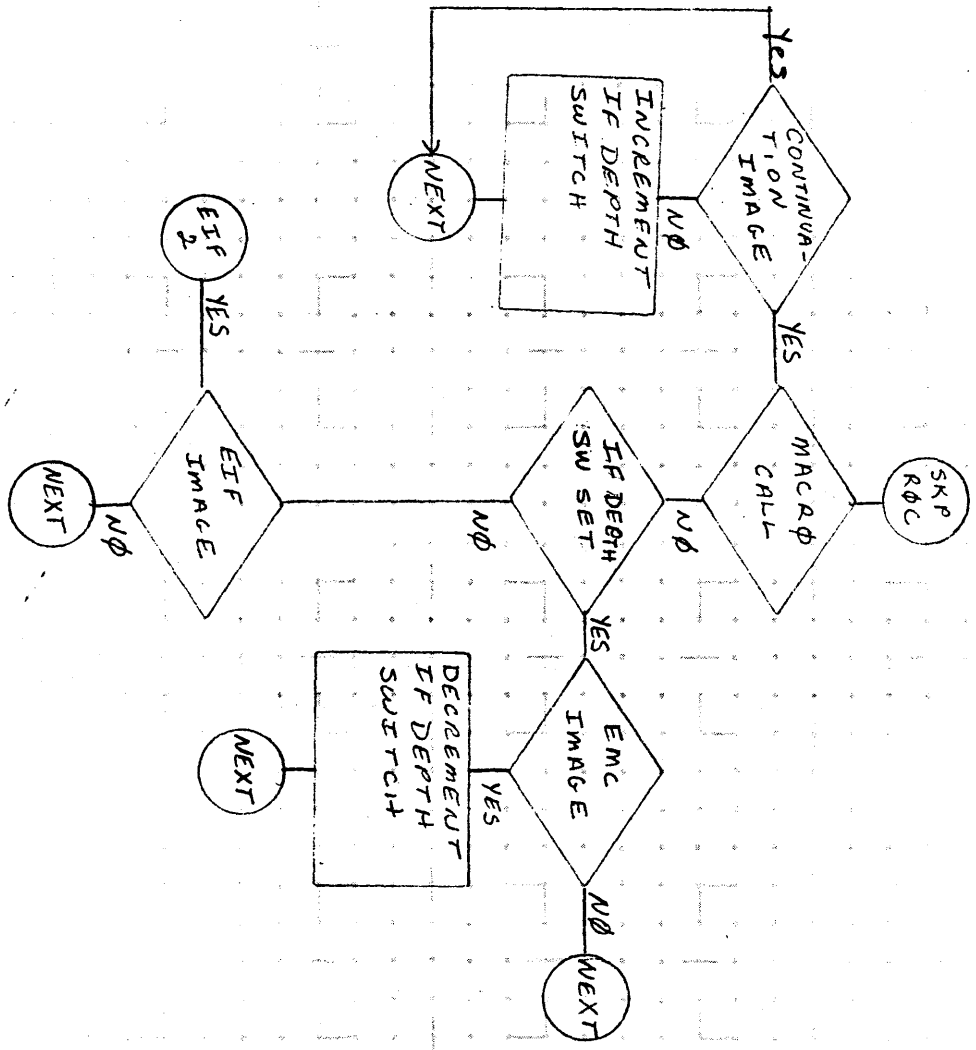
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

AA1385 (FORM) CA127-1)



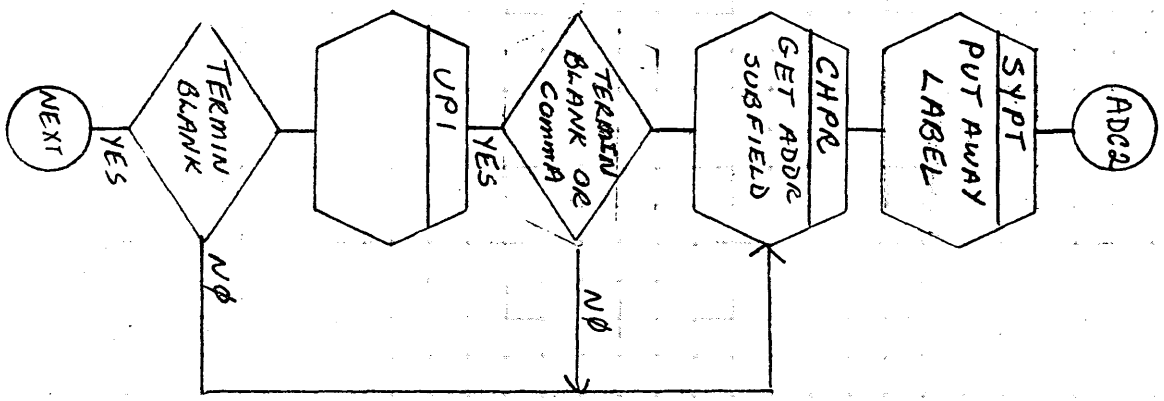
CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE OPCODE PROCESSOR	PROJECT MGR.			
	PASS 2 PAGE 2 OF 2	PROJECT NAME			
	NUMBER 3.2.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)

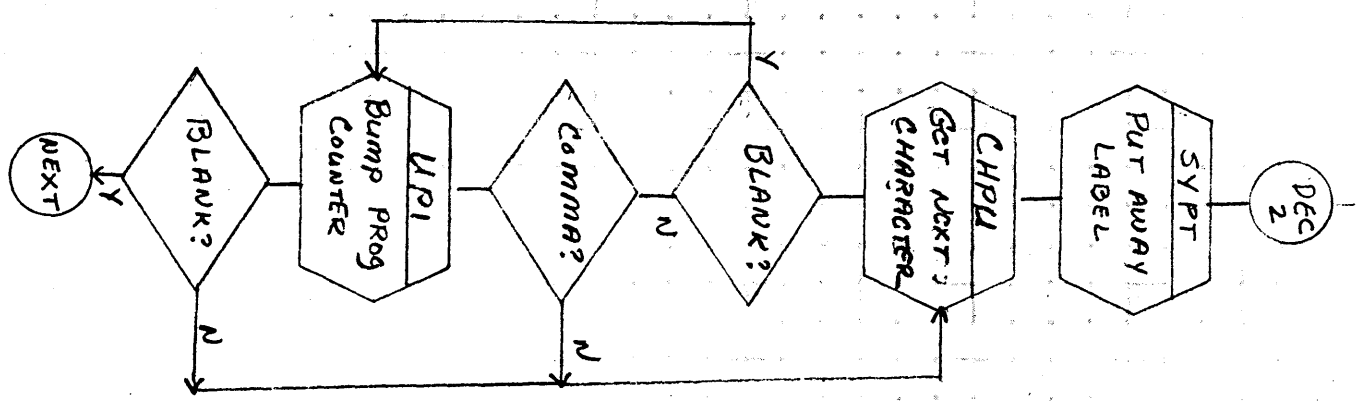


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE SKIP PROCESSOR	PROJECT MGR.			
	PASS2 PAGE 1 OF 1	PROJECT NAME			
	NUMBER 3.3.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORM CA127-1)

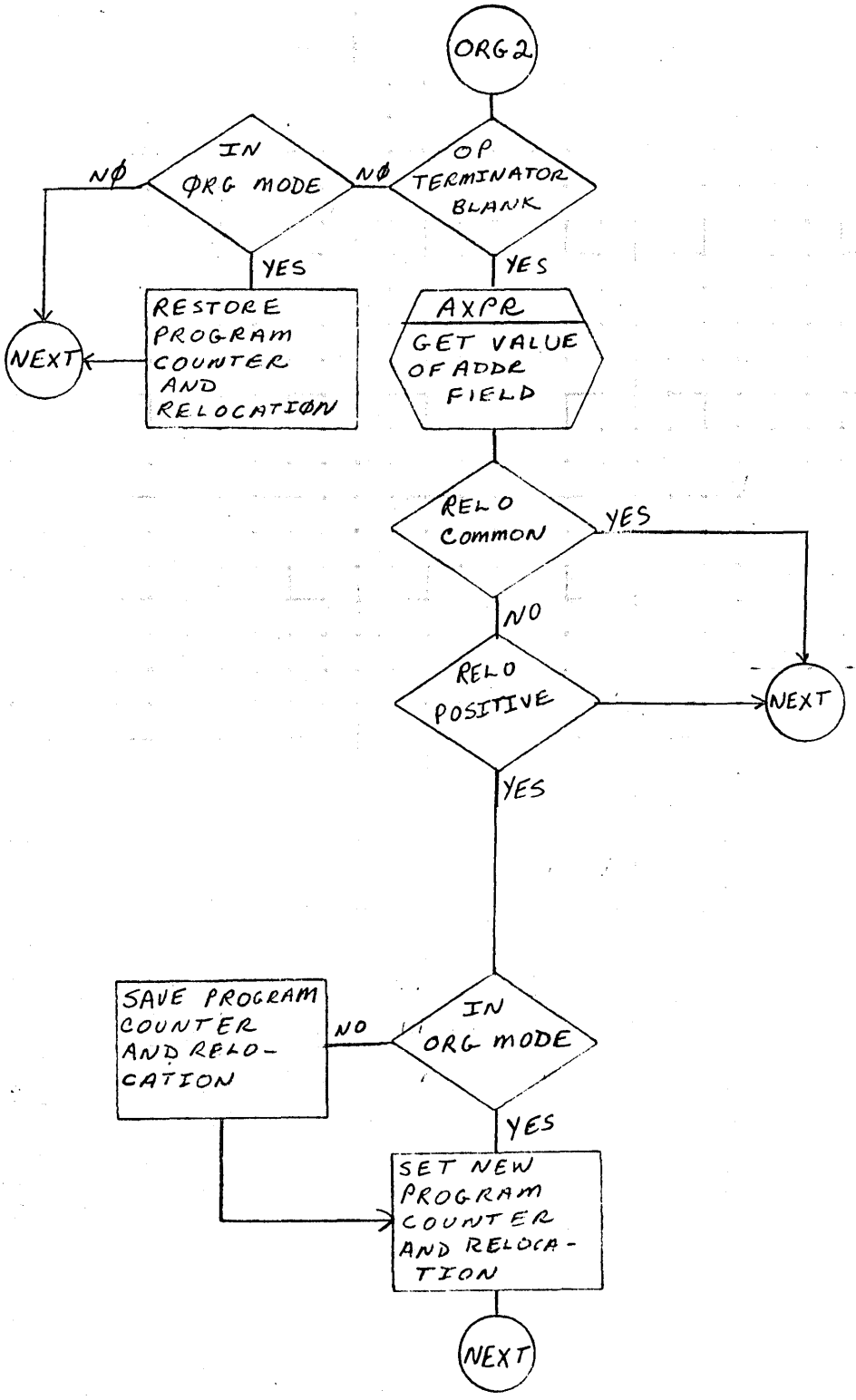


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE ADC, And Num, Pseudos	PROJECT MGR.			
	PROCESSOR PASS 2 PAGE 1 OF 2	PROJECT NAME			
	NUMBER 3.4.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐					
DOCUMENT CLASS: IMS	MACH. TYPE: 1700	PROJECT NO.	REV	APPROVED	DATE
DOCUMENT TITLE: DEC PSEUDO PROCESSOR		PROJECT MGR.			
PASS 2	PAGE 2 OF 2	PROJECT NAME			
NUMBER 3.4.1.1	ISSUE DATE	TASK NO.			
DRAWN BY	DATE	TASK NAME			

AA1385 (FORM CA127-1)



CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

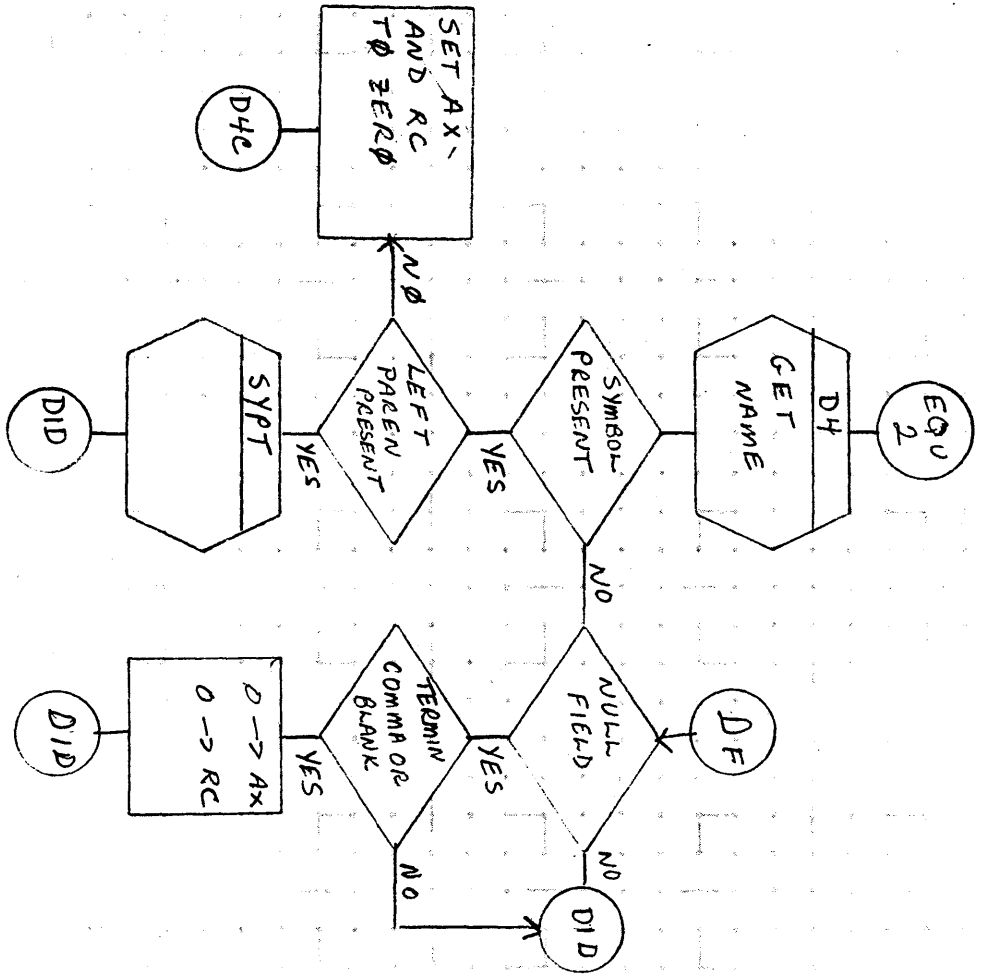
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS		MACH. TYPE	1700
DOCUMENT TITLE	ORG, JRS* PSEUDO		
	PROCESSOR PASS 2	PAGE	1 OF 1
NUMBER	3.5.1	ISSUE DATE	
DRAWN BY		DATE	

REV	APPROVED	DATE

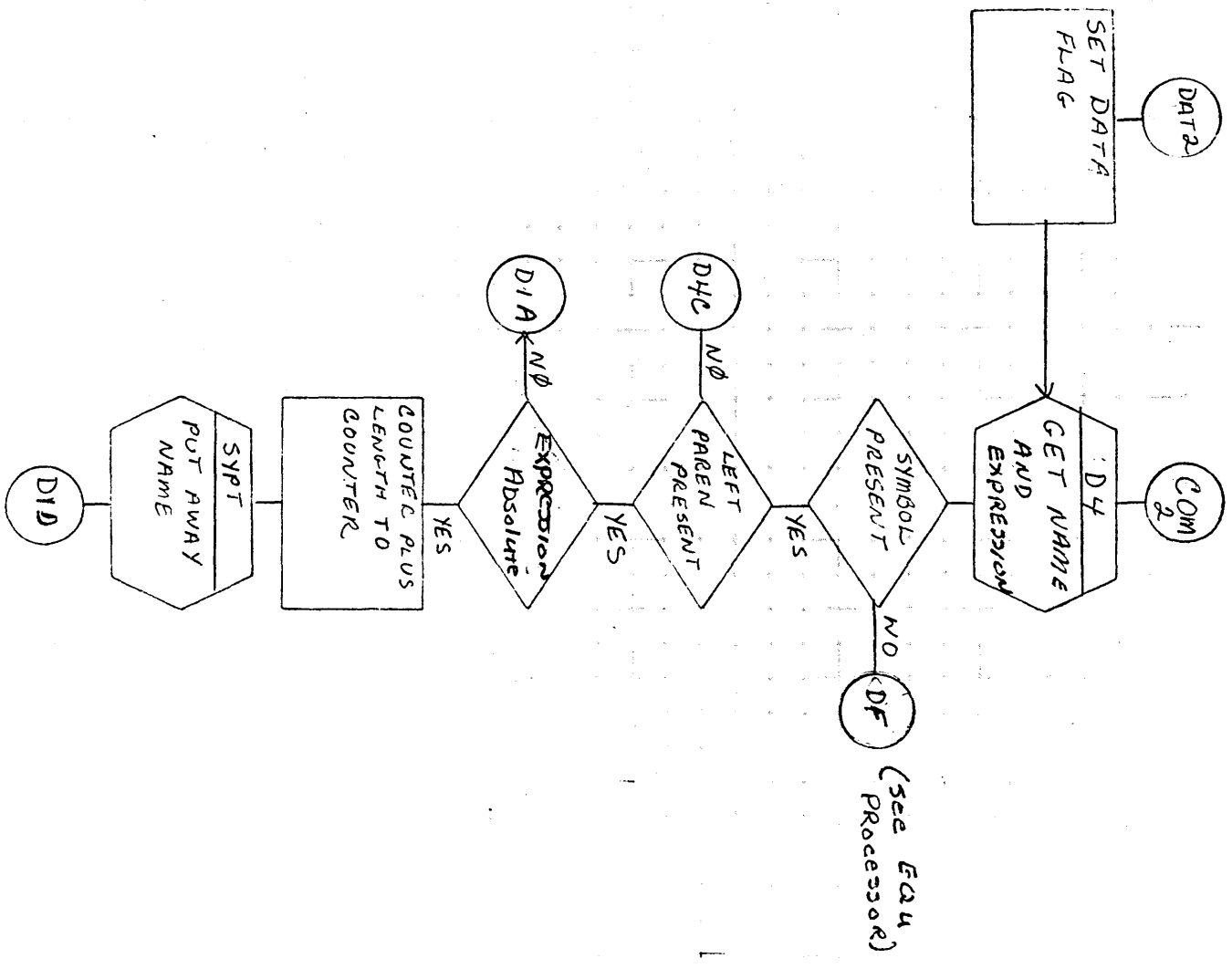
PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

AA1385 (FORMERLY CA127-1)



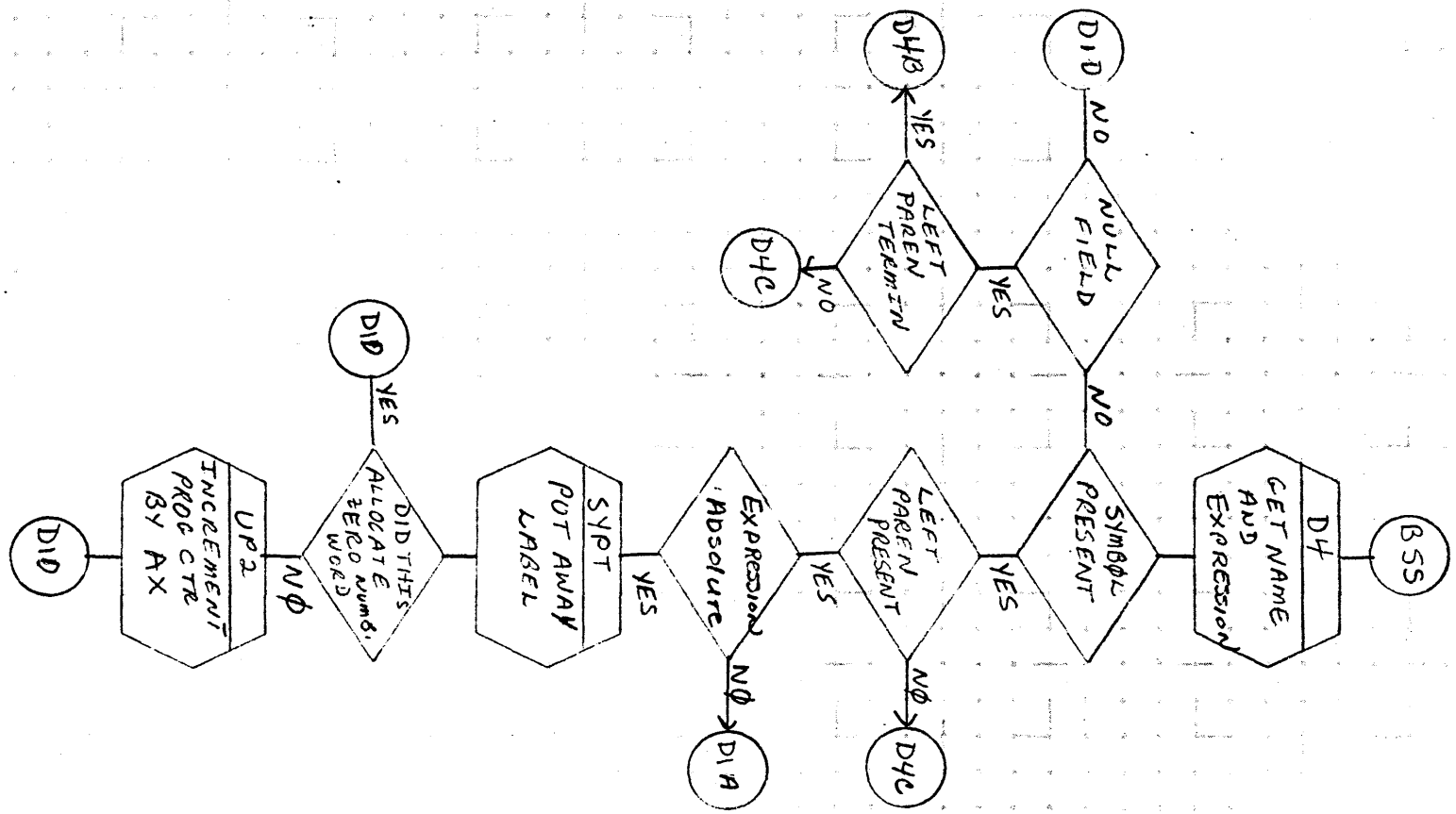
CONTROL DATA CORPORATION	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SOFTWARE DOCUMENT	DOCUMENT TITLE EQ. PSEUDO PROCESSOR		PROJECT MGR.			
SAMPLE CODE ☐	PASS 2	PAGE 1 OF 1	PROJECT NAME			
FLOWCHART ☐	NUMBER 3.6.1	ISSUE DATE	TASK NO.			
DECISION TABLE ☐	DRAWN BY	DATE	TASK NAME			
OTHER ☐						

AA1385 (FORM CA127-1)



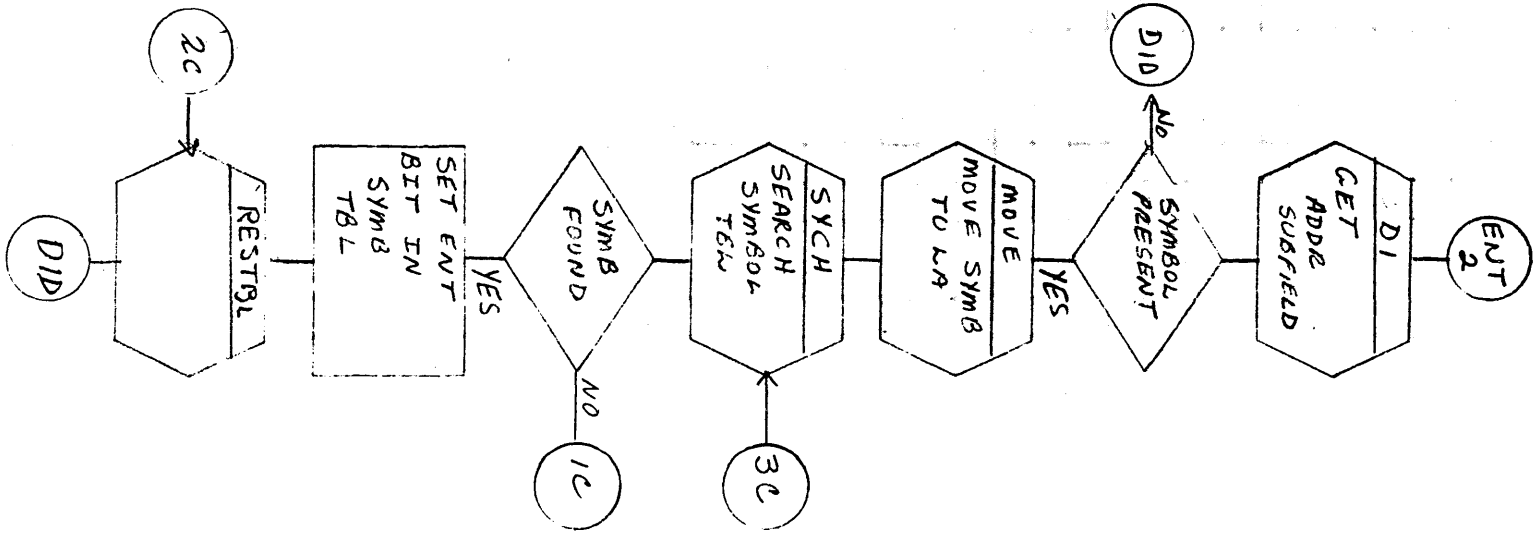
CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS Ims MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE DAT, COM PSEUDO	PROJECT MGR.			
FLOWCHART ☐	PROCESSORS PASS 2 PAGE 1 OF 1	PROJECT NAME			
DECISION TABLE ☐	NUMBER 3.7.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)

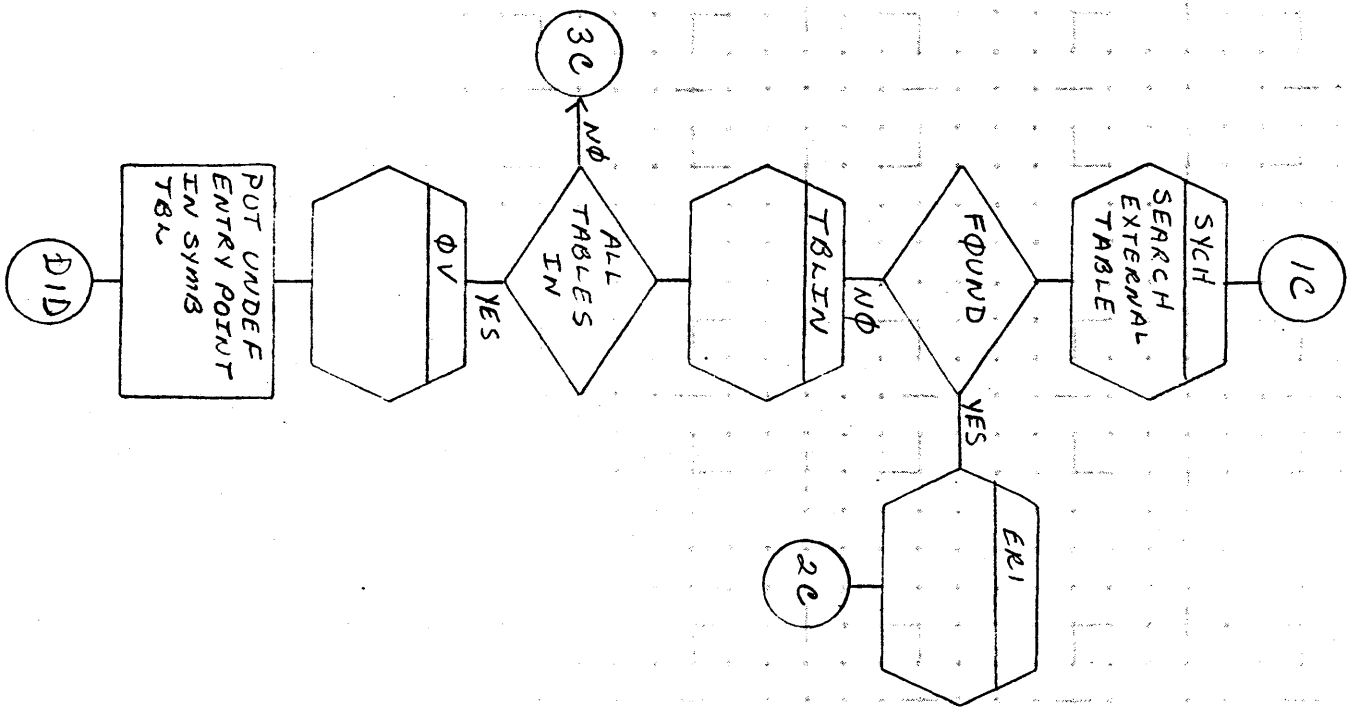


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE B2-, B25 PSEUDO	PROJECT MGR.			
	PROCESSOR PASS 2 PAGE 1 OF 1	PROJECT NAME			
	NUMBER 3.8.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

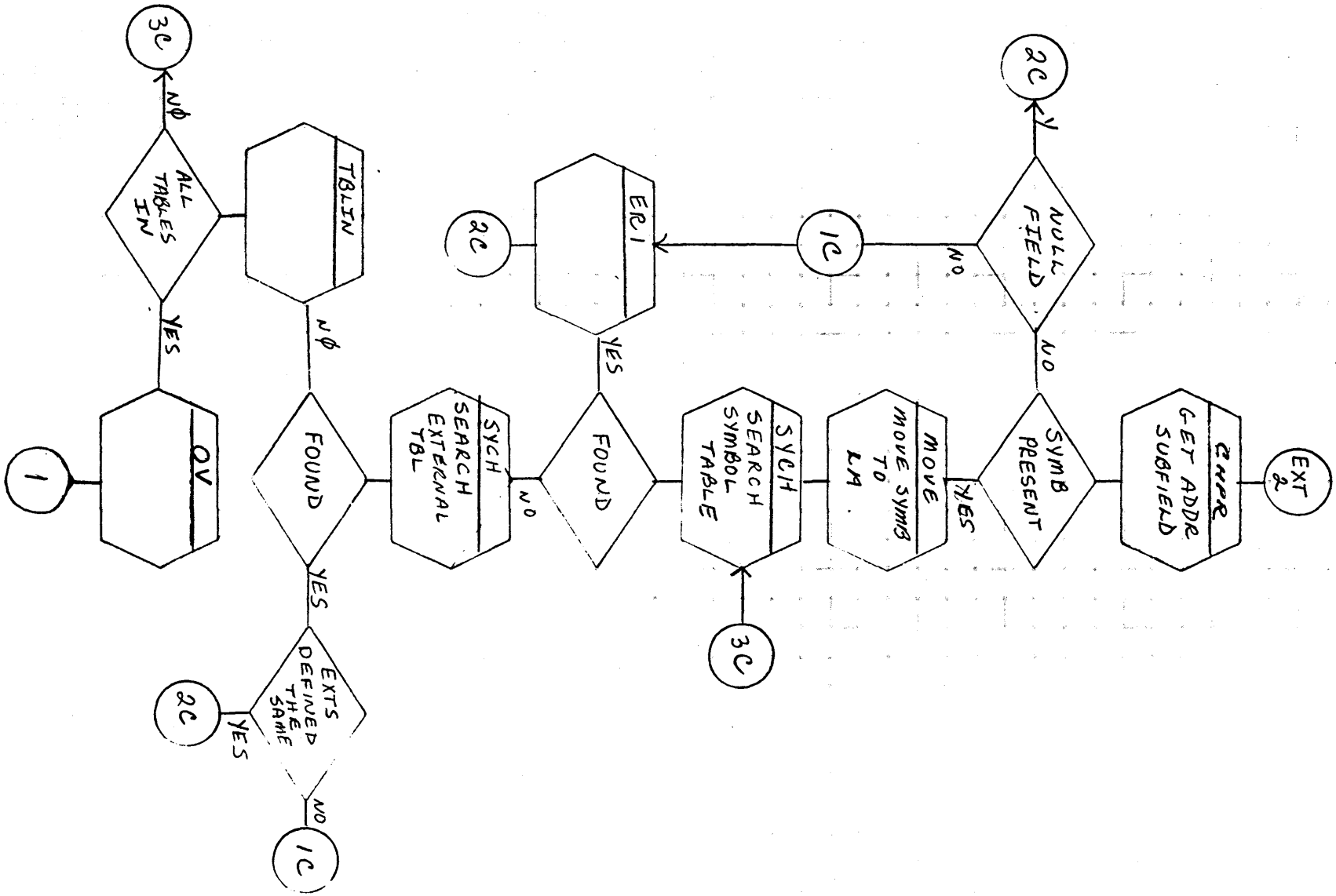
AA1385 (FO LY CA127-1)



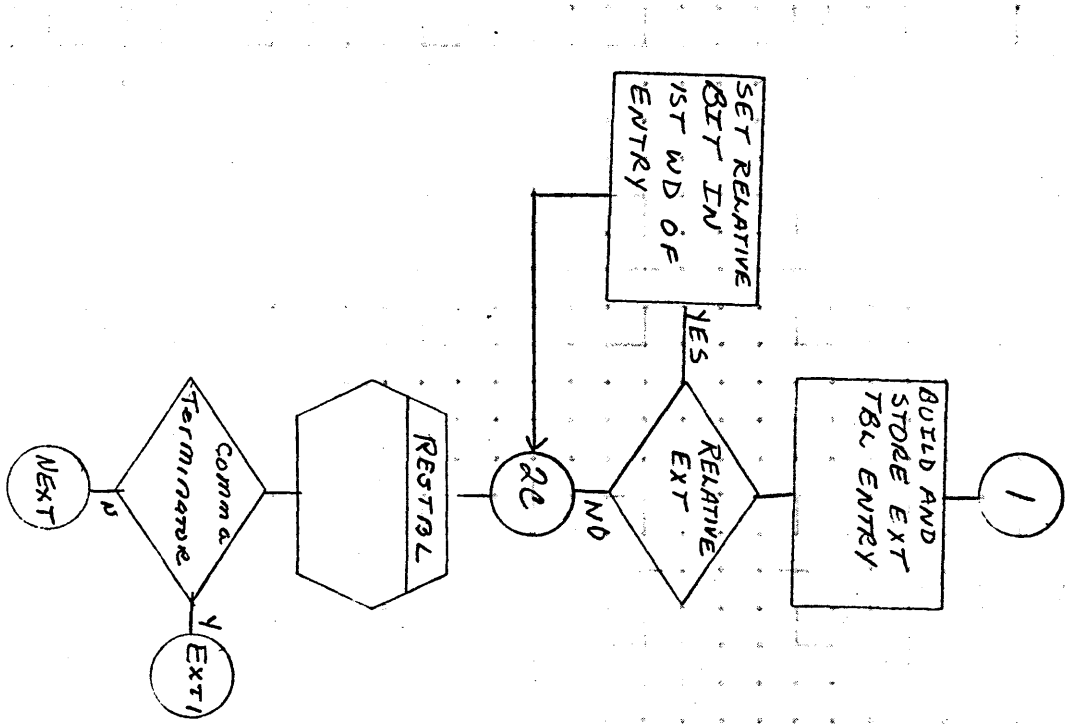
CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE ENT PSEUDO PROCESSOR	PROJECT MGR.			
	PASS 2 PAGE 1 OF 2	PROJECT NAME			
	NUMBER 3.9.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS Ims MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE ENT PSEUDO PROCESSOR	PROJECT MGR.			
FLOWCHART ☐	PASS 2 PAGE 2 OF 2	PROJECT NAME			
DECISION TABLE ☐	NUMBER 3.9.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

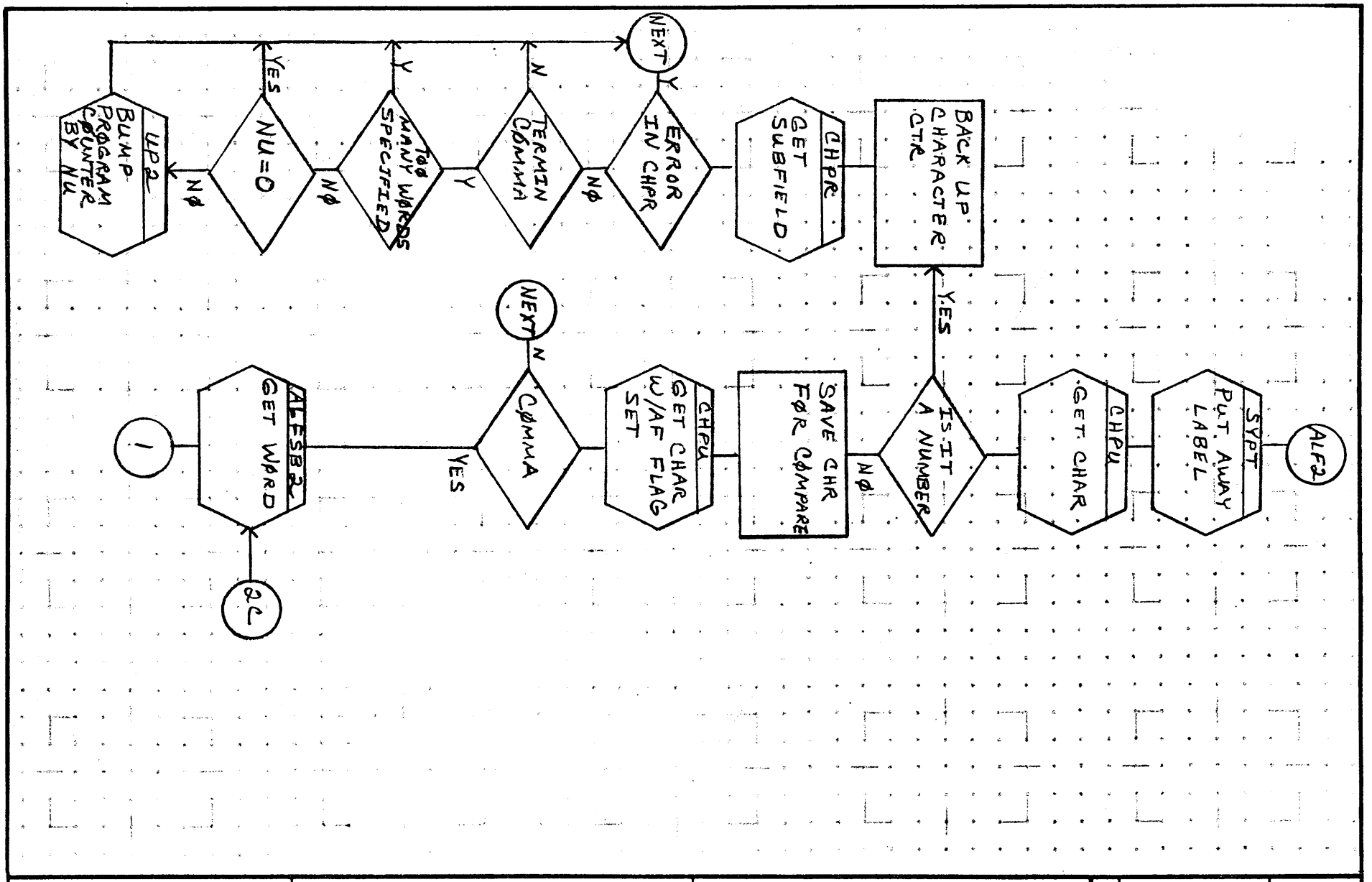


CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE EXT Preludo	PROJECT MGR.			
FLOWCHART ☐	Processor, Pass 2 PAGE 1 OF 2	PROJECT NAME			
DECISION TABLE ☐	NUMBER 3.10.1 ISSUE DATE	TASK NO			
OTHER ☐	DRAWN BY DATE	TASK NAME			

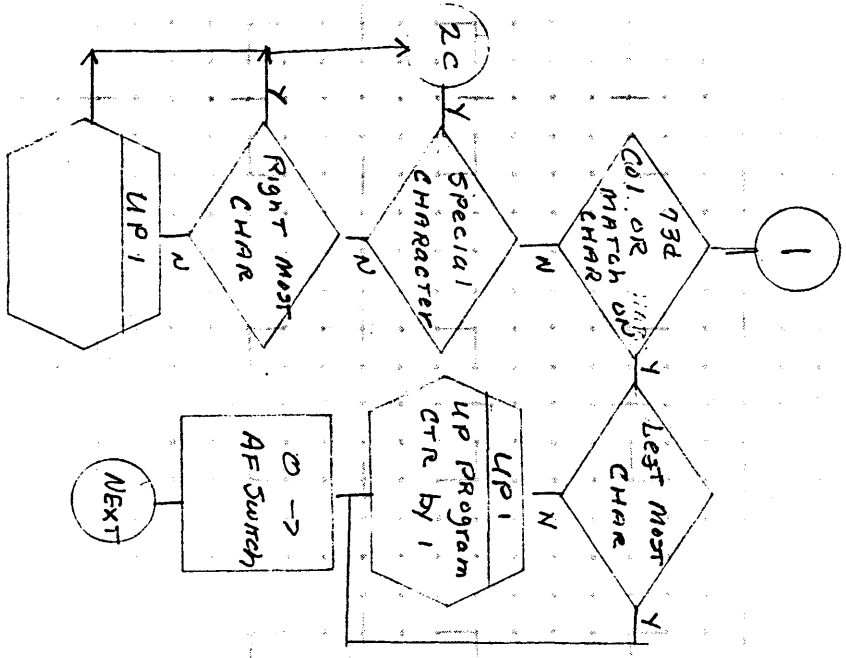


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS J IM3 MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE EXT PSEUDO PROCESSOR	PROJECT MGR.			
	PASS 2 PAGE 2 OF 2	PROJECT NAME			
	NUMBER 3.10.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)

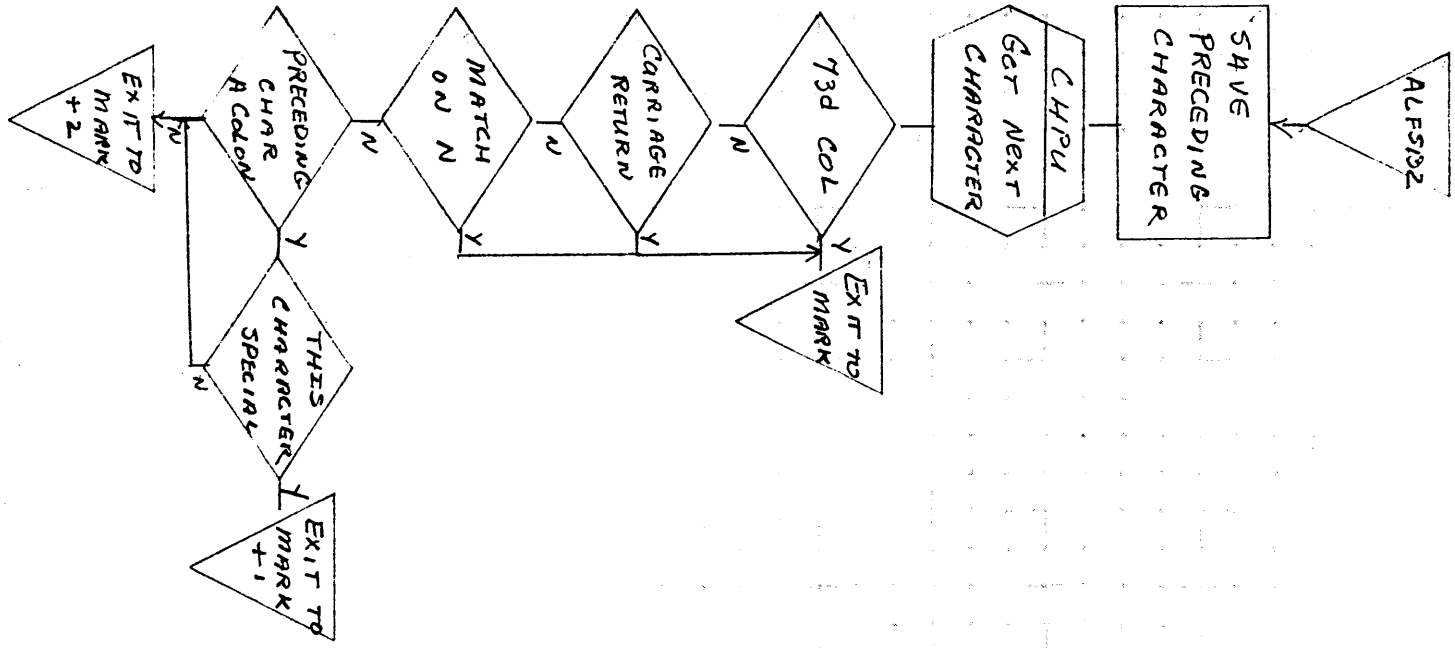


CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
SAMPLE CODE ☐	DOCUMENT TITLE ALF PSEUDO PROCESSOR		PROJECT MGR.		
FLOWCHART ☐	PASS 2	PAGE 1 OF 3	PROJECT NAME		
DECISION TABLE ☐	NUMBER 3.11.1	ISSUE DATE	TASK NO.		
OTHER ☐	DRAWN BY	DATE	TASK NAME		

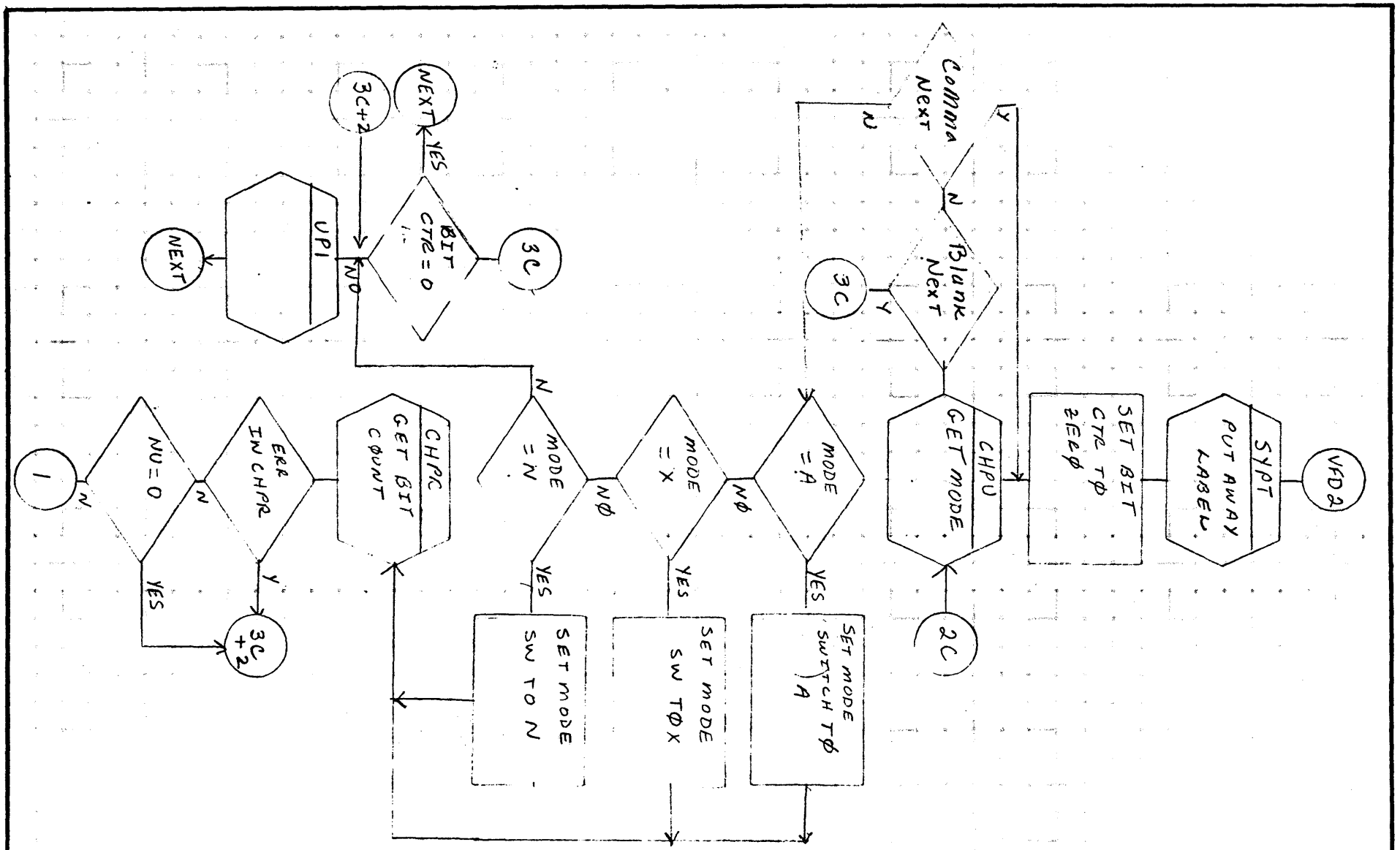


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE HLP PROCESSOR	PROJECT MGR.			
	PASS 2 PAGE 2 OF 3	PROJECT NAME			
	NUMBER 3,11.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

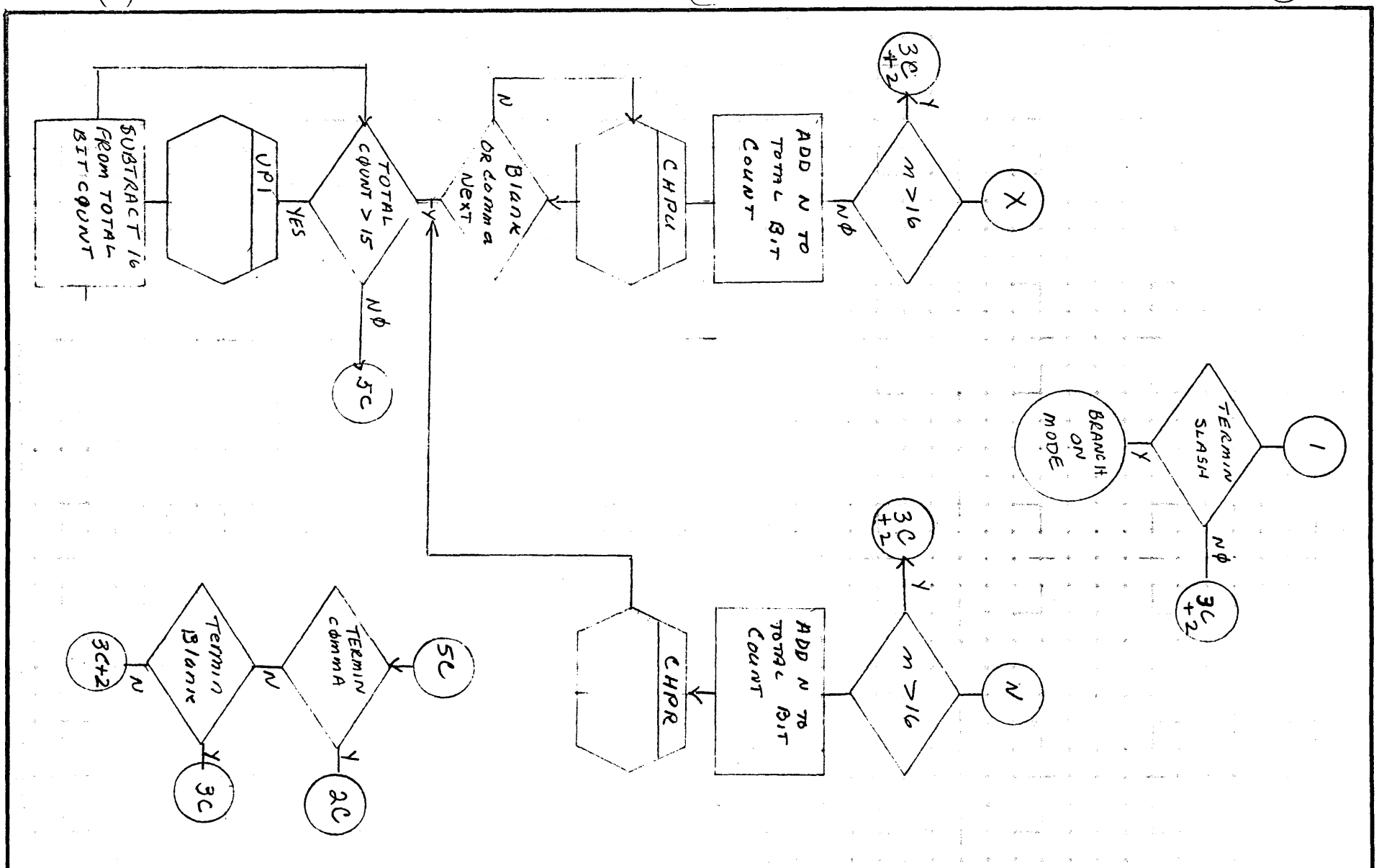
AA1385 (FOR CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
	DOCUMENT TITLE ALFSB2 - SUBROUTINE FOR		PROJECT MGR.		
	ALF and VFD PASS 2 PAGE 3 OF 3		PROJECT NAME		
	NUMBER 3.11.1	ISSUE DATE	TASK NO.		
	DRAWN BY	DATE	TASK NAME		

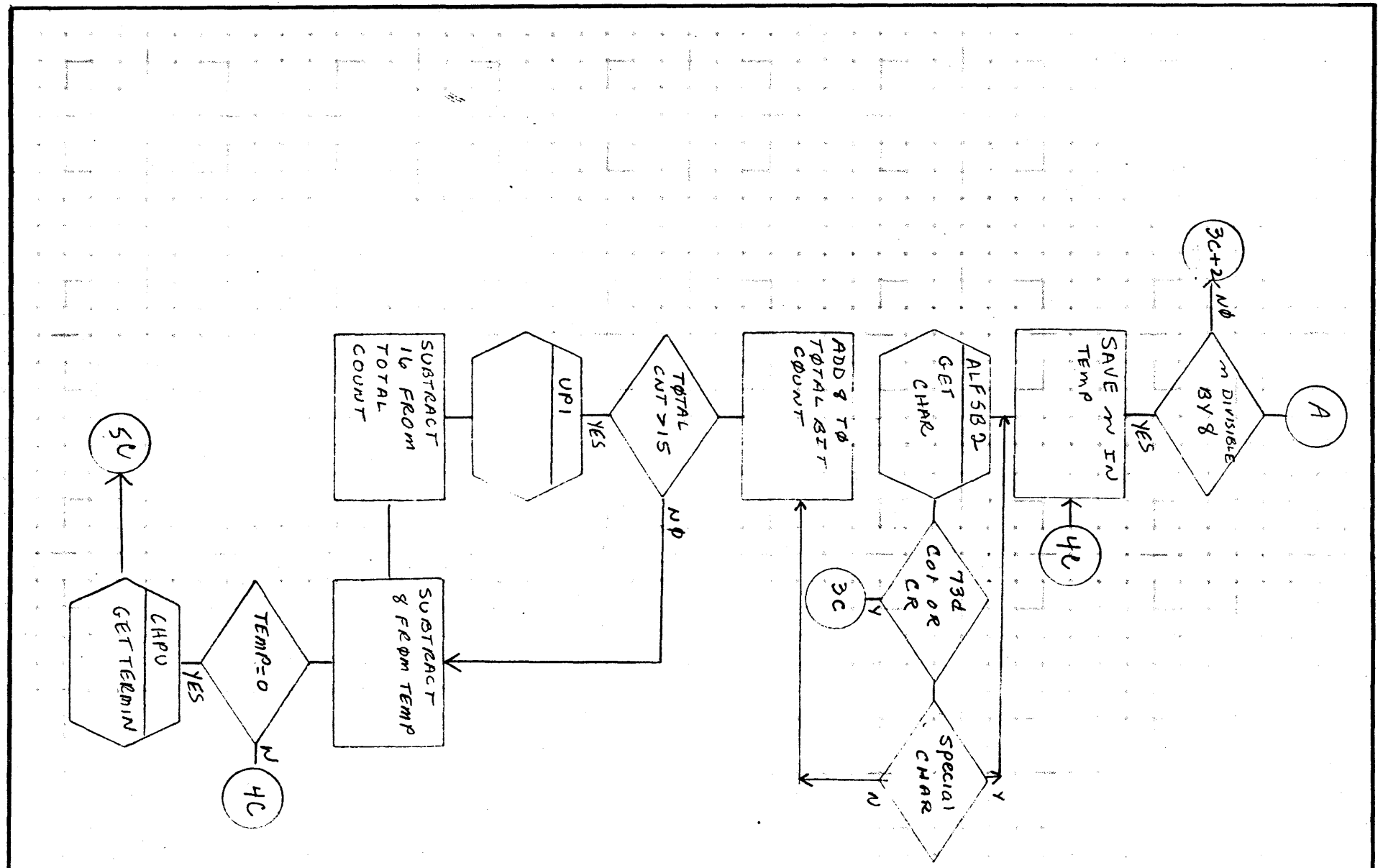


CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
SAMPLE CODE ☐	DOCUMENT TITLE VFD PROCESSOR		PROJECT MGR.		
FLOWCHART ☐	PASS 2	PAGE 1 OF 3	PROJECT NAME		
DECISION TABLE ☐	NUMBER 3.12.1	ISSUE DATE	TASK NO.		
OTHER ☐	DRAWN BY	DATE	TASK NAME		



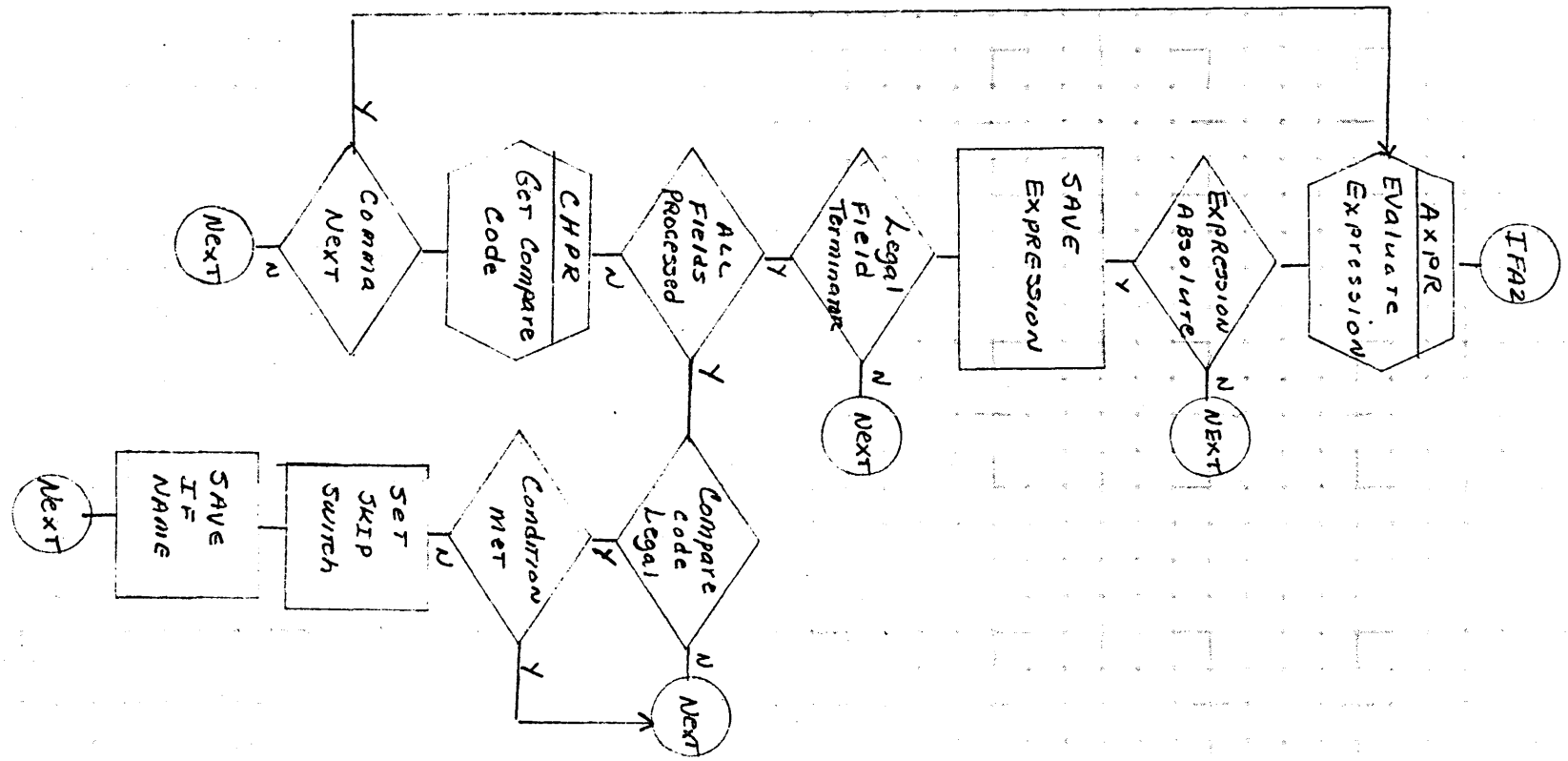
CONTROL DATA CORPORATION	DOCUMENT CLASS - Ems	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SOFTWARE DOCUMENT	DOCUMENT TITLE VFD PROCESSOR		PROJECT MGR.			
SAMPLE CODE ☐	PASS 2	PAGE 2 OF 3	PROJECT NAME			
FLOWCHART ☐☐	NUMBER 3.12.1	ISSUE DATE	TASK NO.			
DECISION TABLE ☐☐	DRAWN BY	DATE	TASK NAME			
OTHER ☐						

AA1385 (FORMERLY CA127-1)

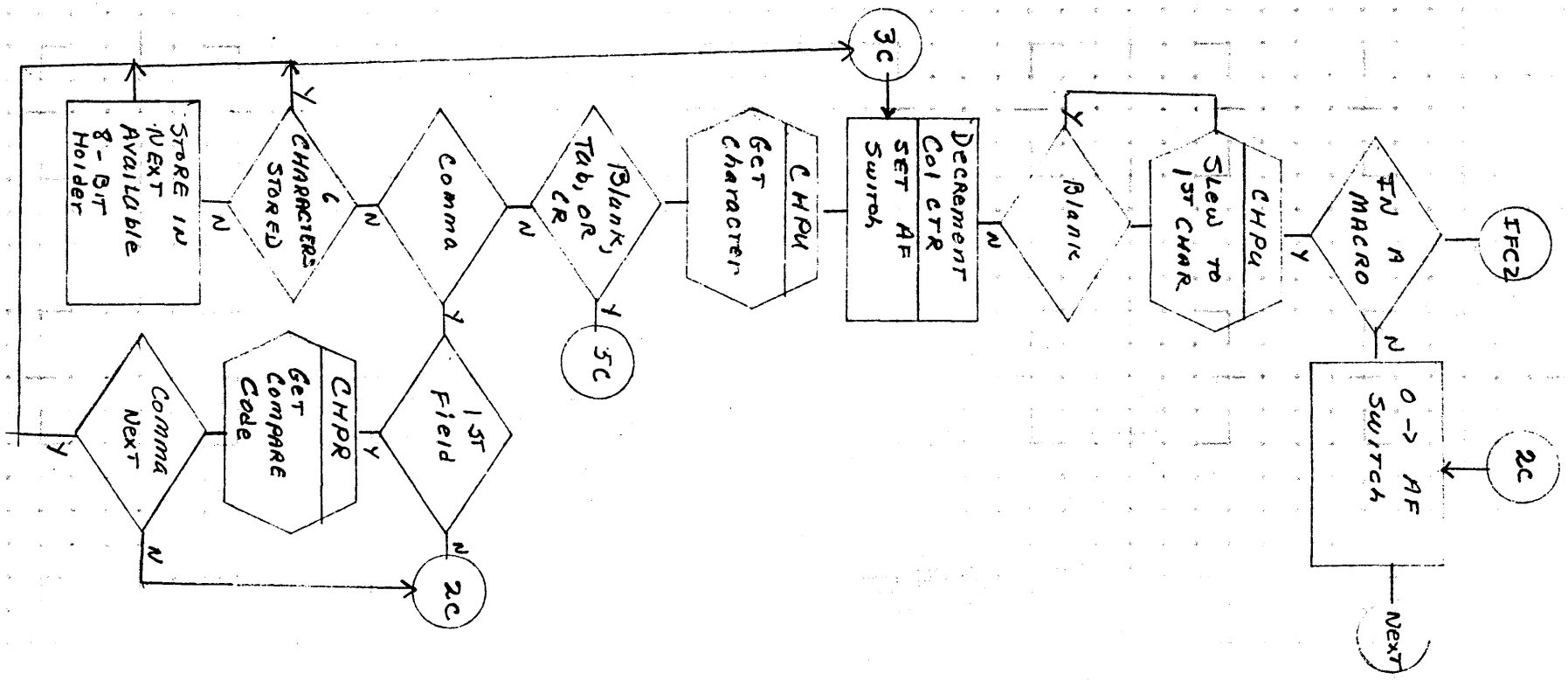


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE VFD PROCESSOR	PROJECT MGR.			
	PASS 2 PAGE 3 OF 3	PROJECT NAME			
	NUMBER 3.12.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORM CA127-1)

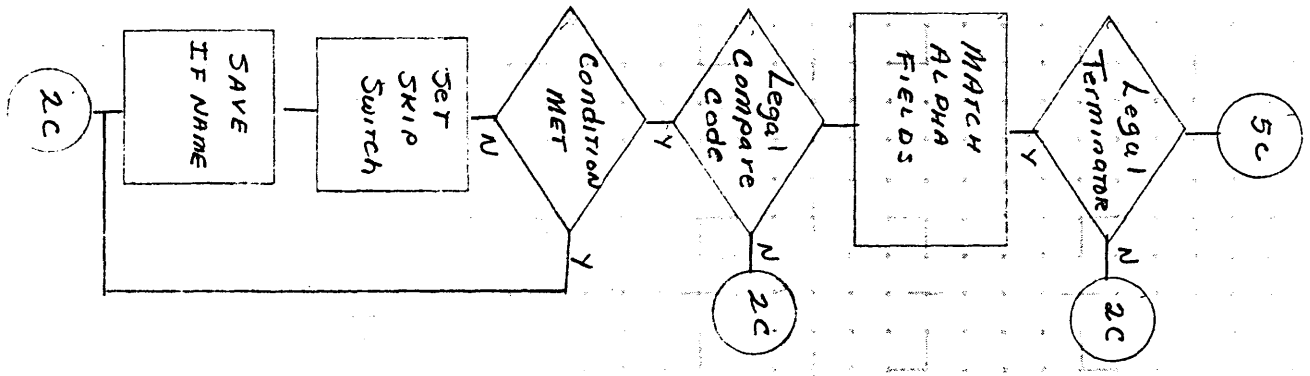


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
	DOCUMENT TITLE IFA PSEUDO PROCESSOR		PROJECT MGR.		
	PASS 2	PAGE 1 OF 1	PROJECT NAME		
	NUMBER 3.13.1	ISSUE DATE	TASK NO.		
	DRAWN BY	DATE	TASK NAME		

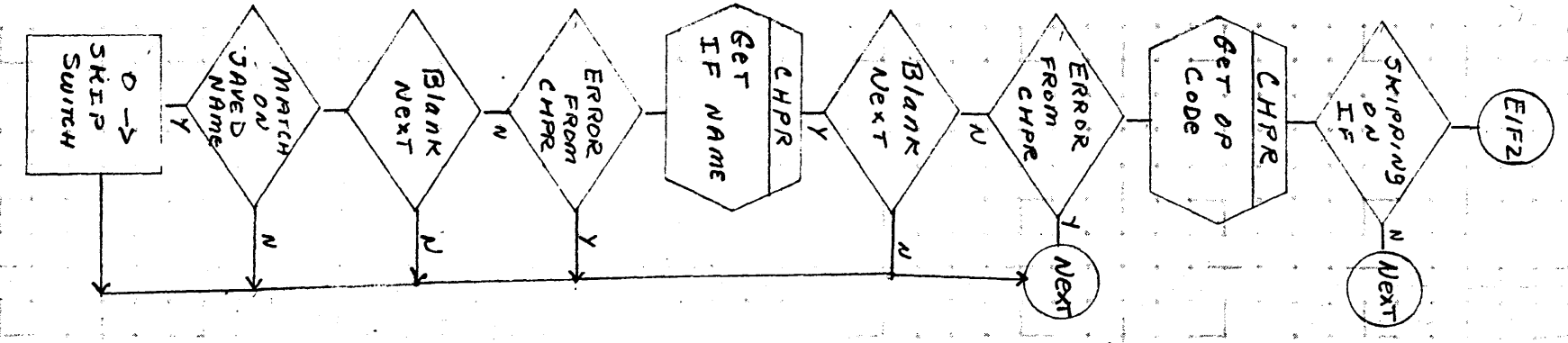


CONTROL DATA CORPORATION SOFTWARE DOCUMENT						
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE IFC PSEUDO PROCESSOR		PROJECT MGR.			
	PA552	PAGE 1 OF 2	PROJECT NAME			
	NUMBER 3.14.1	ISSUE DATE	TASK NO.			
	DRAWN BY	DATE	TASK NAME			

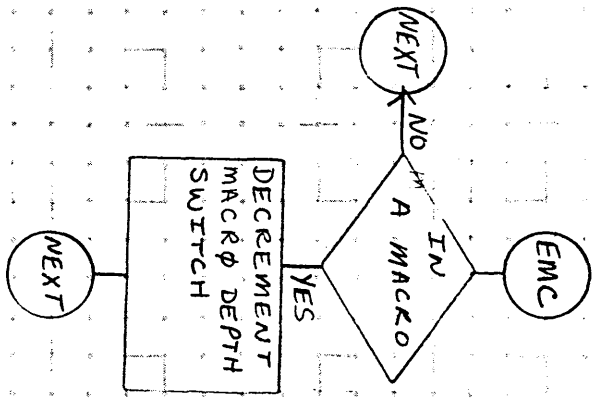
AA1385 (FORM CA127-1)



CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
SAMPLE CODE ☐	DOCUMENT TITLE IFC PSEUDO PROCESSOR		PROJECT MGR.		
FLOWCHART ☐	PASS 2	PAGE 2 OF 2	PROJECT NAME		
DECISION TABLE ☐	NUMBER 3,14.1	ISSUE DATE	TASK NO.		
OTHER ☐	DRAWN BY	DATE	TASK NAME		

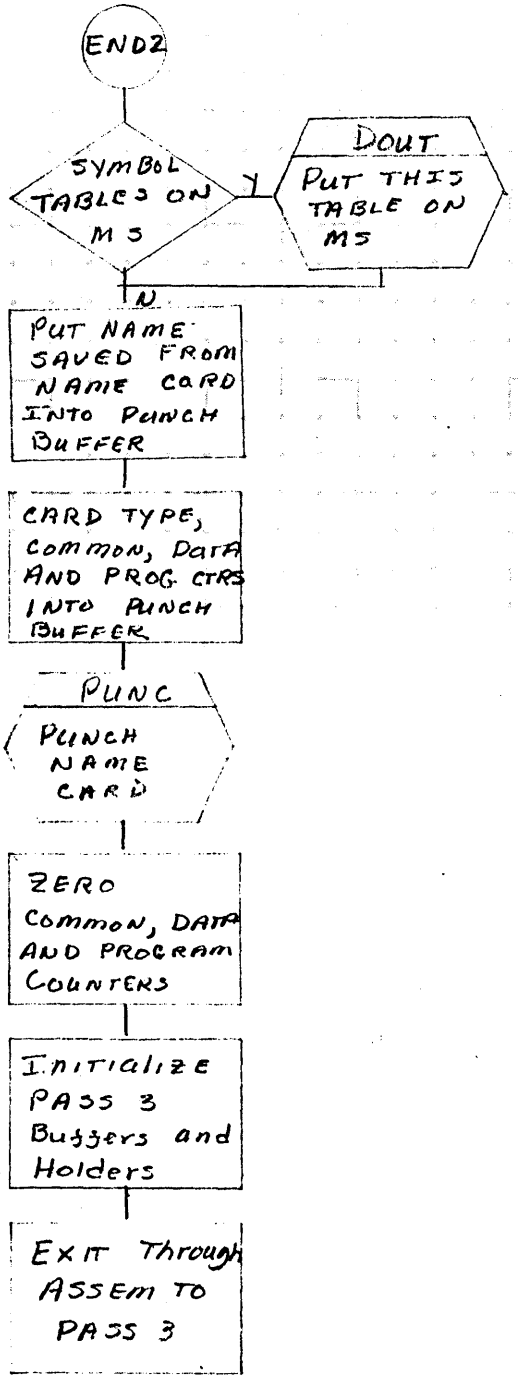


CONTROL DATA CORPORATION						
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE EIF PSEUDO PROCESSOR		PROJECT MGR.			
FLOWCHART ☐	PASS 2	PAGE 1 OF 1	PROJECT NAME			
DECISION TABLE ☐	NUMBER 3.15.1	ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY	DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE EMC PSEUDO PROCESSOR	PROJECT MGR.			
	PASS 2 PAGE 1 OF 1	PROJECT NAME			
	NUMBER 3.16.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



REV	APPROVED	DATE

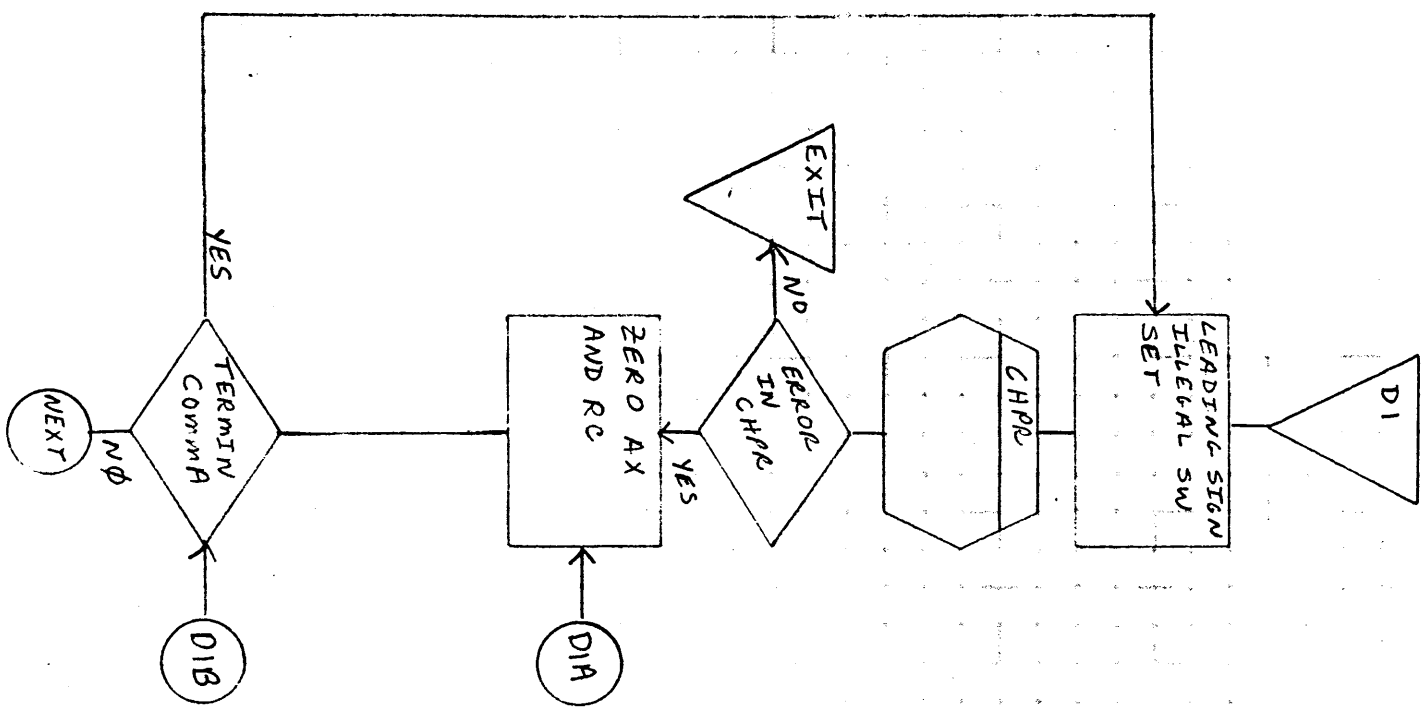
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE ☐
FLOWCHART ☐
DECISION TABLE ☐
OTHER ☐

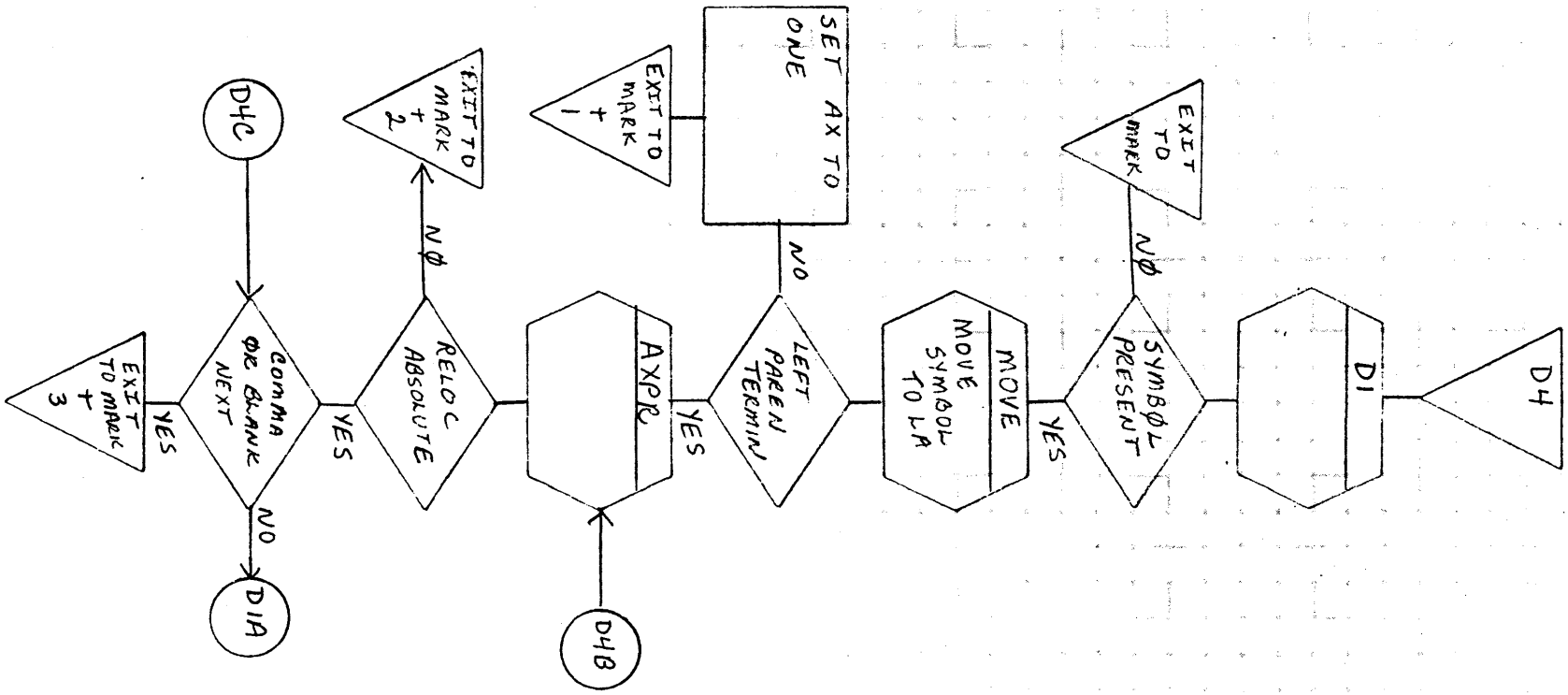
DOCUMENT CLASS	IMS	MACH. TYPE	1700
DOCUMENT TITLE	END PSEUDO PROCESSOR		
PASS 2		PAGE 1 OF 1	
NUMBER	3.17.1	ISSUE DATE	
DRAWN BY		DATE	

PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

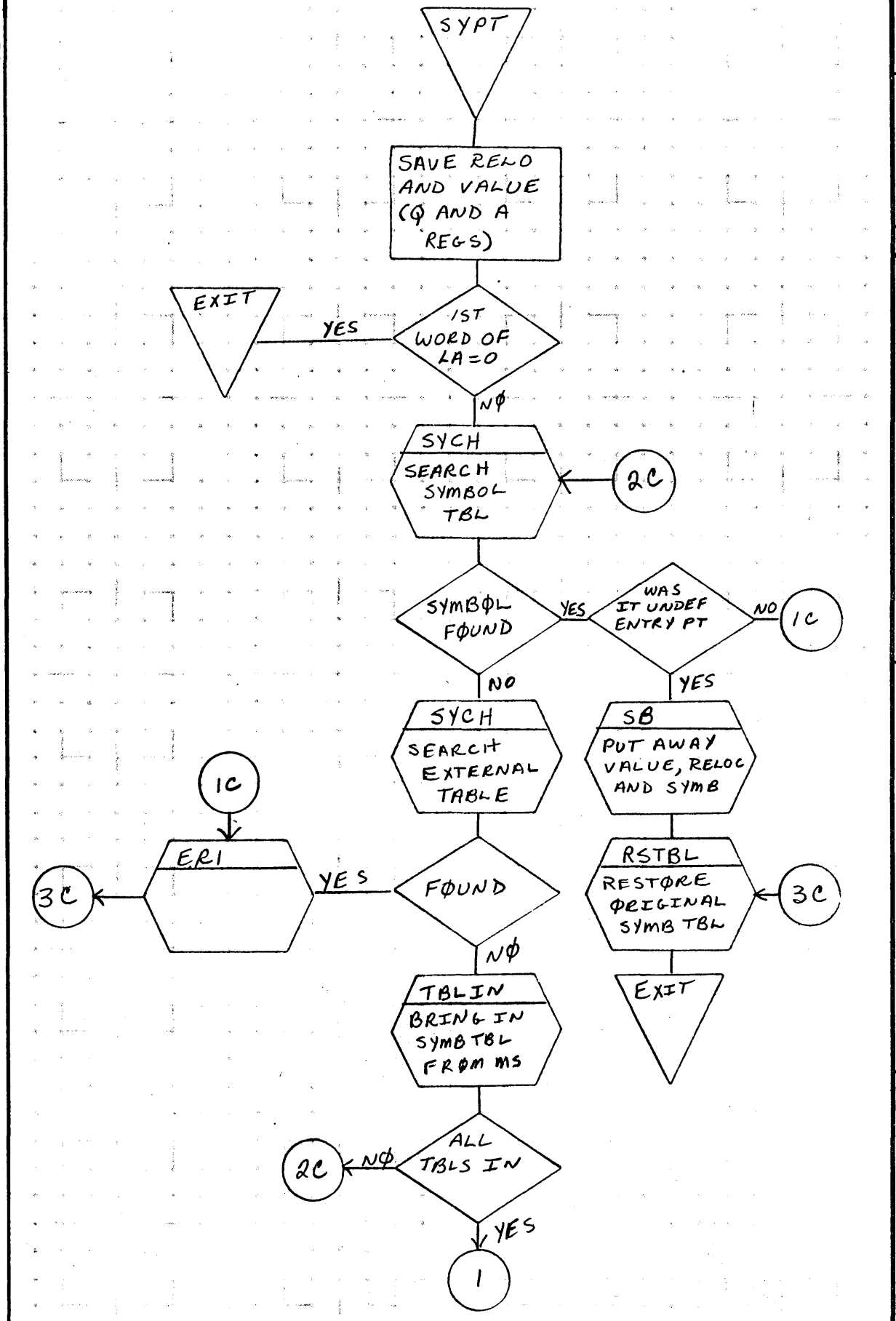
AA1385 (FORM) CA127-11



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS Ims MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE Miscellaneous Pseudo Subroutines PASS 2 PAGE 1 OF 2	PROJECT MGR.			
		PROJECT NAME			
	NUMBER 3.18.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



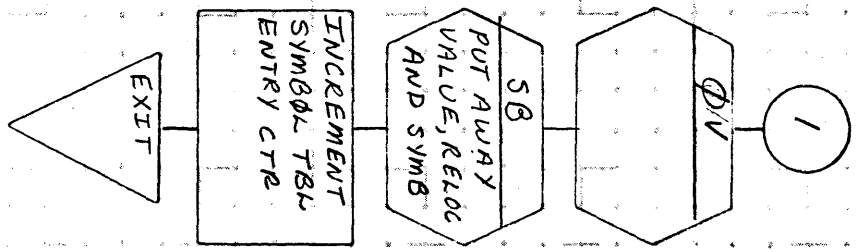
CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS Ims MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE Miscellaneous	PROJECT MGR.			
FLOWCHART ☐	Pseudo Subroutines PAGE 2 OF 2	PROJECT NAME			
DECISION TABLE ☐	NUMBER 3.18.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION	DOCUMENT CLASS	MACH. TYPE	PROJECT NO.
SOFTWARE DOCUMENT	DOCUMENT TITLE	IMS 1700 SYMBOL TABLE PUTAWAY	PROJECT MGR.
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	ROUTINE PASS 2	PAGE 1 OF 2	PROJECT NAME
	NUMBER 3.19.1	ISSUE DATE	TASK NO.
	DRAWN BY	DATE	TASK NAME

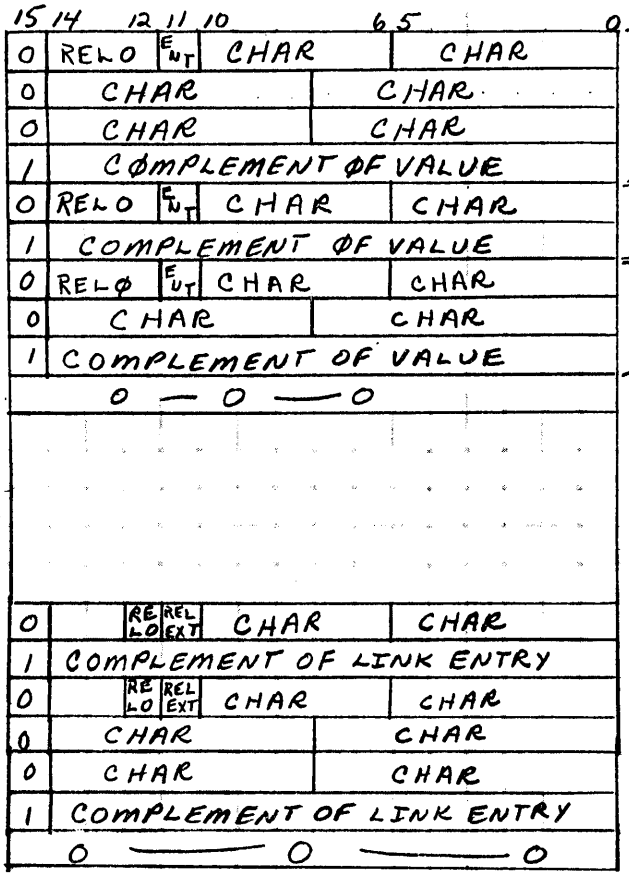
REV	APPROVED	DATE

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE SYMBOL TABLE PUTAWAY	PROJECT MGR.			
	ROUTINE PASS 2 PAGE 2 OF 2	PROJECT NAME			
	NUMBER 3.19.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



REV	APPROVED	DATE

PROJECT NO.

PROJECT MGR.

PROJECT NAME

TASK NO.

TASK NAME

DOCUMENT CLASS

DOCUMENT TITLE SYMBOL TABLE FORMAT

NUMBER 3.19.2 ISSUE DATE

DRAWN BY DATE

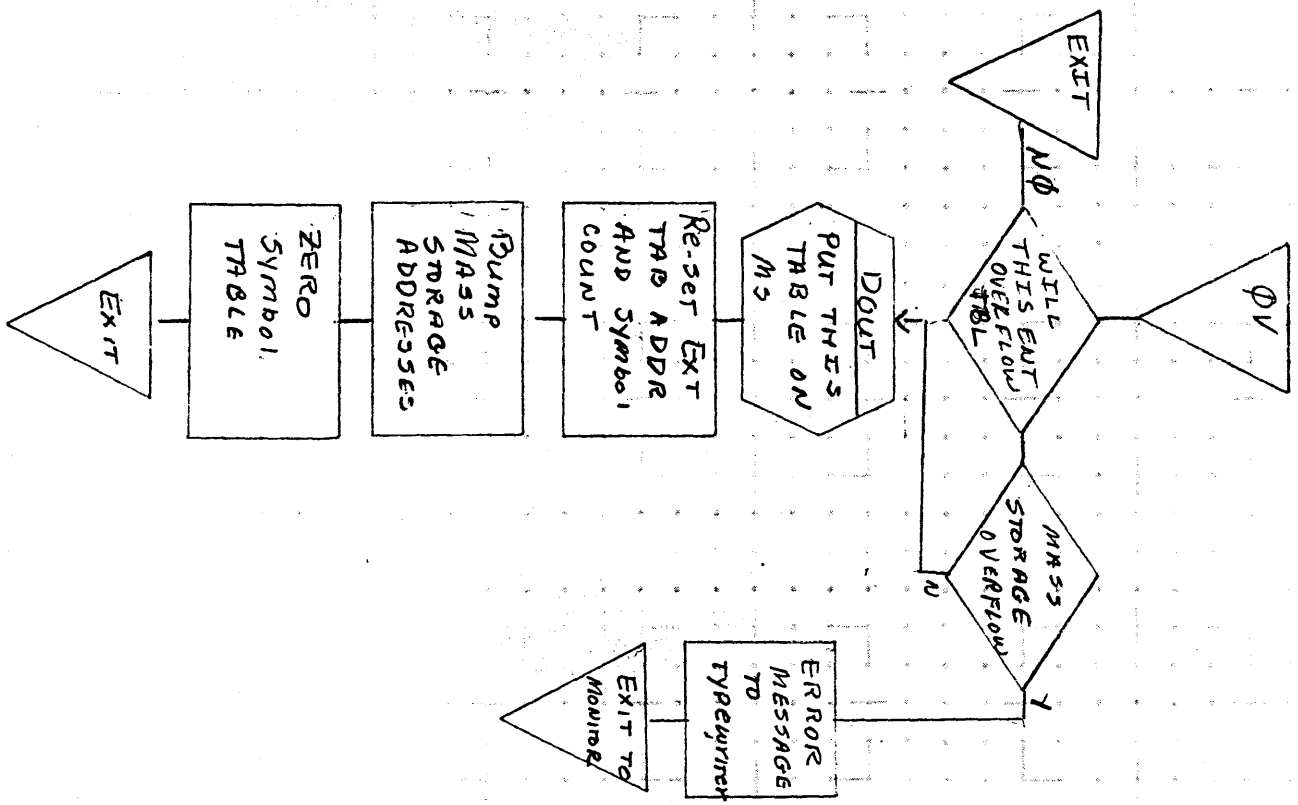
MACH. TYPE IMS 1700

PAGE 1 OF 1

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

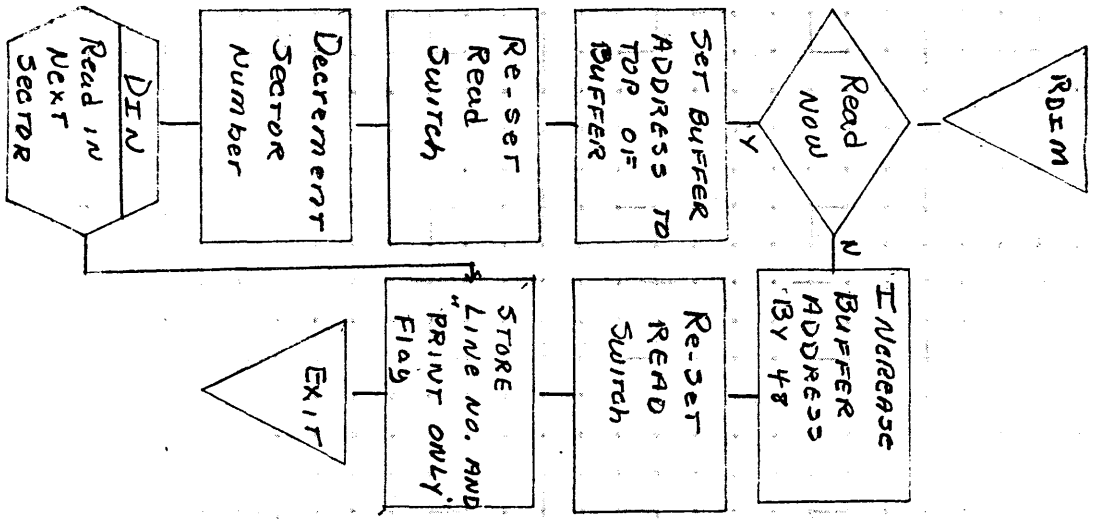
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

AA1385 (FORMERLY CA127-1)



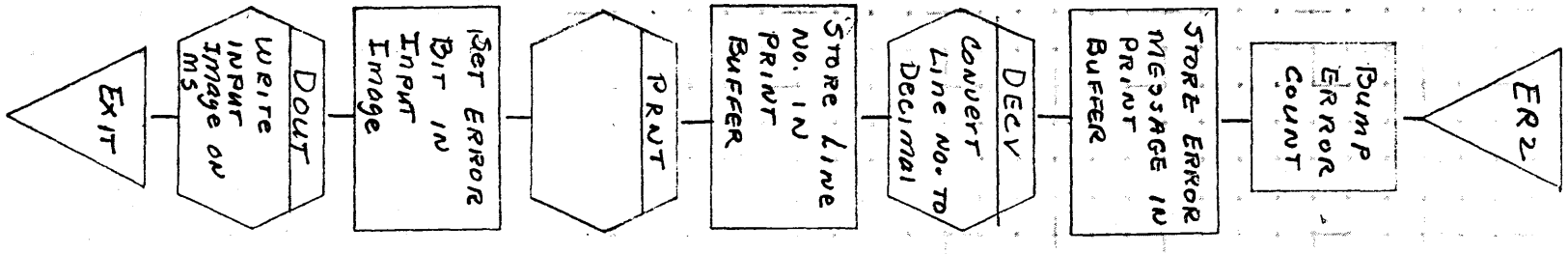
CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE SYMBOL TABLE OVER - FLOW SORT. PASS 2 PAGE 1 OF 1	PROJECT MGR.			
	NUMBER 3.20.1 ISSUE DATE	PROJECT NAME			
	DRAWN BY DATE	TASK NO.			
		TASK NAME			

AA1385 (FORMERLY CA127-1)



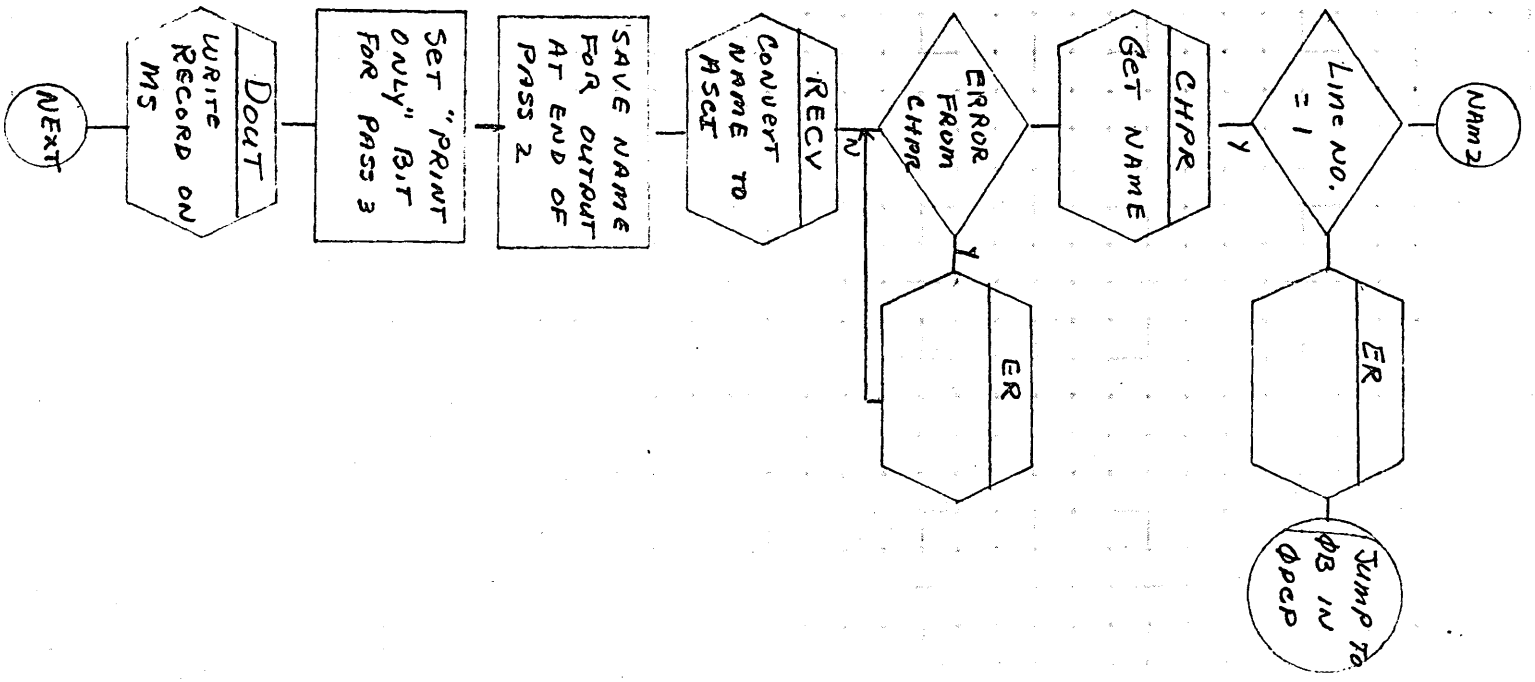
CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE READ IMAGE	PROJECT MGR.			
	PASS 2 PAGE 1 OF 1	PROJECT NAME			
	NUMBER 3.21.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
SAMPLE CODE ☐	DOCUMENT TITLE ERROR SUBROUTINE		PROJECT MGR.		
FLOWCHART ☐	PASS 2	PAGE 1 OF 1	PROJECT NAME		
DECISION TABLE ☐	NUMBER 3.22.1	ISSUE DATE	TASK NO.		
OTHER ☐	DRAWN BY	DATE	TASK NAME		

AA1385 (FOR Y CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐					
DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
DOCUMENT TITLE NAME PSEUDO PROCESSOR	PROJECT MGR.			
PASS 2 PAGE 1 OF 1	PROJECT NAME			
NUMBER 3.23.1 ISSUE DATE	TASK NO.			
DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)

SECTION IV - PASS 3

4. Pass 3 processes the address field of all machine and pseudo instructions except EXT and NAM. Relocatable binary output and a listing are generated.

4.1 Next and Label Pickup Routines

NEXT is the cyclical return for the pass. The Read Image Routine is entered to get the source image. If the assembler is skipping input images as the result of a conditional IF instruction, there is an immediate exit to the Label Pickup Routine. An error message is printed if the error bit has been set in the input record by a previous pass. If the input record is flagged as a "print only IL", the image is printed and the Read Image routine is re-entered. Otherwise exit is to the Label Pickup Routine.

LBPK is used to get the label field of the image. An asterisk as the 1st character causes label pickup to exit to IGNOR. Otherwise, it exits to the Opcode Processor.

4.1.1 Flow Chart of Next and Label Pickup Routines

4.2 Opcode Processor

This routine gets the opcode, checks its terminator, places the binary instruction in the command word, and transfers according to the type of instruction. If images are being skipped due to an IF instruction, the skip processor is entered. If a macro call is encountered, the depth switch is incremented and a print switch is set according to the M control option.

4.2.1 Flow Chart of Opcode Processor

4.3 Skip Processor

This routine is the same as in Pass 2 except that if an EIF is found, exit is to EIF3.

4.3.1 Flow Chart of Skip Processor

4.4 ADC Pseudo Processor

This routine gets the binary value for subfields of the address field. The program counter is incremented for each subfield. It is also entered from the Machine Address Processor to process a literal.

4.4.1 Flow Chart of ADC Pseudo Processor

4.5 NUM Pseudo Processor

This routine gets the binary value for subfields of the address field. The program counter is incremented for each subfield. It is also entered from the Machine Address Processor to process a literal.

4.5.1 Flow Chart of NUM Pseudo Processor

4.6 DEC Pseudo Processor

This routine gets the binary value for subfields of the address field. The program counter is incremented for each subfield. A power of ten table is used for conversion. Scaling is done when division is necessary.

4.6.1 Flow Chart of DEC Pseudo Processor

4.7 ORG, ORG* Pseudo Processor

This routine is the same as the Pass 2 routine except that UNCP is used to output the current RBD image.

4.7.1 Flow Chart of ORG, ORG* Pseudo Processor

4.8 EXT Pseudo Processor

This routine exits to IGNOR which prints the image.

4.8.1 Flow Chart of EXT Pseudo Processor

4.9 EQU Pseudo Processor

The Miscellaneous pseudo subroutine D4 is entered to get the symbol and the expression value. The expression value is stored in W1. Exit is to Miscellaneous pseudo subroutine D1 which prints the image and checks the next field.

4.9.1 Flow Chart of EQU Pseudo Processor

4.10 COM, DAT Pseudo Processor

The Miscellaneous pseudo subroutine D4 is entered to get the symbol and the expression value. The common or data counter is stored in W1 and the counter is increased by the expression value. Relocation is set to common or data. Exit is to pseudo subroutine D1 which prints the image and checks the next field.

4.10.1 Flow Chart of COM,DAT Pseudo Processor

4.11 BSS, BZS Pseudo Processor

The program counter is incremented according to the block sizes in the address field. No binary output is generated for a BSS, but UNCP is called to output the current binary image. If the instruction is a BZS, binary words of zero are generated to fill the current image. If this image gets filled, a BZS binary image is generated for the remainder of the block.

4.11.1 Flow Chart of BSS, BZS Pseudo Processor

4.12 ENT Pseudo Processor

The function of this routine in Pass 3 is to find illegal entry points. An entry point is illegal if it is undefined or if its relocation is common or data.

4.12.1 Flow Chart of ENT Pseudo Processor

4.13 ALF Pseudo Processor

This processor increments the program counter and places the character in the binary image. If the length is determined by a number in the first subfield, the routine does not look for a terminating character. If the length is determined by a teminating character, output stops when this character is reached. The routine contains two subroutines ALFSB and ALFSB2. ALFSB gets a word of output (2 characters). If a character is the terminator, and it is the first character of a word, ALFSB exits with the A register negative to show end of character string. ALFSB2 gets a character of output. It processes the special output characters which are flagged by a colon on the input. ALFSB2 is used by the VFD processor. The ALF Pseudo Processor is entered from the Machine Address Processor to process a literal.

4.13.1 Flow Chart of ALF Pseudo Processor

4.14 VFD Pseudo Processor

This processor increments the program counter according to the bit counts and outputs the binary constants. Each mode of constant is handled separately but a common subroutine is used to output a word when it is filled.

4.14.1 Flow Chart of VFD Pseudo Processor

4.15 IFA Pseudo Processor

This processor is the same as in Pass 2.

4.15.1 Flow Chart of IFA Pseudo Processor

4.16 IFC Pseudo Processor

This processor is the same as in Pass 2

4.16.1 Flow Chart of IFC Pseudo Processor

4.17 EIF Pseudo Processor

This processor is the same as in Pass 2.

4.17.1 Flow Chart of EIF Pseudo Processor

4.18 EMC Pseudo Processor

The function of this routine is to decrement the macro depth counter and to unset the macro print switch.

4.18.1 Flow Chart of EMC Processor

4.19 END Pseudo Processor

This processor prints the END card and exits through ASSEM to Pass 4.

4.19.1 Flow Chart of END Pseudo Processor

4.20 Miscellaneous Pseudo Subroutine D4

This subroutine enters Miscellaneous pseudo subroutine D1 and the address expression processor to get the symbol and the expression value. There are four possible exits from the subroutine depending on the following conditions:

Exit to Mark	No symbol present
Exit to Mark+1	No left parenthesis present
Exit to Mark+2	Expression is relocatable
Exit to Mark+3	Normal exit

4.20.1 Flow Chart of Miscellaneous Pseudo Subroutine D4

4.21 Miscellaneous Pseudo Subroutine D1

This subroutine enters the Character Processor to get the symbol in the address field. If no error is returned from the Character Processor, it exits immediately. Otherwise an error message and the image are printed. If the next character is a comma, the Character Processor is re-entered.

4.21.1 Flow Chart of Miscellaneous Pseudo Subroutine D1

4.22 Machine Address Processor

This routine processes the address field of machine commands. W1 and W2 are used to hold the command words (W2 is used in two word commands). Processing is done according to the class of the command. N, X and A literals are processed through the NUM, ADC and ALF pseudo processors. The program counter is incremented according to the number of words in the command.

4.22.1 Flow Chart of Machine Address Processor

4.23 Location Pack Subroutine

This routine converts the current program counter to hex ASCII and places it in the print image. The relocation of the program counter is also placed in the print image. The subroutine WDPK is called before exiting.

4.23.1 Flow Chart of Location Pack Subroutine

4.24 Word Pack Subroutine

This routine converts the command word to hex ASCII and places it in the print image. The relocation of the command word is also placed in the print image. The routine calls PRNT before exiting.

4.24.1 Flow Chart of Word Pack Subroutine

4.25 Print Subroutine

This routine outputs the print line if the list option has been selected and a no list pseudo instruction is not in effect. The routine also outputs error messages to either the comment medium of the list medium. The printing is buffered by moving the current image to an alternate buffer for the actual printing.

4.25.1 Flow Chart of Print Subroutine

4.26 Pack Relocatable Binary Subroutine

This routine is used to place the command word and its relocation byte into the binary image. A word count is kept. When an image is filled, the routine UNCP is called to output the image.

4.26.1 Flow Chart of Pack Relocatable Binary Subroutine

4.27 Unconditional Binary Punch Subroutine

This routine is called whenever output of the current relocatable binary image is described. The routine places the flag bit for end of image in the last relocation byte used. The routine PUNC is called for the actual output.

4.27.1 Flow Chart of Unconditional Binary Punch Subroutine

4.28 Binary Punch Subroutine

This routine outputs the binary image to the standard binary output device and to the load and go device. Output is determined by the X and P control option switches. The operation is buffered by moving the current image to an alternate buffer.

4.28.1 Flow Chart of Binary Punch Subroutine

4.29 Read Image Subroutine

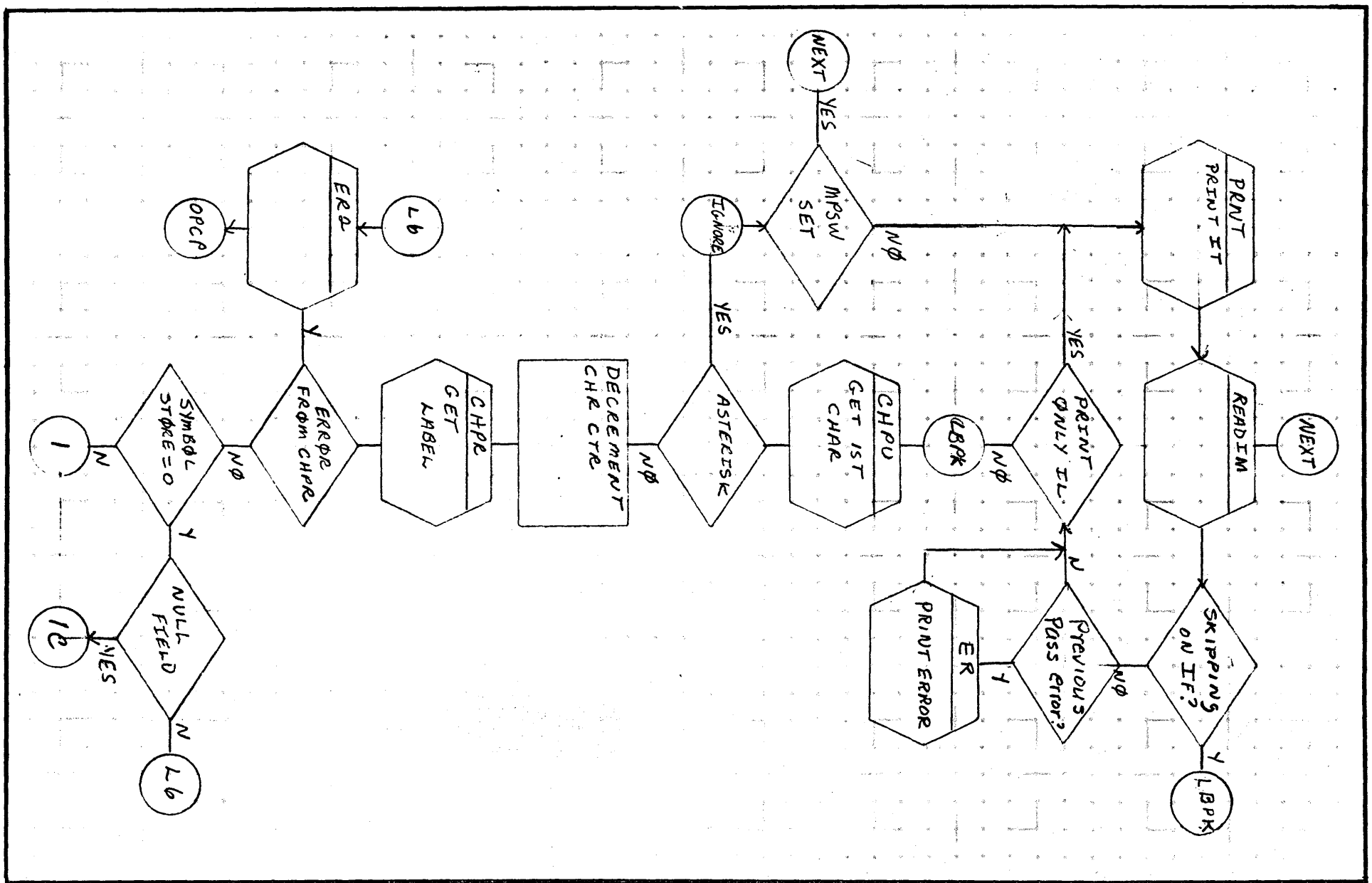
This routine is the same as in Pass 2.

4.29.1 Flow Chart of Read Image Subroutine

4.30 Error Subroutine

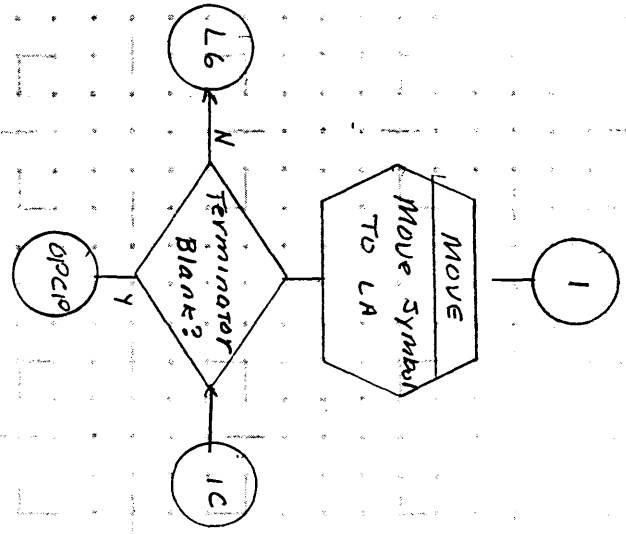
This routine packs the error message in a buffer. The buffer is determined by the setting of the L control option. The subroutine PRNT is called to output the line.

4.30.1 Flow Chart of Error Subroutine

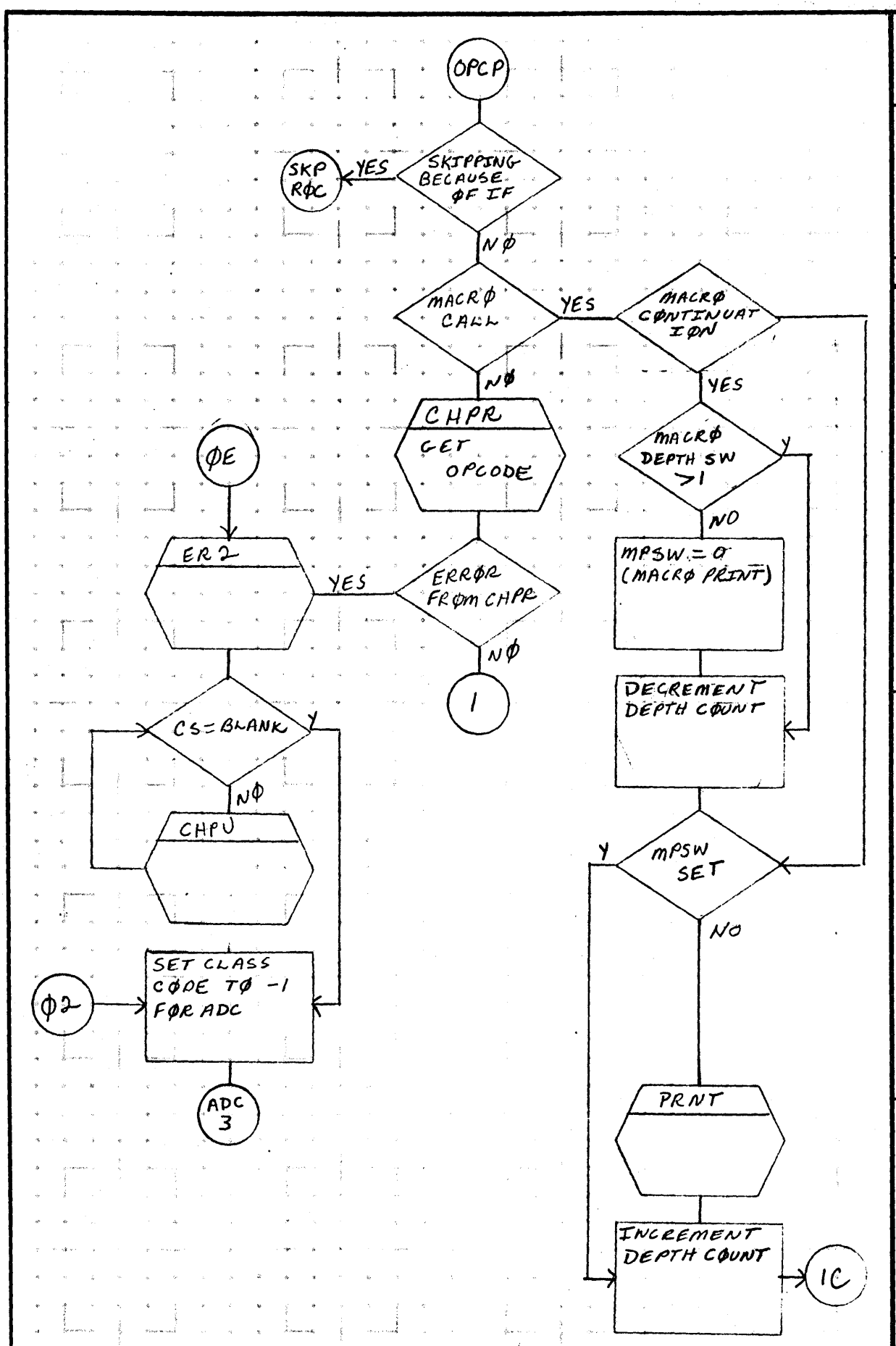


CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT TITLE NEXT AND LBPK	PROJECT MGR.			
	PASS 3 PAGE 1 OF 2	PROJECT NAME			
	NUMBER 4.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FOR...Y CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS EMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE NEXT And LBPK	PROJECT MGR.			
	PASS 3 PAGE 2 OF 2	PROJECT NAME			
	NUMBER 4.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

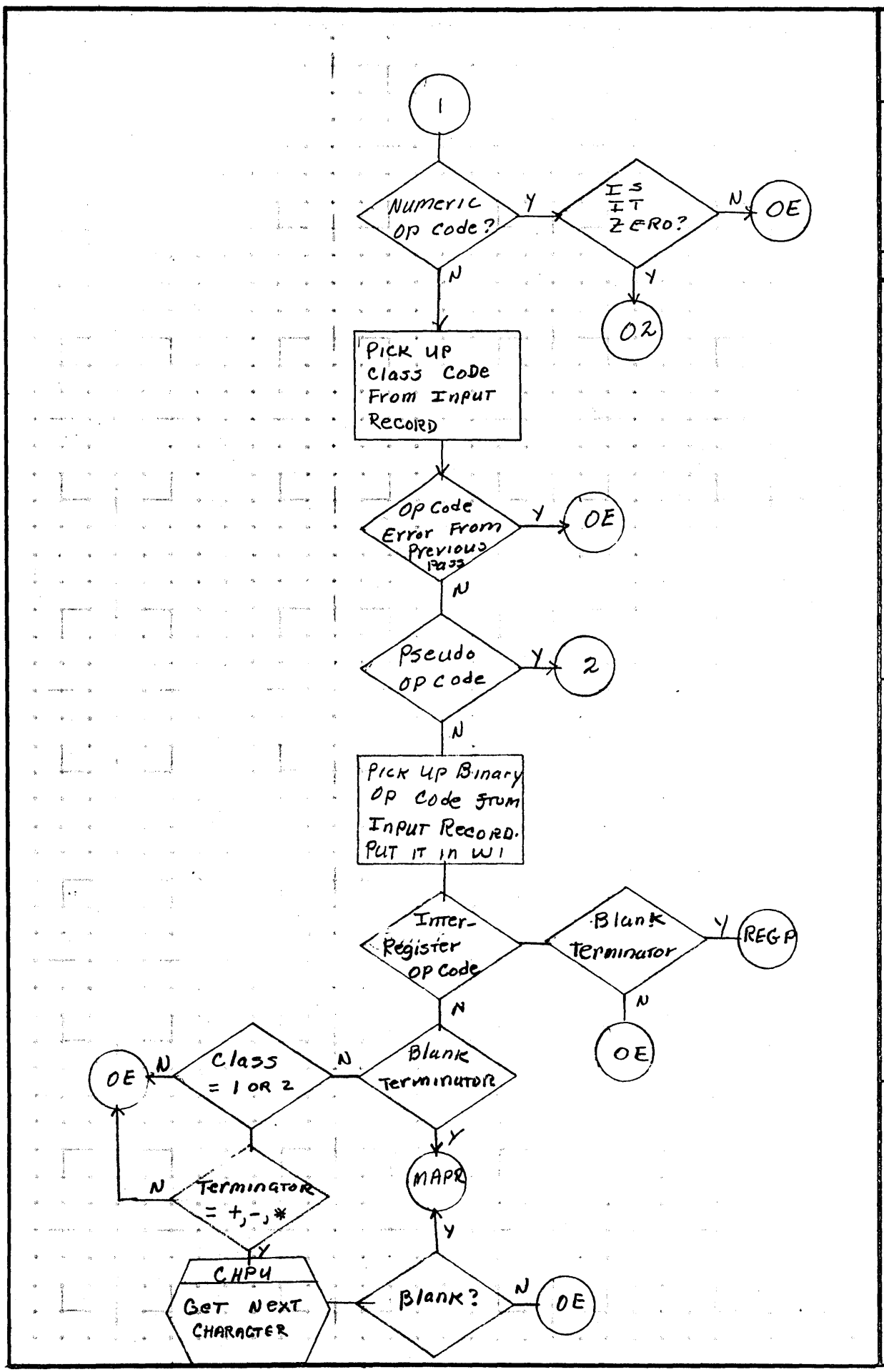


CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE FLOWCHART DECISION TABLE OTHER

DOCUMENT CLASS	MACH. TYPE 1700	PROJECT NO.	
DOCUMENT TITLE OPCODE PROCESSØR		PROJECT MGR.	
PASS 3	PAGE 1 OF 3	PROJECT NAME	
NUMBER 4.2.1	ISSUE DATE	TASK NO.	
DRAWN BY	DATE	TASK NAME	

REV	APPROVED	DATE

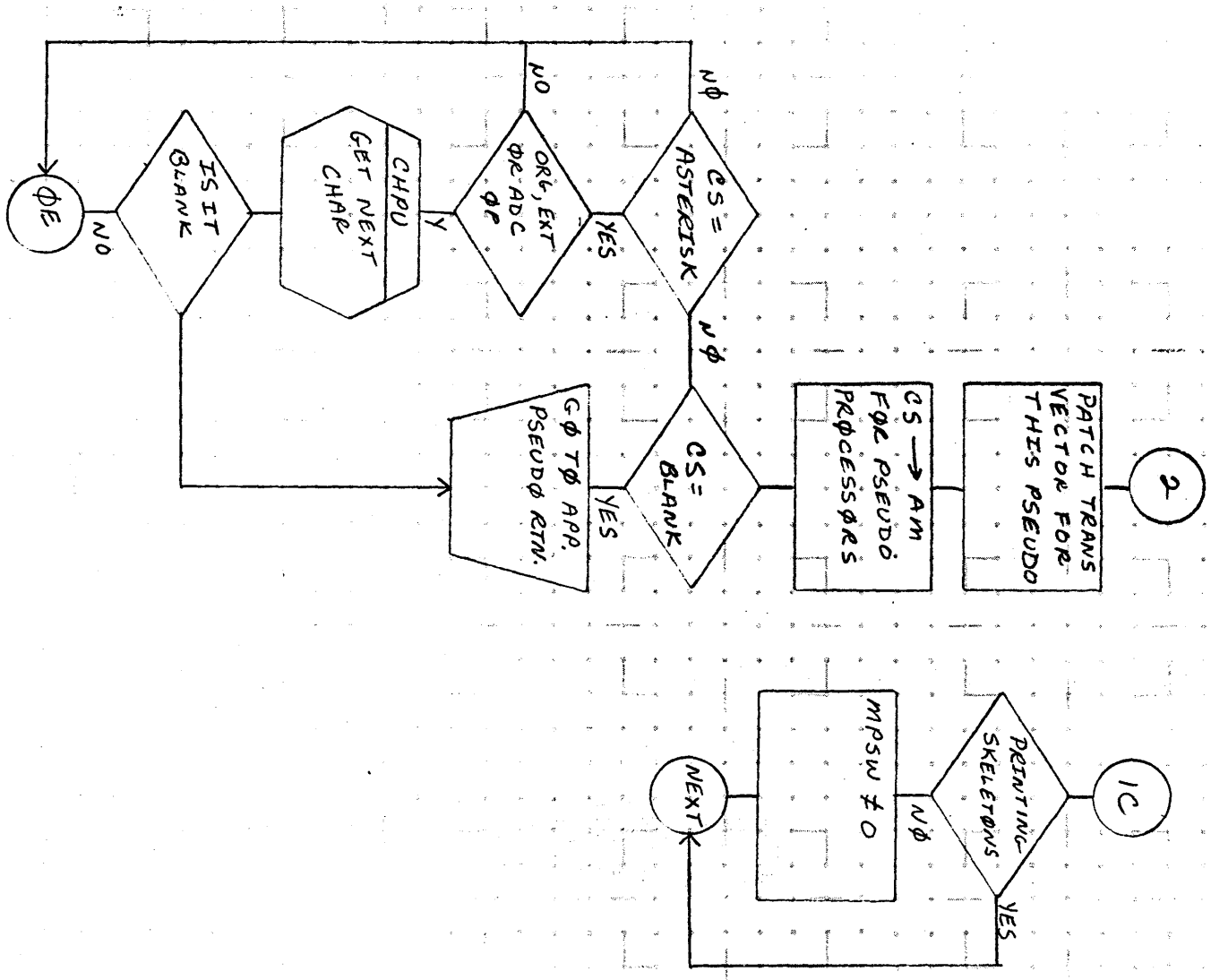
AA1385 (FORM CA127-1)



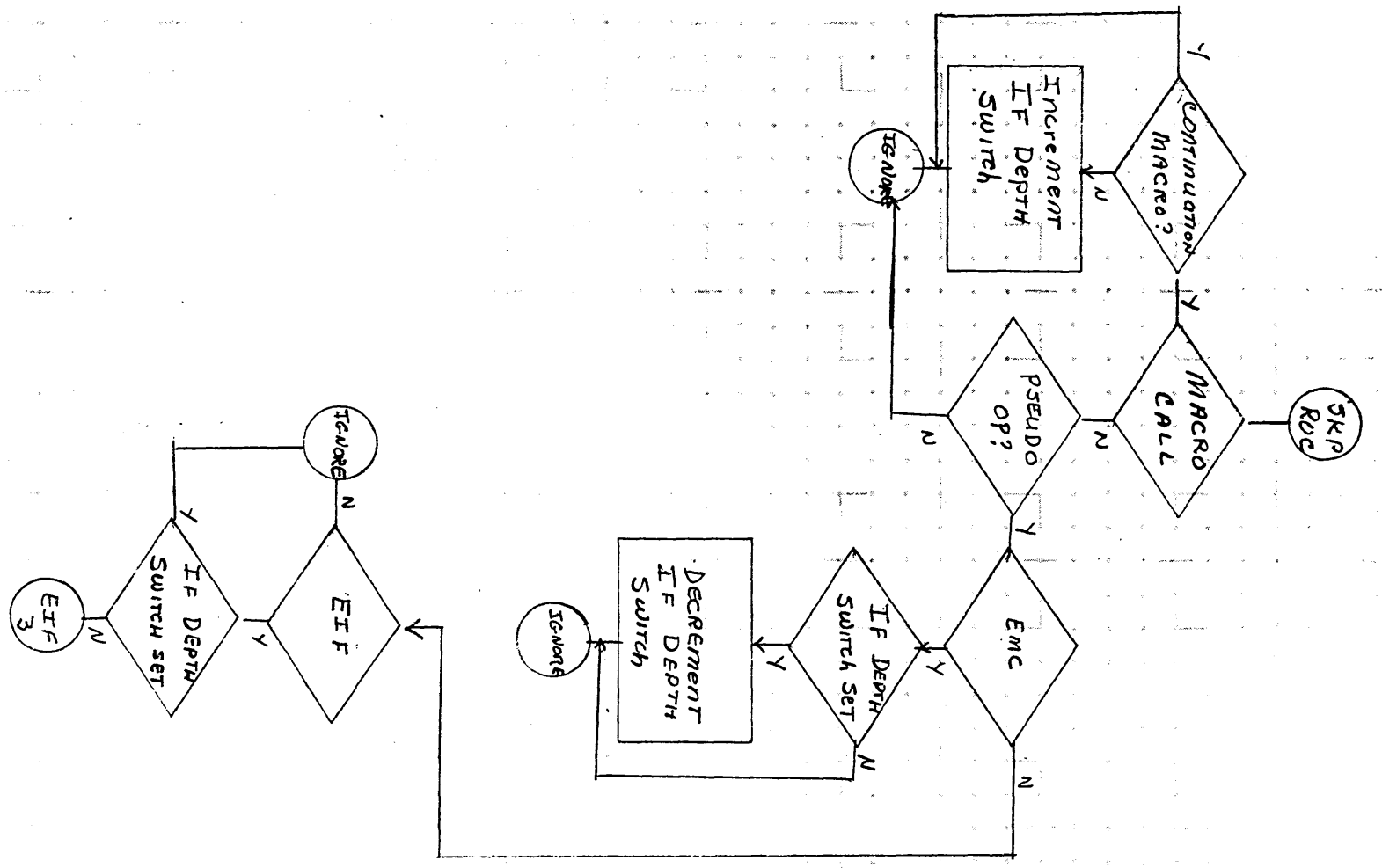
CONTROL DATA CORPORATION	DOCUMENT CLASS	MACH. TYPE	PROJECT NO.
SOFTWARE DOCUMENT		IMS 1700	
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT TITLE	PROJECT MGR.	
	OPcode Processor		
	PASS 3	PAGE 2 OF 3	PROJECT NAME
	NUMBER 4.2.1	ISSUE DATE	TASK NO.
	DRAWN BY	DATE	TASK NAME

REV	APPROVED	DATE

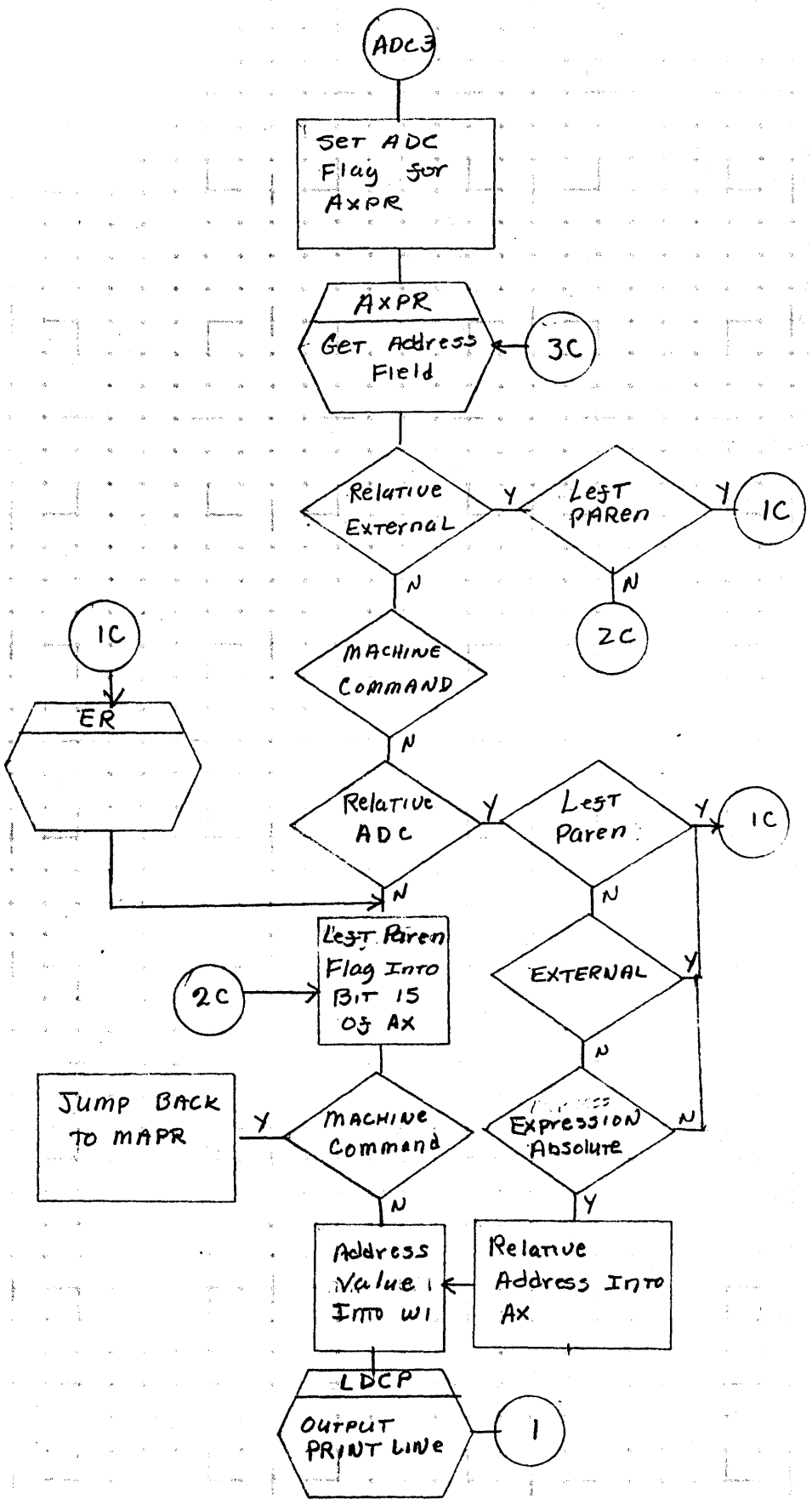
AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE OPCODE PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 3 OF 3	PROJECT NAME			
	NUMBER 4.2.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE SKIP PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 1 OF 1	PROJECT NAME			
	NUMBER 4.3.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



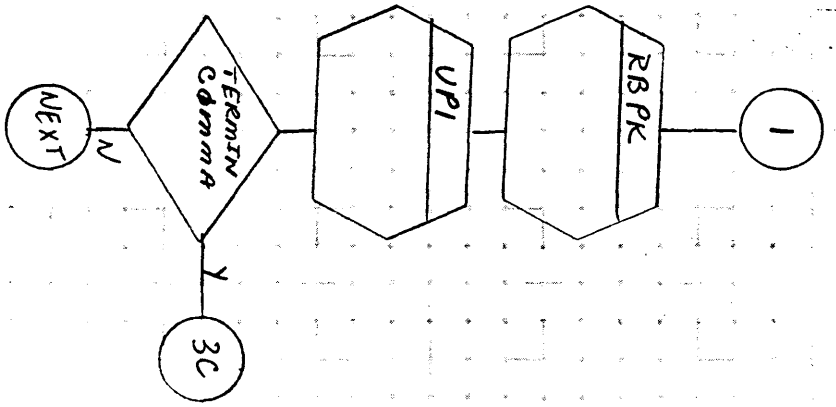
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS		MACH. TYPE	IMS 1700
DOCUMENT TITLE	ADC PROCESSOR		
PASS 3		PAGE 1 OF 2	
NUMBER 4.4.1		ISSUE DATE	
DRAWN BY		DATE	

REV	APPROVED	DATE

PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

AA1385 (FORME A127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
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	DOCUMENT TITLE ADC PROCESSOR, PASS 3 PAGE 2 OF 2	PROJECT MGR.			
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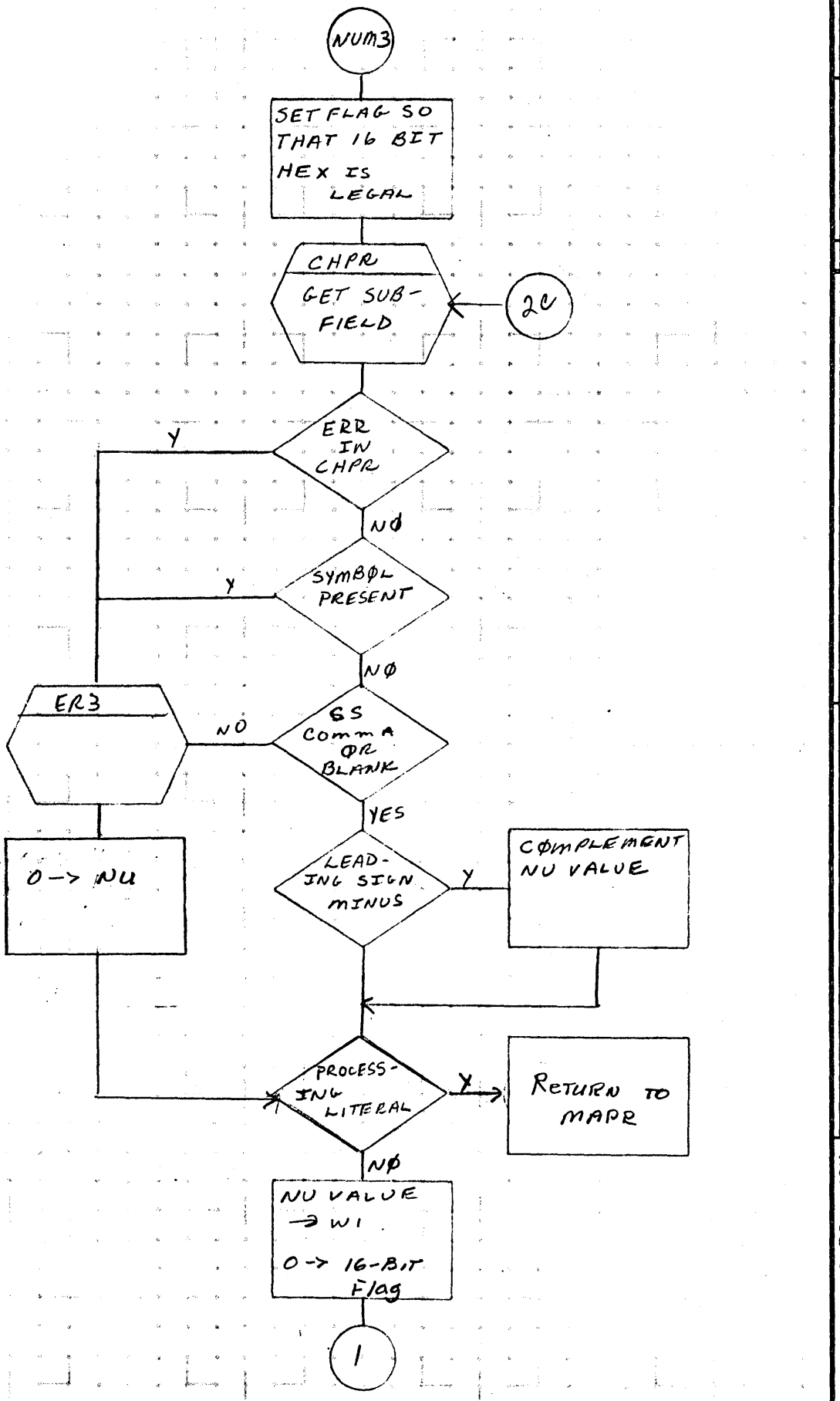
	NUMBER 4.4.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

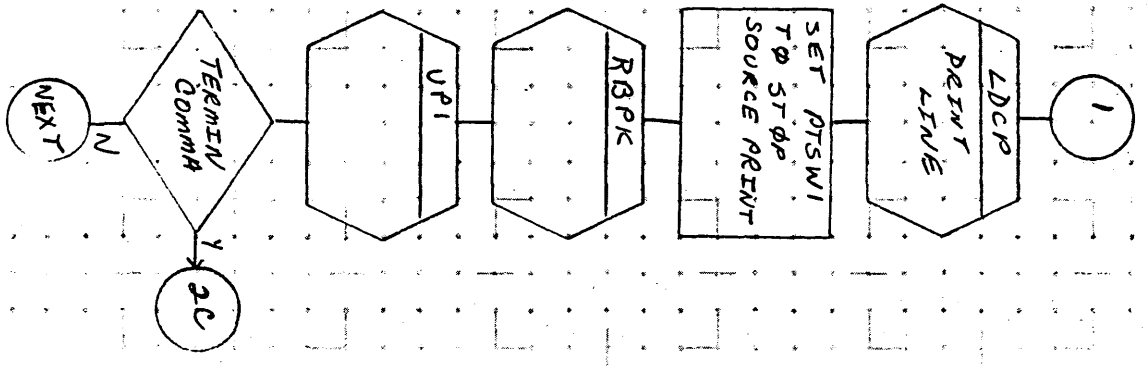
AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION	DOCUMENT CLASS	MACH. TYPE 1700	PROJECT NO.
SOFTWARE DOCUMENT	DOCUMENT TITLE NUM PROCESSOR		PROJECT MGR.
SAMPLE CODE ☐	PASS 3	PAGE 1 OF 2	PROJECT NAME
FLOWCHART ☐	NUMBER 4.5.1	ISSUE DATE	TASK NO.
DECISION TABLE ☐	DRAWN BY	DATE	TASK NAME
OTHER ☐			

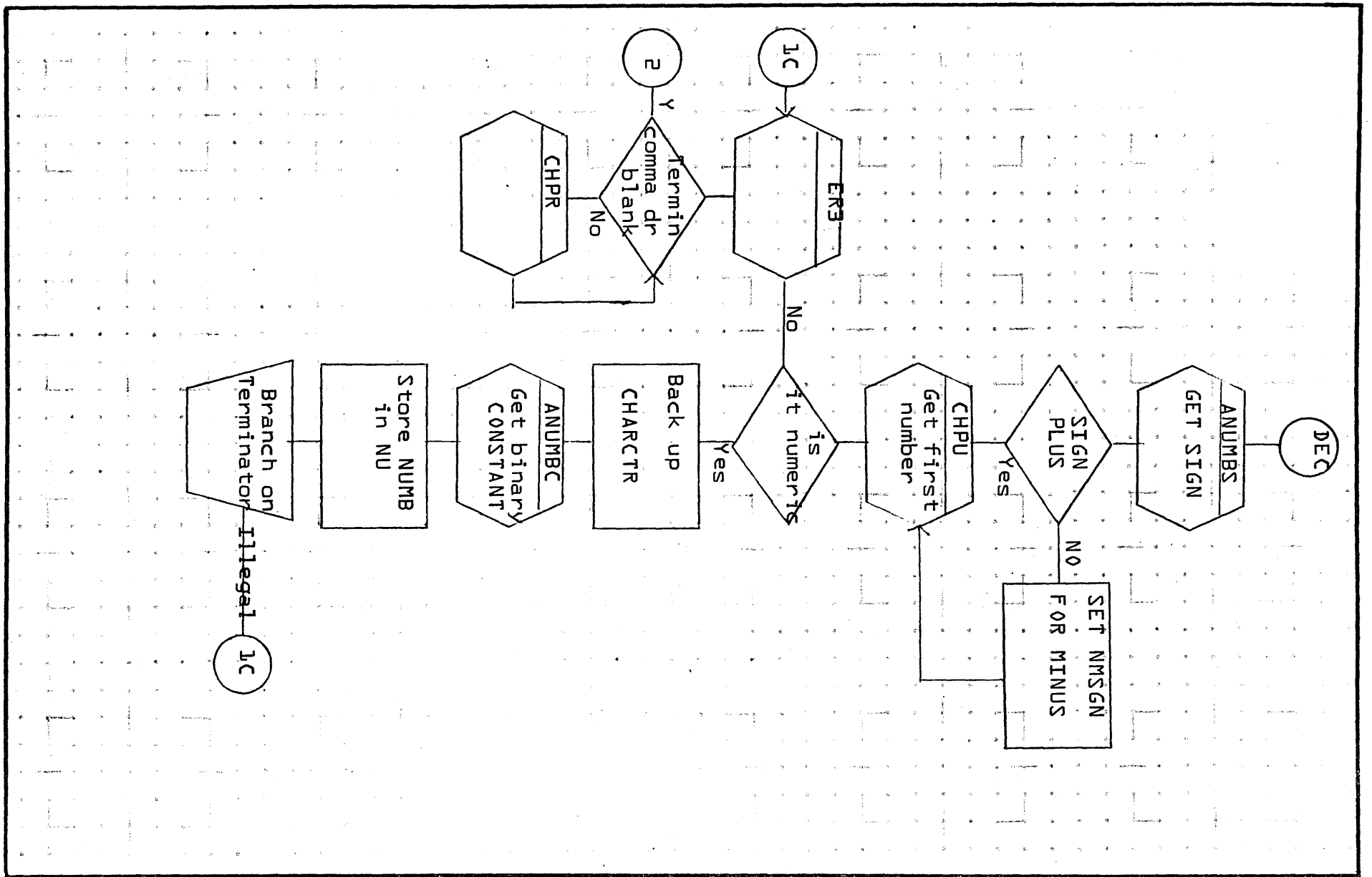
REV	APPROVED	DATE

AA1385 (FORME CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE NUM PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 2 OF 2	PROJECT NAME			
	NUMBER 4.5.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION						
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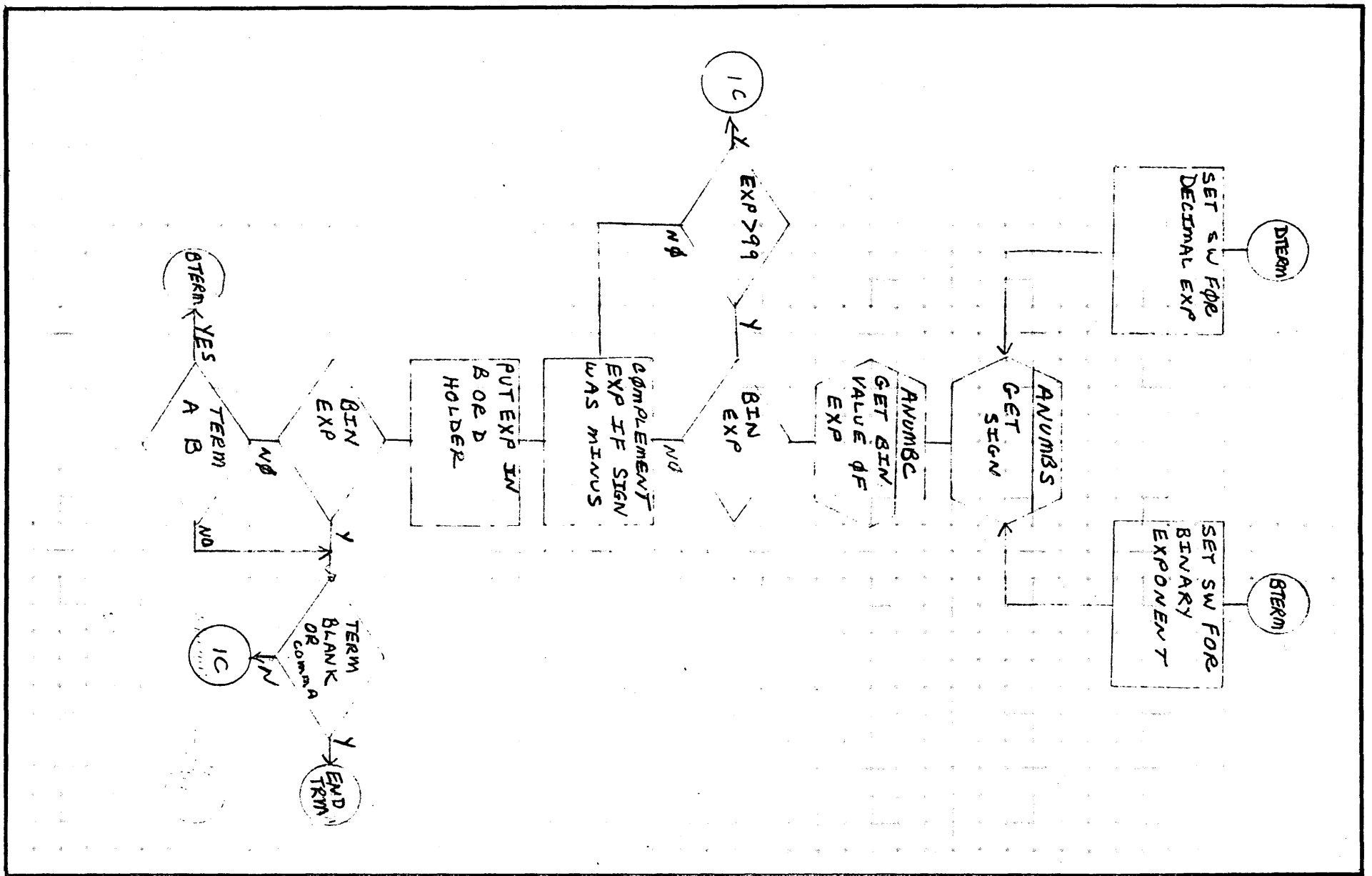
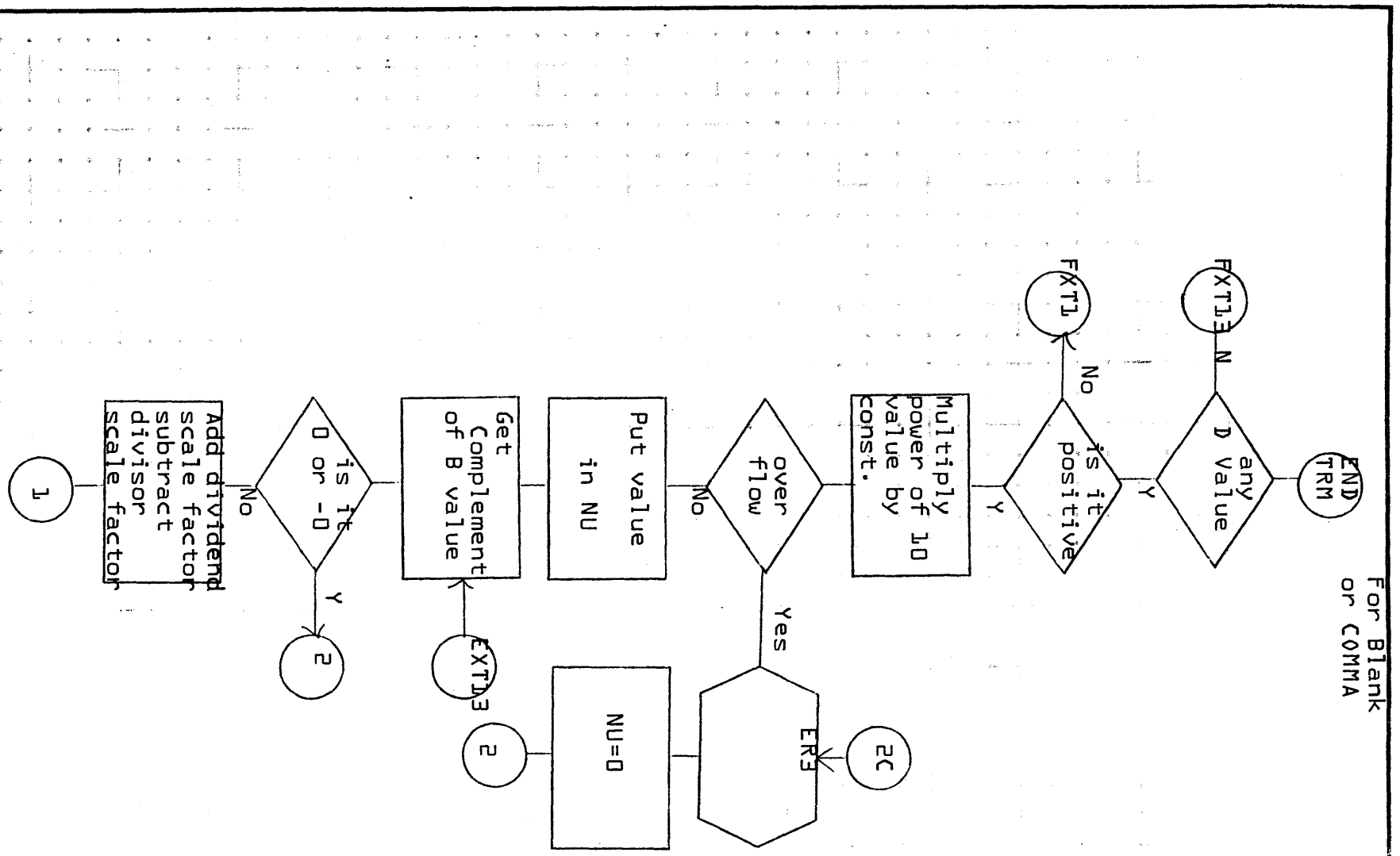
SAMPLE CODE ☐	DOCUMENT TITLE DEC PROCESSOR		PROJECT MGR.			
FLOWCHART ☐	PASS 3	PAGE 1 OF 7	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.6.1	ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY	DATE	TASK NAME			

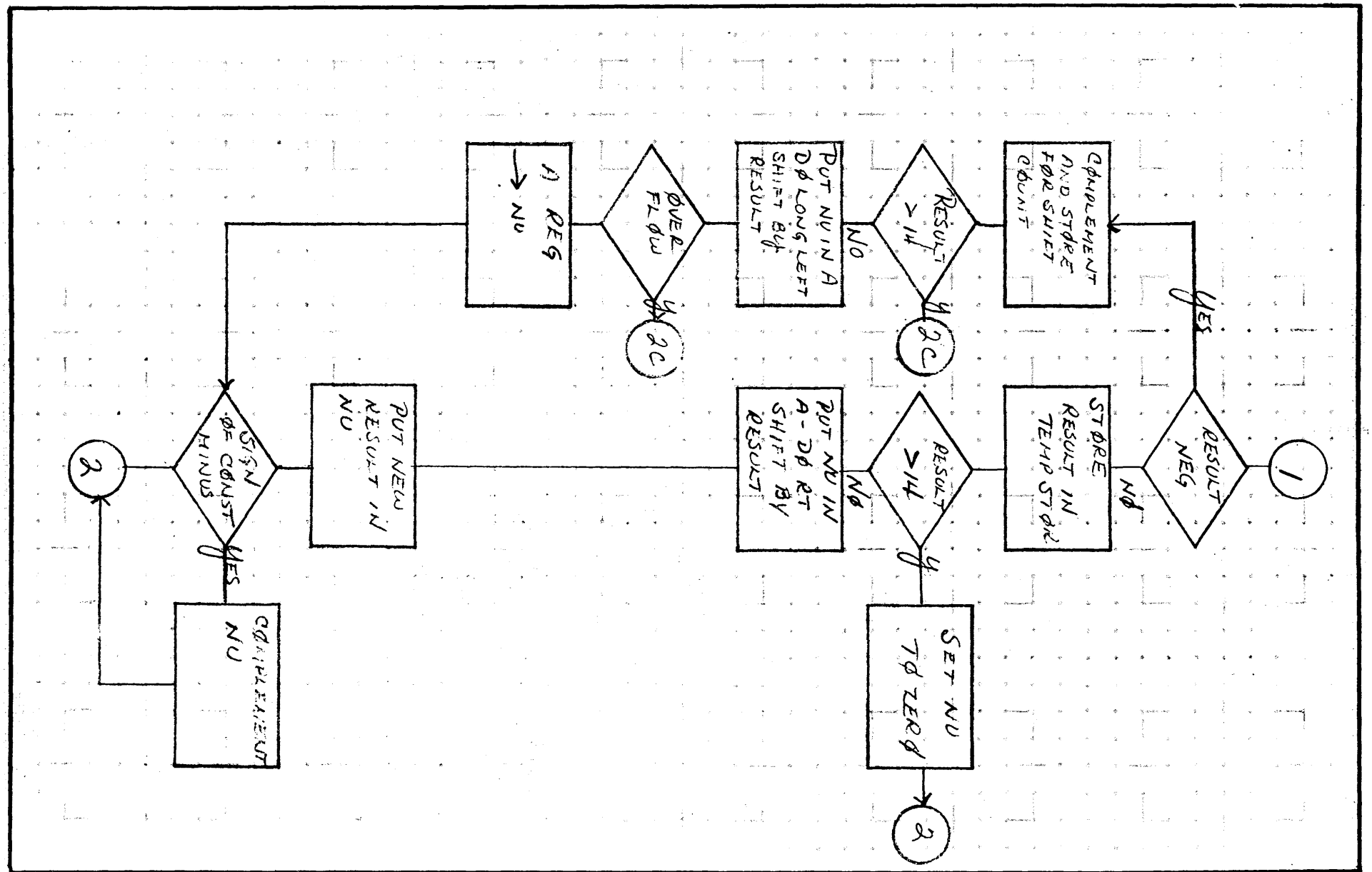


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐☐ DECISION TABLE ☐☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE DEC PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 2 OF 7	PROJECT NAME			
	NUMBER 4.6.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION						
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE DEC PROCESSOR		PROJECT MGR.			
FLOWCHART ☐	PASS3	PAGE 3 OF 7	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.6.1	ISSUE DATE	TASK NO			
OTHER ☐	DRAWN BY	DATE	TASK NAME			



CONTROL DATA CORPORATION					
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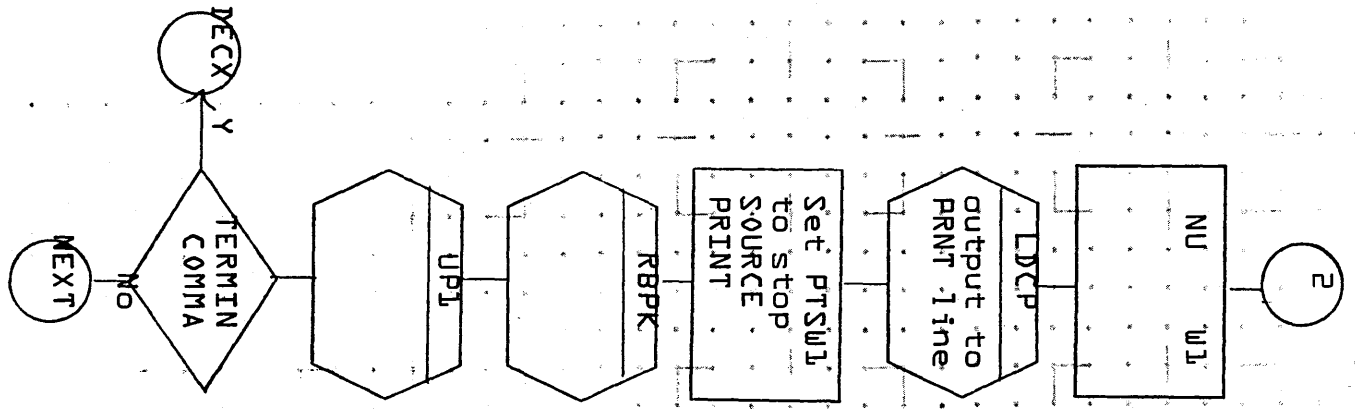
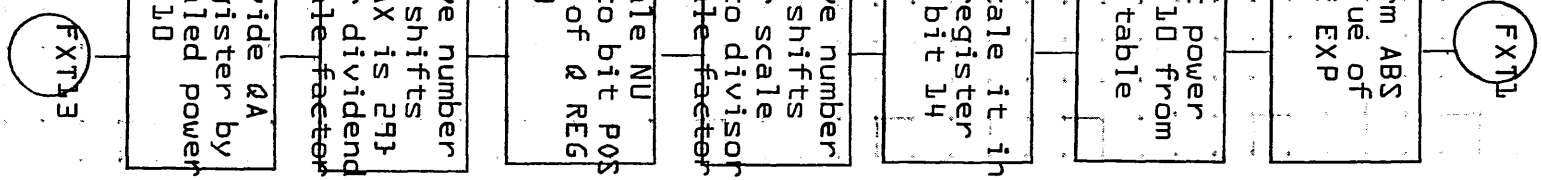
SAMPLE CODE ☐	DOCUMENT TITLE DEC PROCESSOR		PROJECT MGR.		
FLOWCHART ☐	PASS 3	PAGE 4 OF 7	PROJECT NAME		
DECISION TABLE ☐	NUMBER 4.6.1	ISSUE DATE	TASK NO.		
OTHER ☐	DRAWN BY	DATE	TASK NAME		

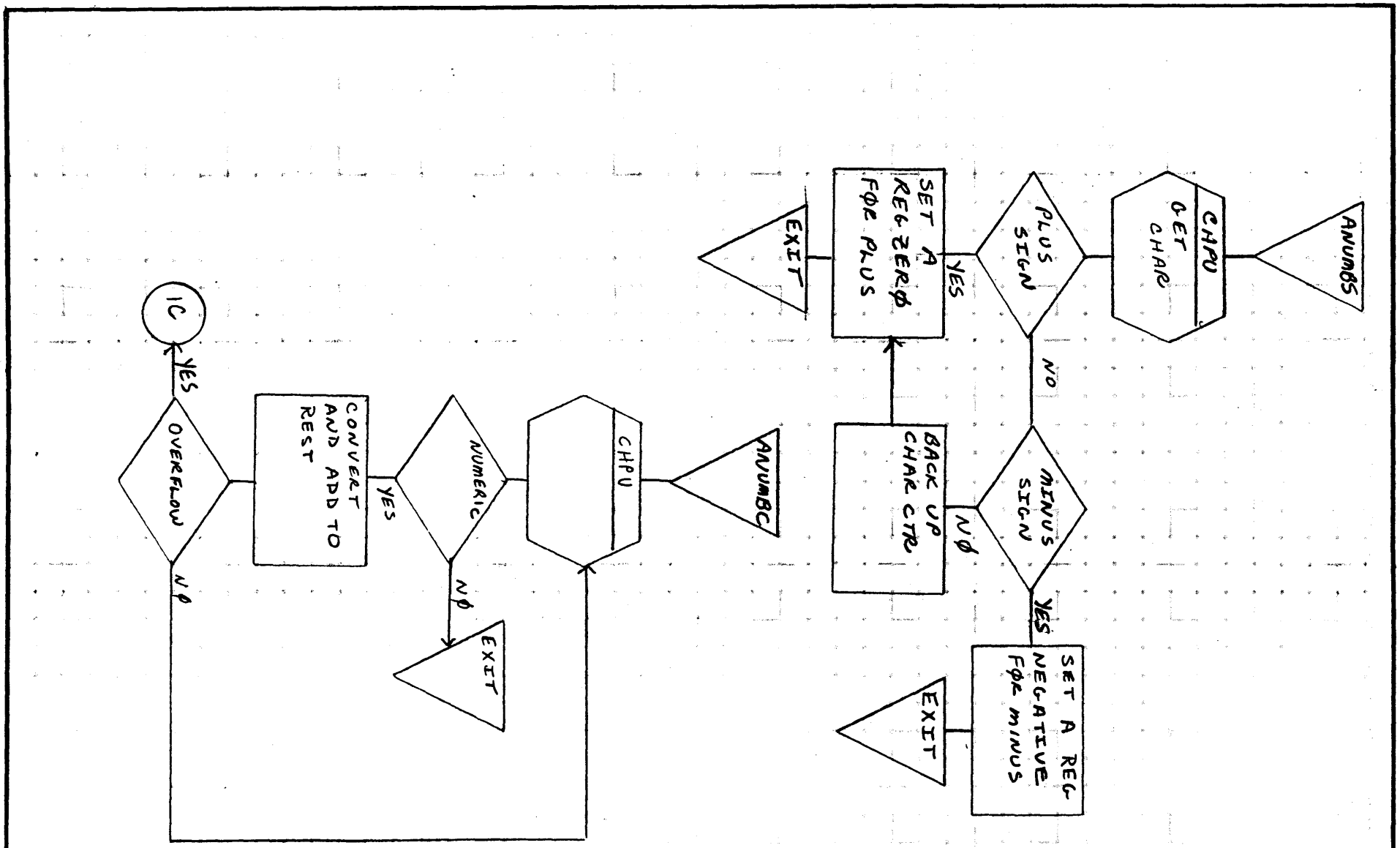
AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE DEC PROCESSOR	PROJECT MGR.			
	PASS3 PAGE 5 OF 7	PROJECT NAME			
	NUMBER 4.6.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

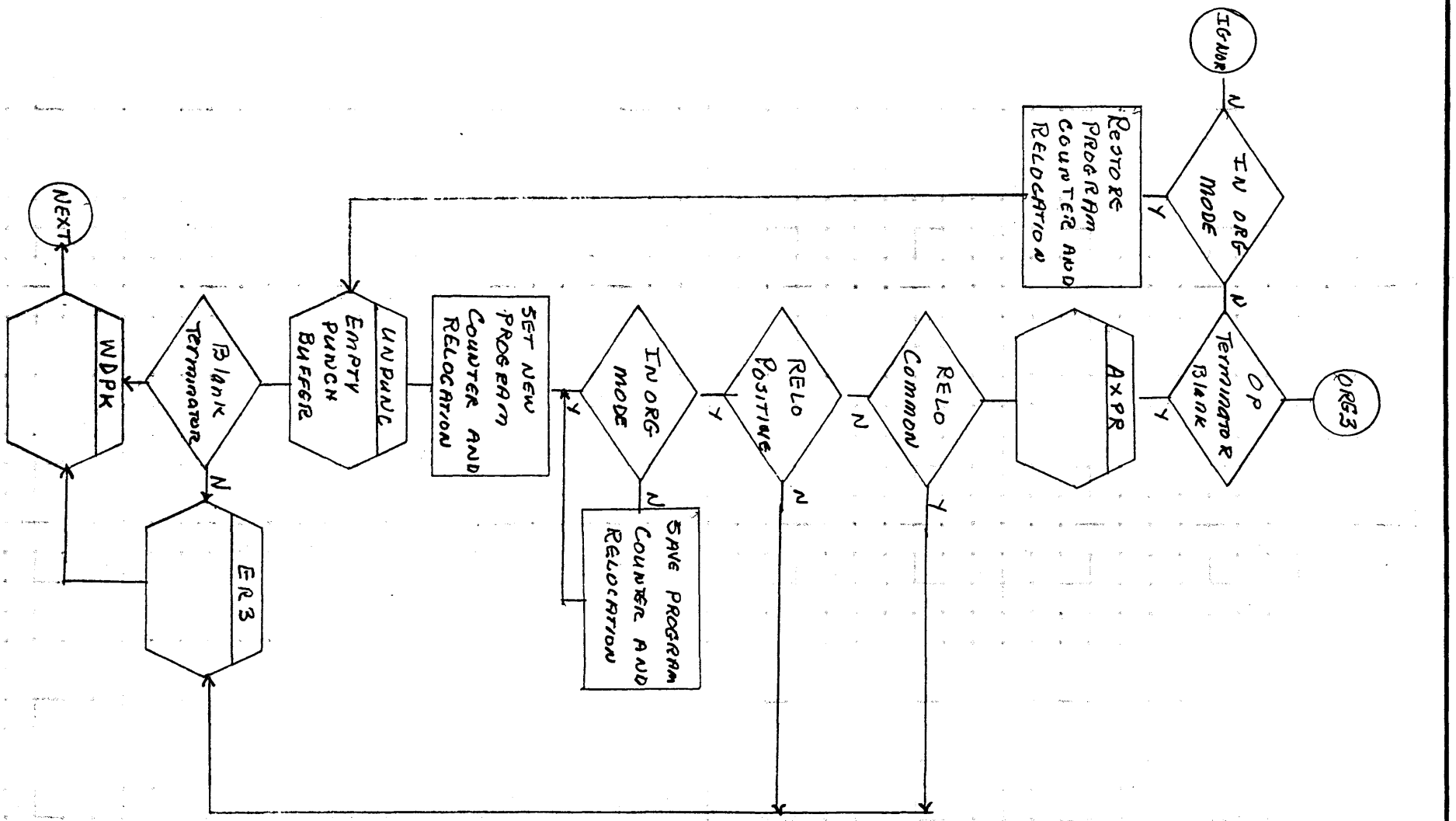


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE DEC PROCESSOR		PROJECT MGR.			
	PASS3	PAGE 6 OF 7	PROJECT NAME			
	NUMBER 4.6.1	ISSUE DATE	TASK NO.			
	DRAWN BY	DATE	TASK NAME			

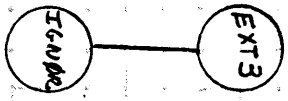


CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS - IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE DEC PROCESSOR	PROJECT MGR.			
FLOWCHART ☐	PASS 3 PAGE 7 OF 7	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.6.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

AA1385 (FORM CA127-1)

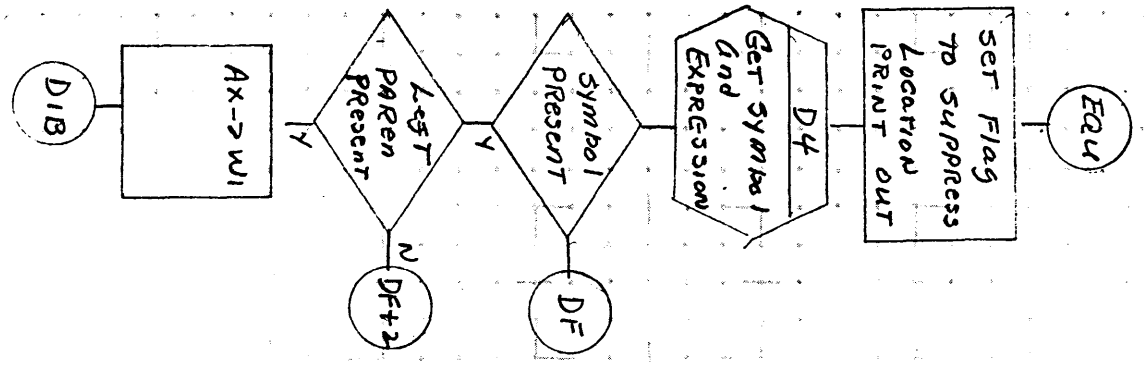


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
FLOWCHART ☐☐	DOCUMENT TITLE ORG, ORG* PROCESSOR		PROJECT MGR.		
DECISION TABLE ☐☐	PASS 3	PAGE 1 OF 1	PROJECT NAME		
OTHER ☐☐	NUMBER 4.7.1	ISSUE DATE	TASK NO.		
	DRAWN BY	DATE	TASK NAME		

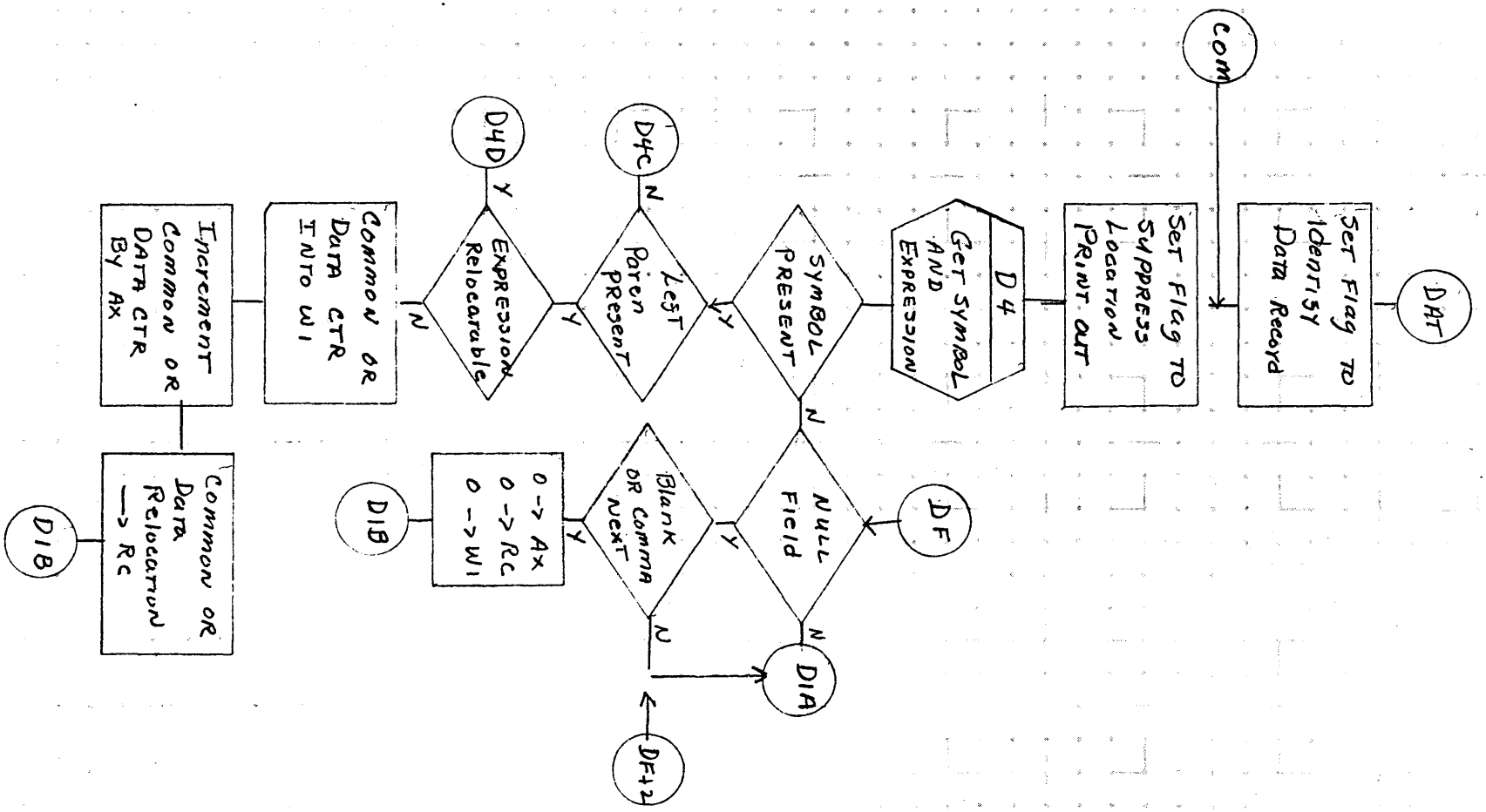


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE EXT		PROJECT MGR.			
	PASS 3	PAGE 1 OF 1	PROJECT NAME			
	NUMBER 4.8.1	ISSUE DATE	TASK NO.			
	DRAWN BY	DATE	TASK NAME			

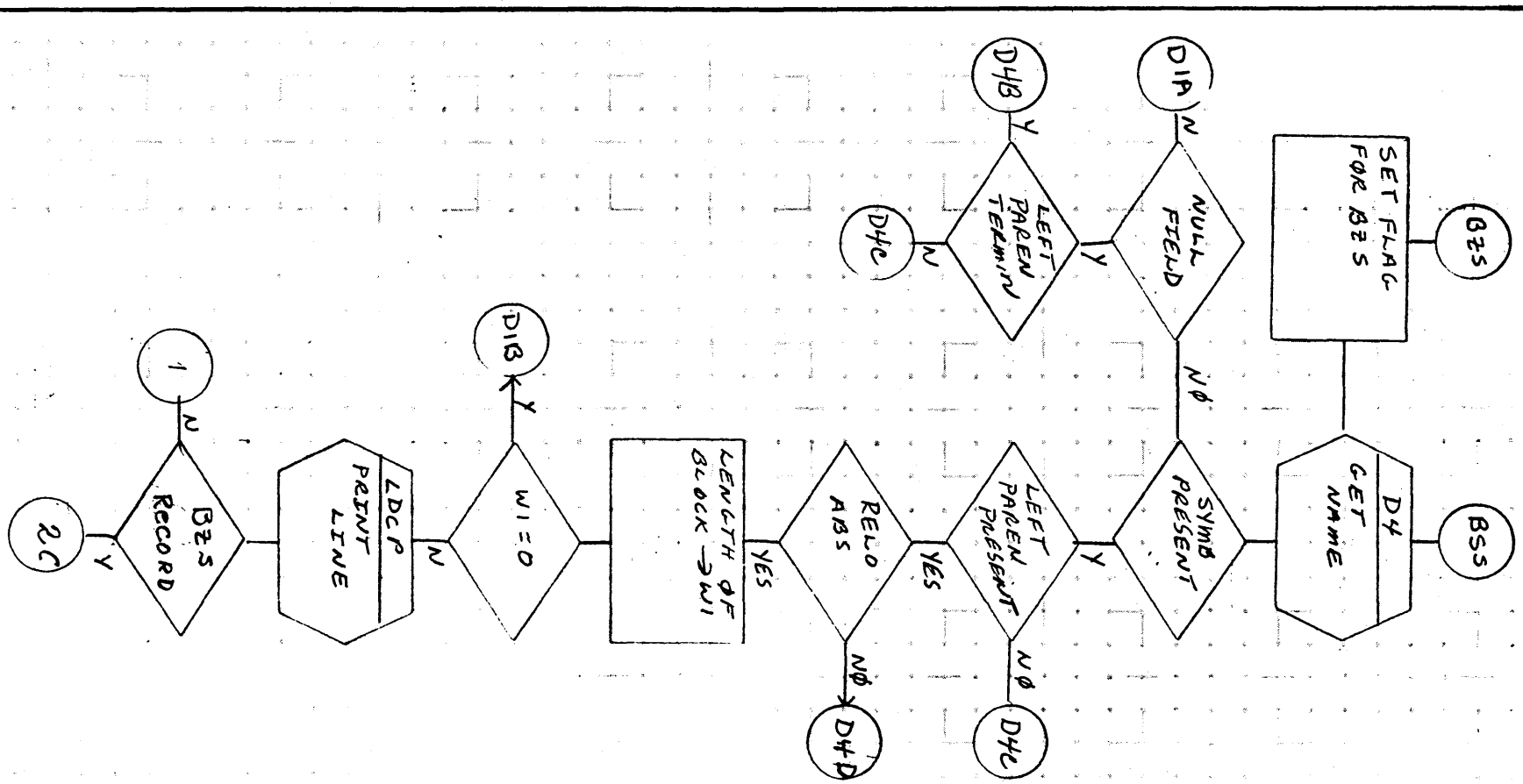
AA1385 (FORM CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE EQU PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 1 OF 1	PROJECT NAME			
	NUMBER 4.9.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
	DOCUMENT TITLE COMMON AND DATA		PROJECT MGR.		
	PROCESSORS PASS 3	PAGE 1 OF 1	PROJECT NAME		
	NUMBER 4.10.1	ISSUE DATE	TASK NO.		
	DRAWN BY	DATE	TASK NAME		



CONTROL DATA CORPORATION SOFTWARE DOCUMENT			
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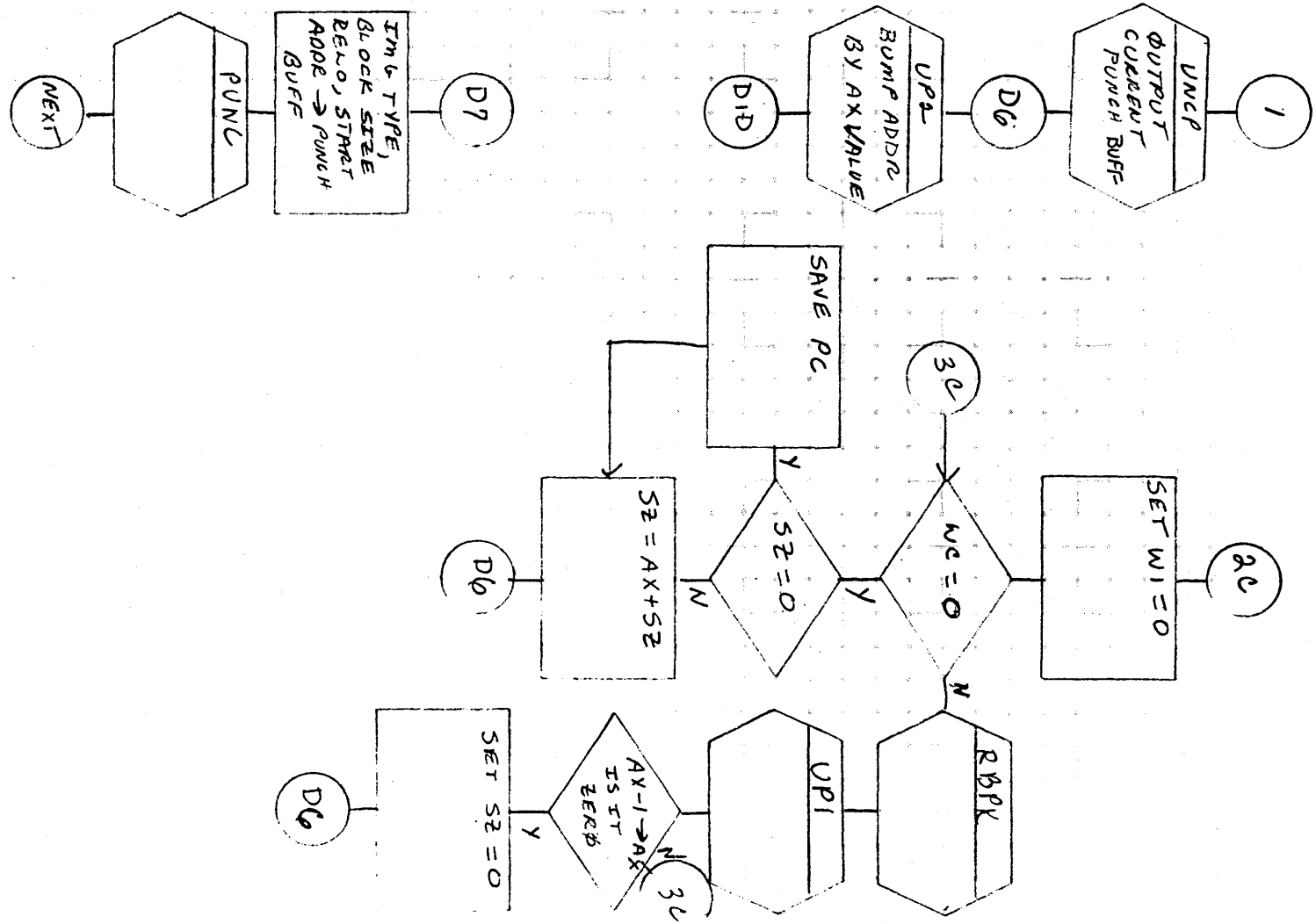
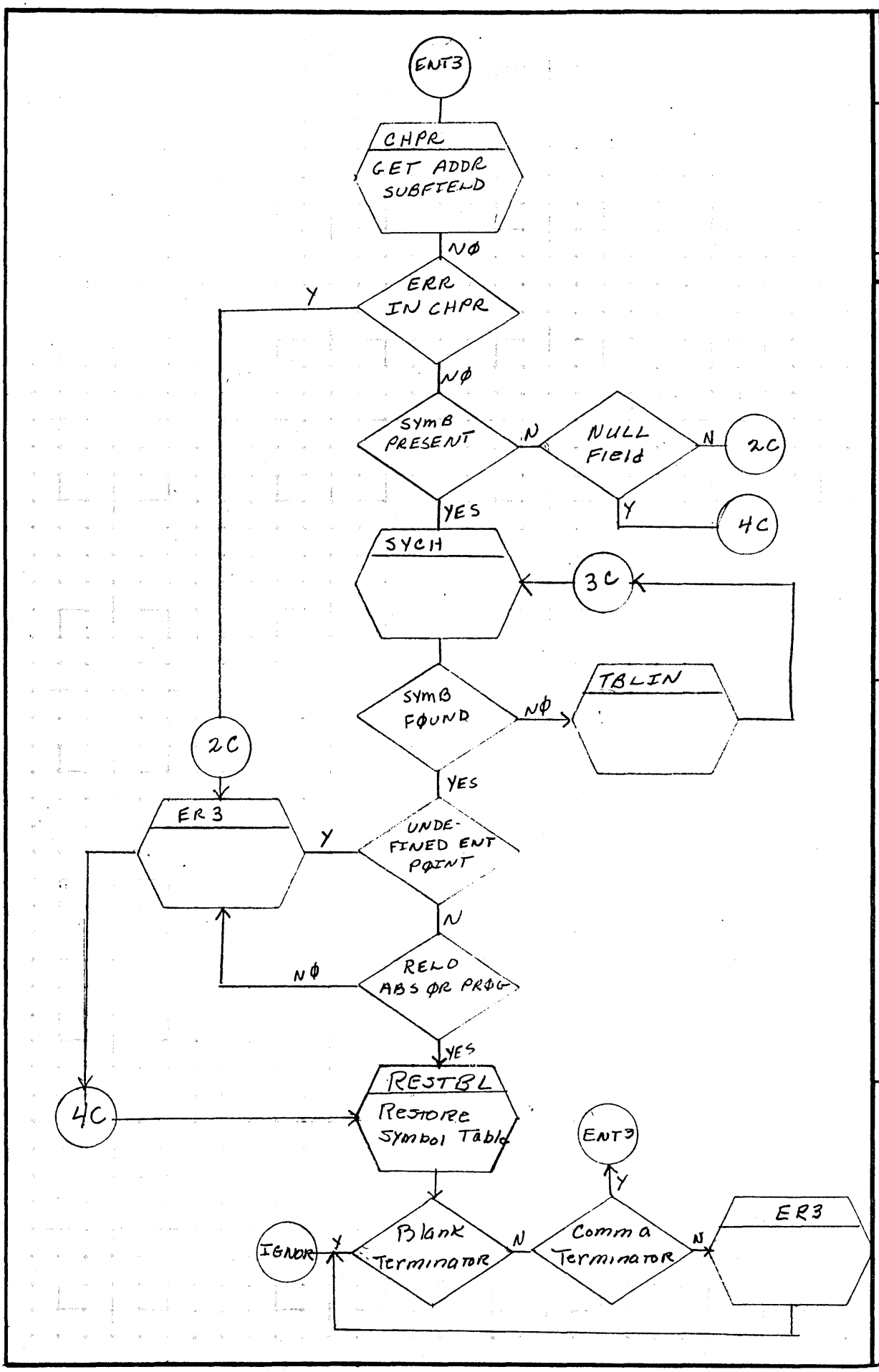
	DOCUMENT TITLE BSS, BZS PROCESSORS	PROJECT MGR.	
	PASS 3 PAGE 1 OF 2	PROJECT NAME	
	NUMBER 4.11.1 ISSUE DATE	TASK NO.	
	DRAWN BY DATE	TASK NAME	

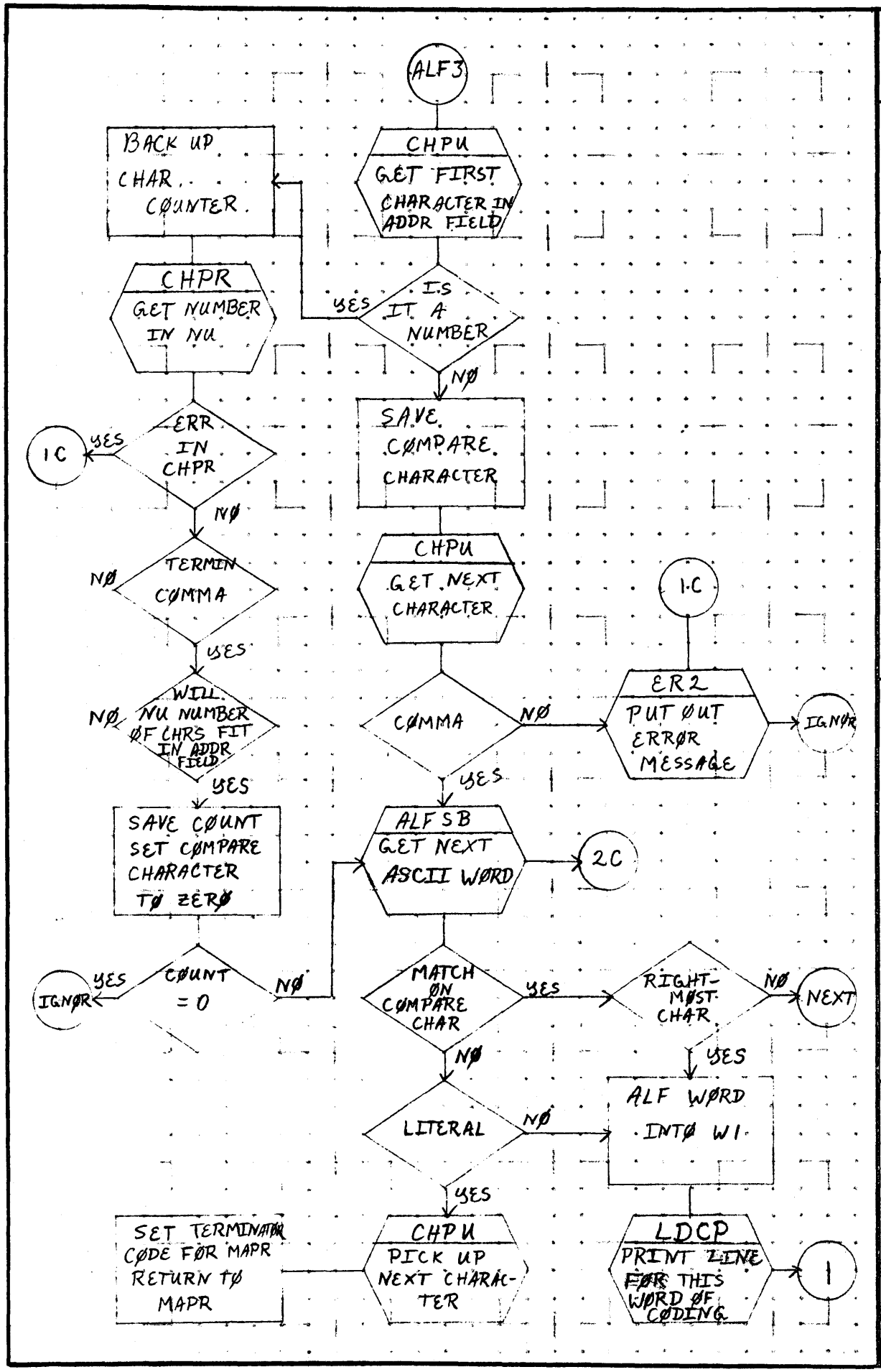


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE BSS, BTS PROCESSORS	PROJECT MGR.			
	PASS 3 PAGE 2 OF 2	PROJECT NAME			
	NUMBER 4.11.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORM CA127-1)



AA1385 (FORMERLY CA127-1)

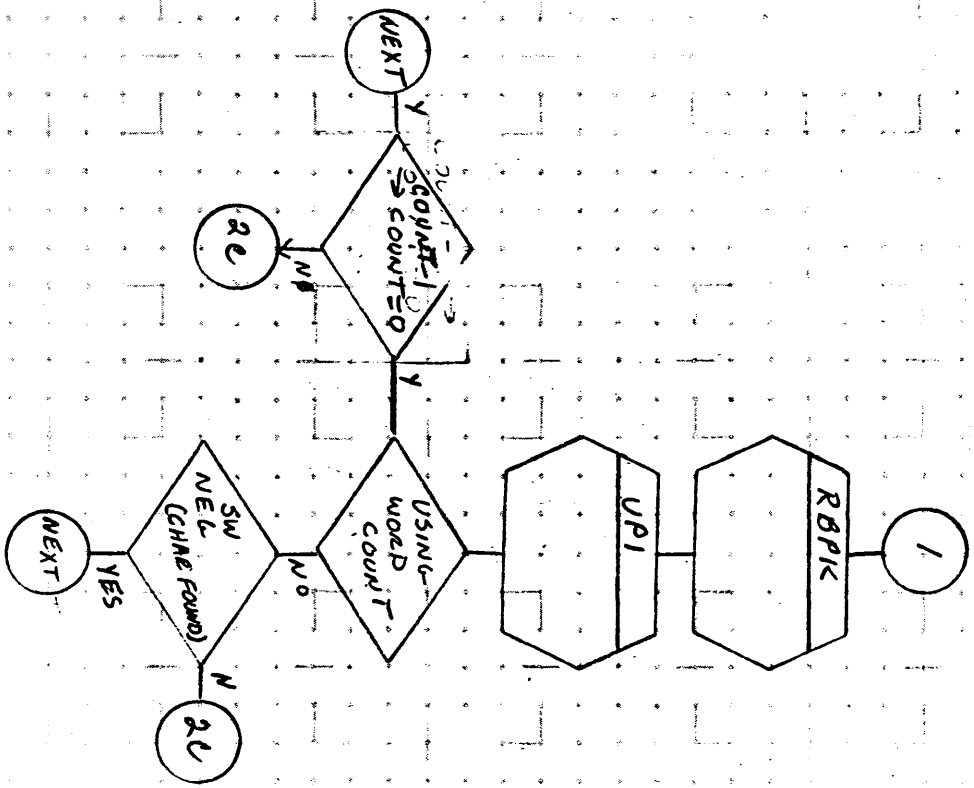


REV	APPROVED	DATE			
PROJECT NO.		PROJECT MGR.		PROJECT NAME	
TASK NO.		TASK NAME			
DOCUMENT CLASS	IMS	MACH. TYPE	1700		
DOCUMENT TITLE	ALF PROCESSØR				
PASS 3	PAGE 1 OF 5				
NUMBER 4.13.1	ISSUE DATE				
DRAWN BY	DATE				

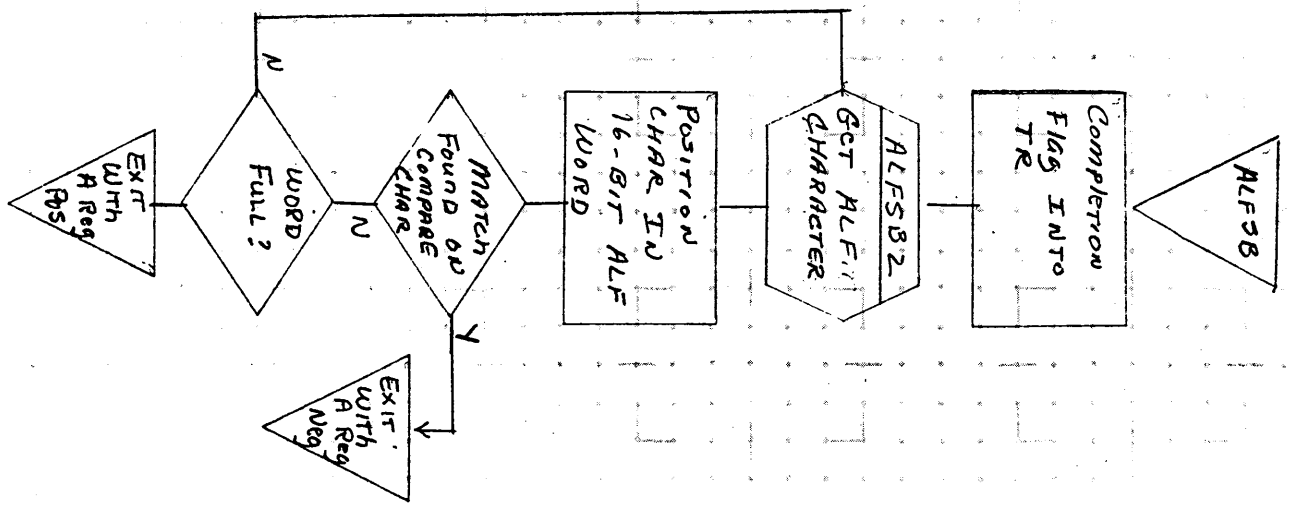
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

PRINTED IN US

AA1385 (FORME A127-1)

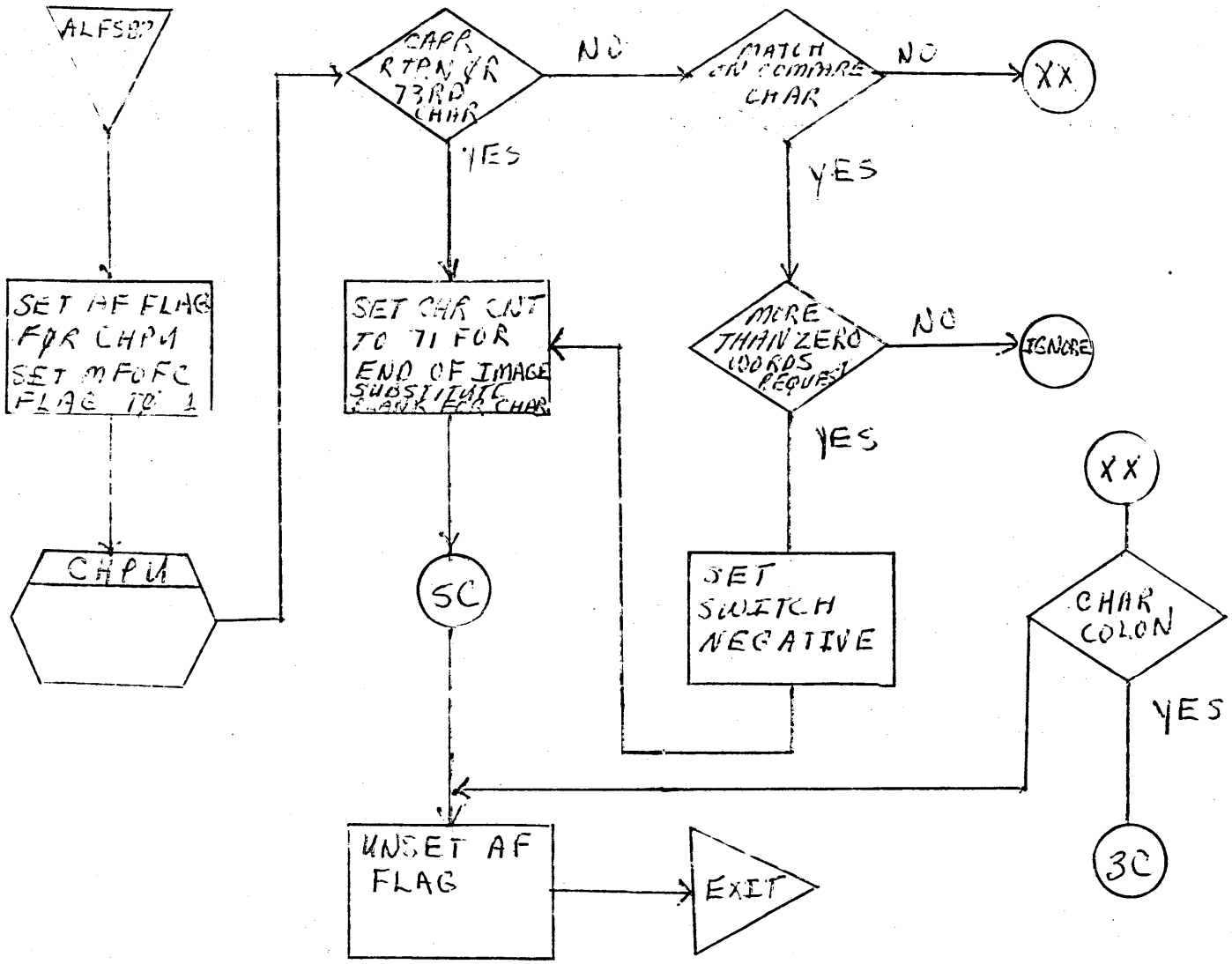


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE ALF PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 2 OF 5	PROJECT NAME			
	NUMBER 4.13-1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

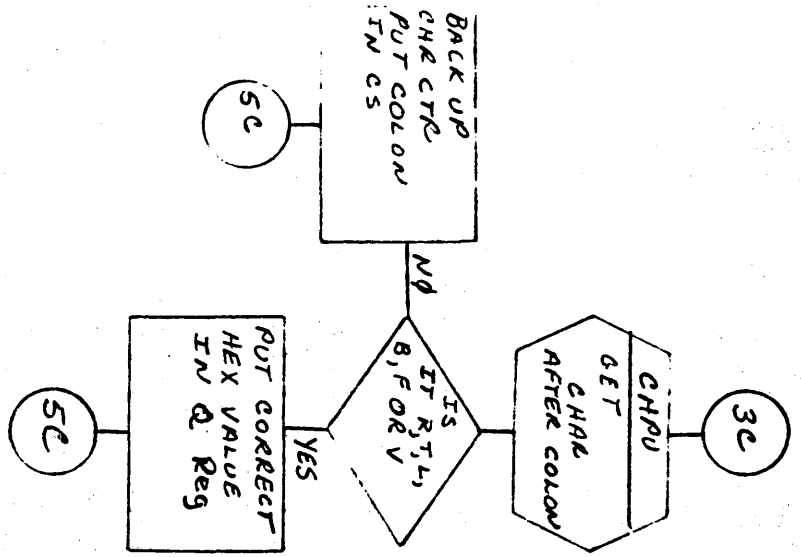


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS EMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE ALF PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 3 OF 5	PROJECT NAME			
	NUMBER 4.13.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORME A127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE ALF PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 4 OF 5	PROJECT NAME			
	NUMBER 4.13.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS: EMS — MACH. TYPE	PROJECT NO.	REV	APPROVED	DATE
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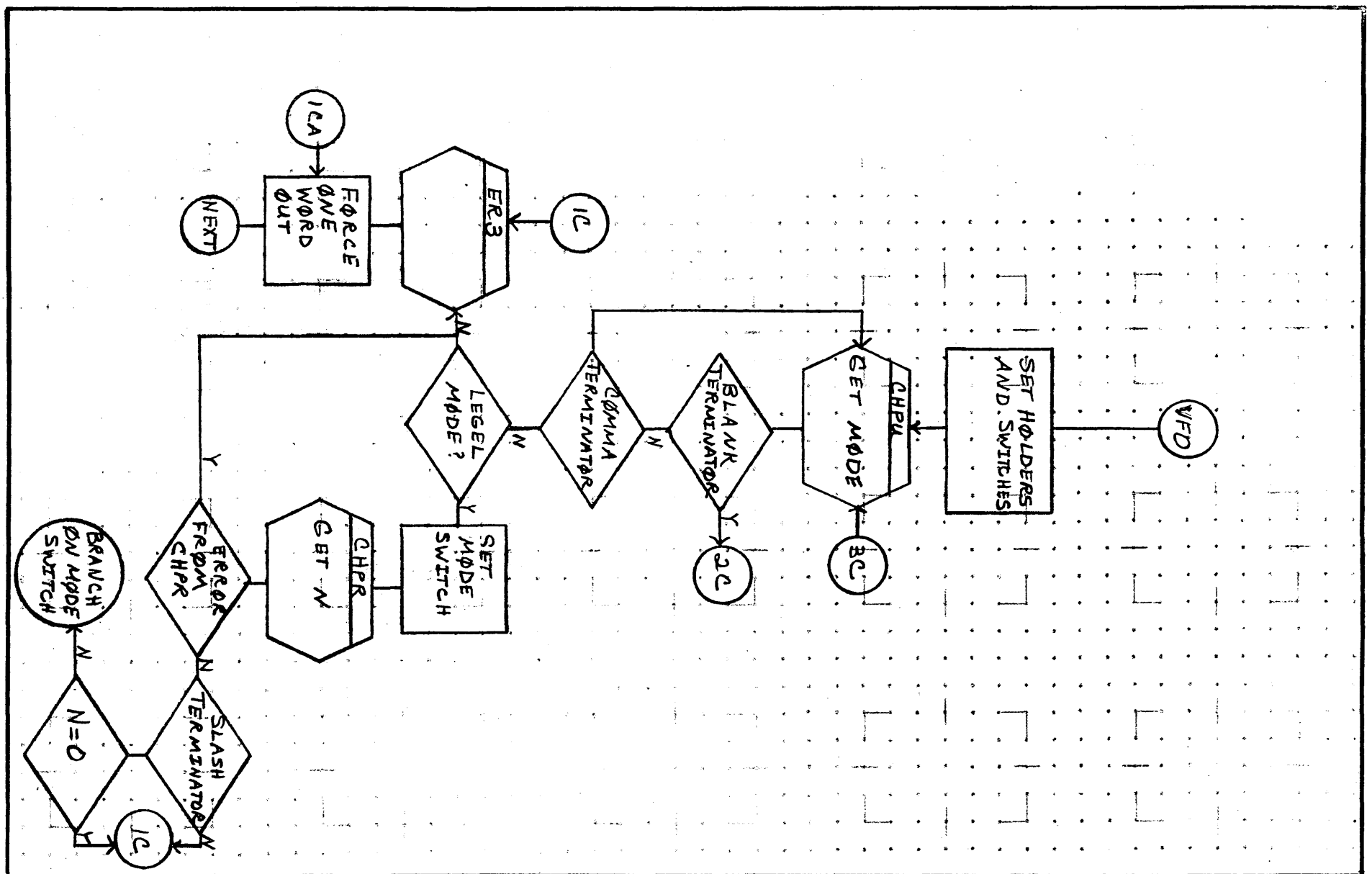
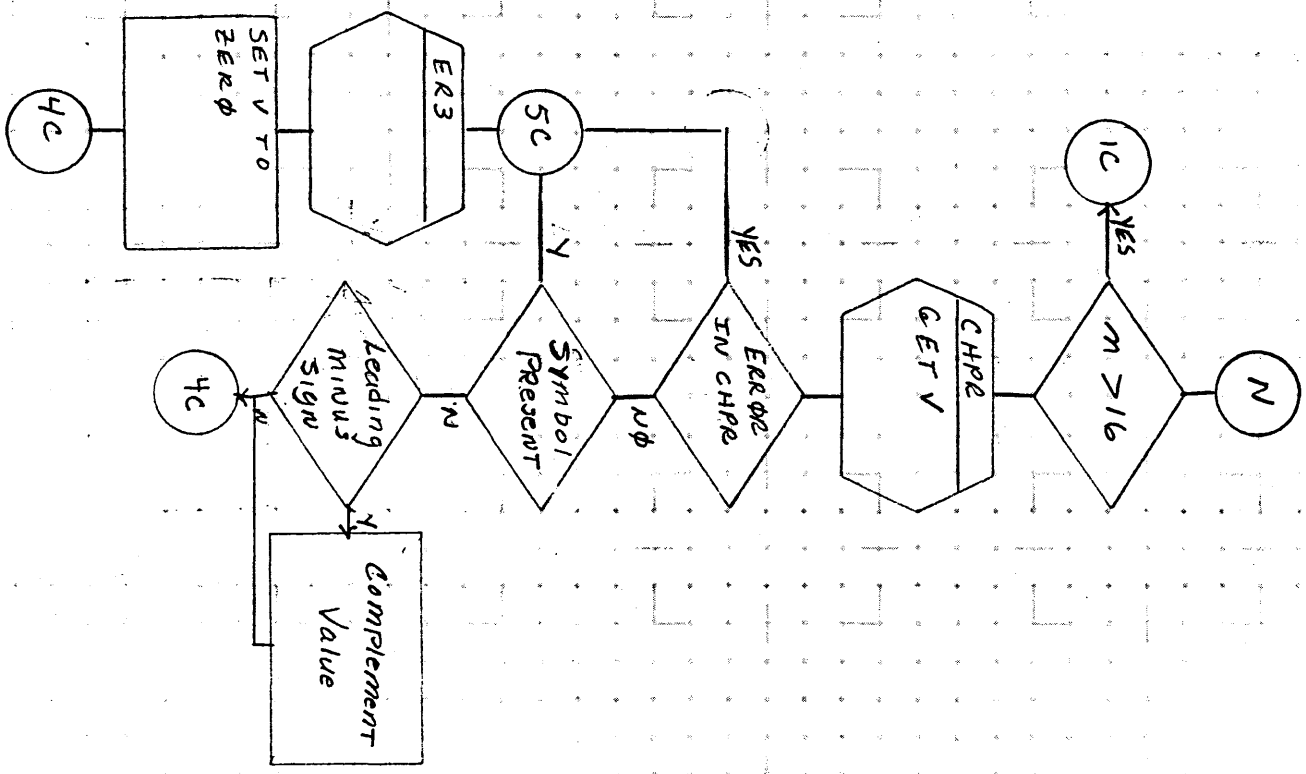
	PASS 3 — PAGE 5 OF 5	PROJECT NAME			
	NUMBER: 4.13.1 — ISSUE DATE	TASK NO.			
	DRAWN BY — DATE	TASK NAME			



CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE VFD PROCESSOR	PROJECT MGR.			
FLOWCHART ☐	PASS 3 PAGE 1 OF 6	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.14.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

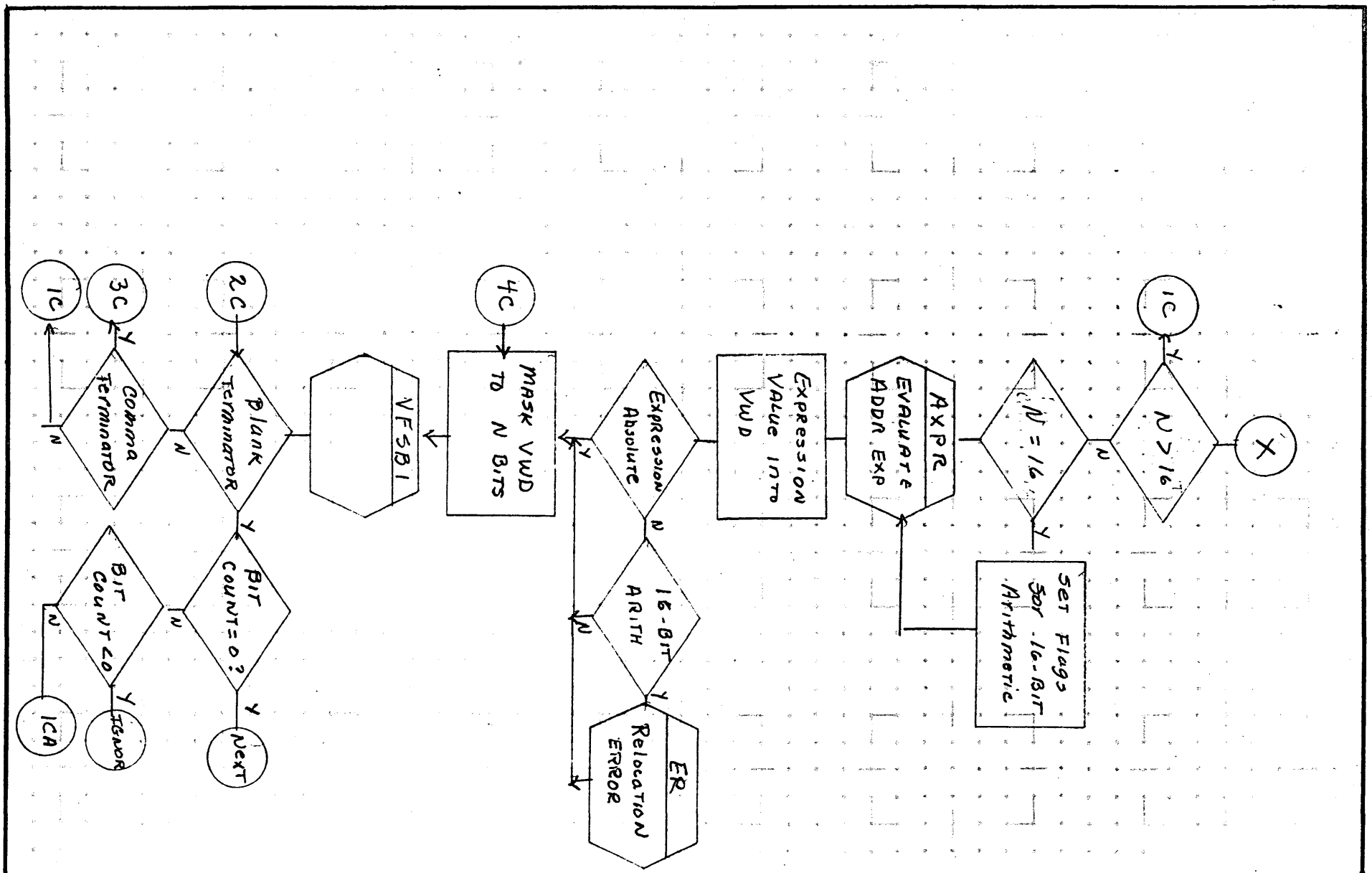
AA1385 (FORMERLY CA127-1)

PRINTED IN U.S.A.

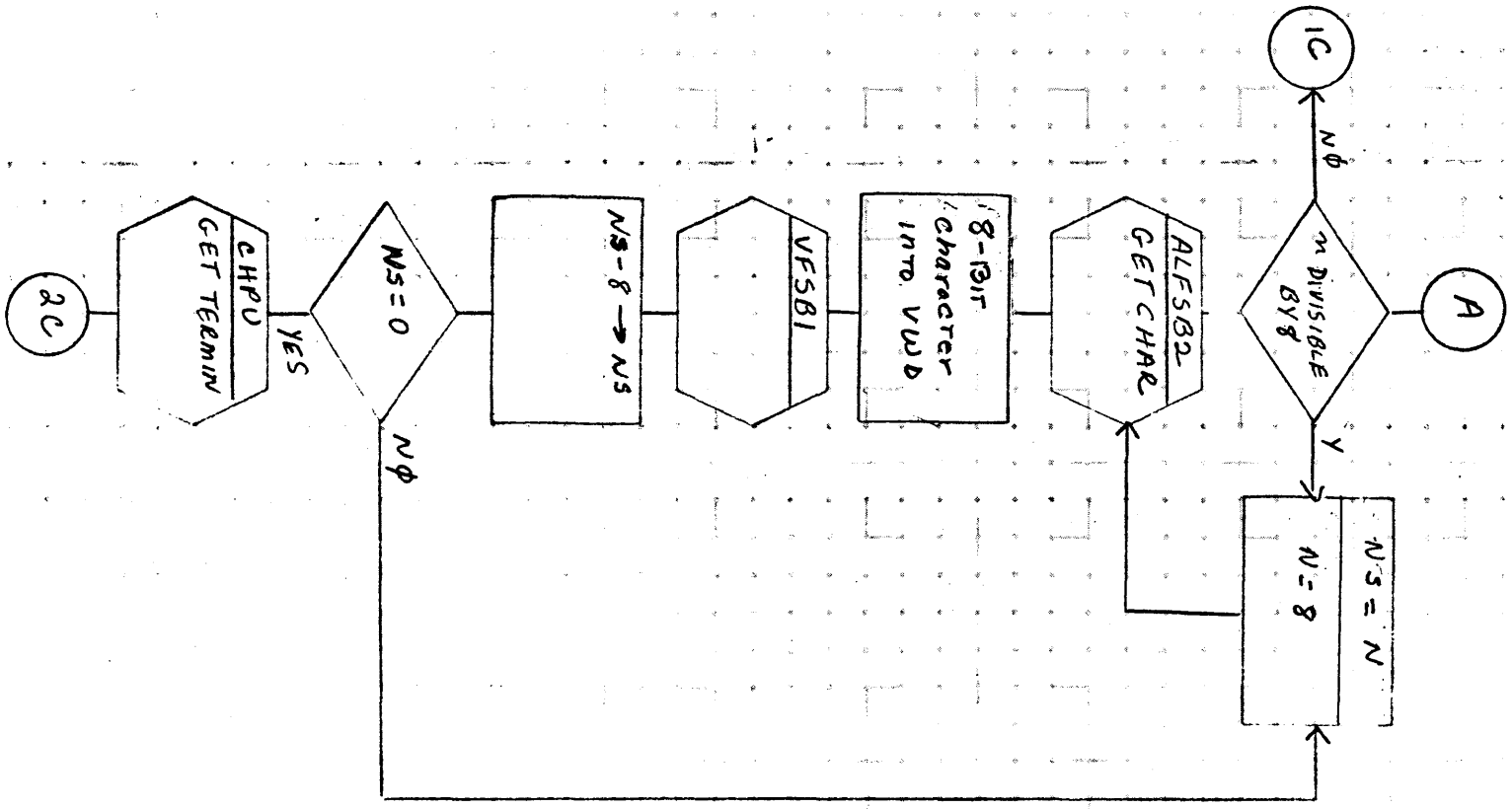


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS -IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE VFD PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 2 OF 6	PROJECT NAME			
	NUMBER 4.14.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)

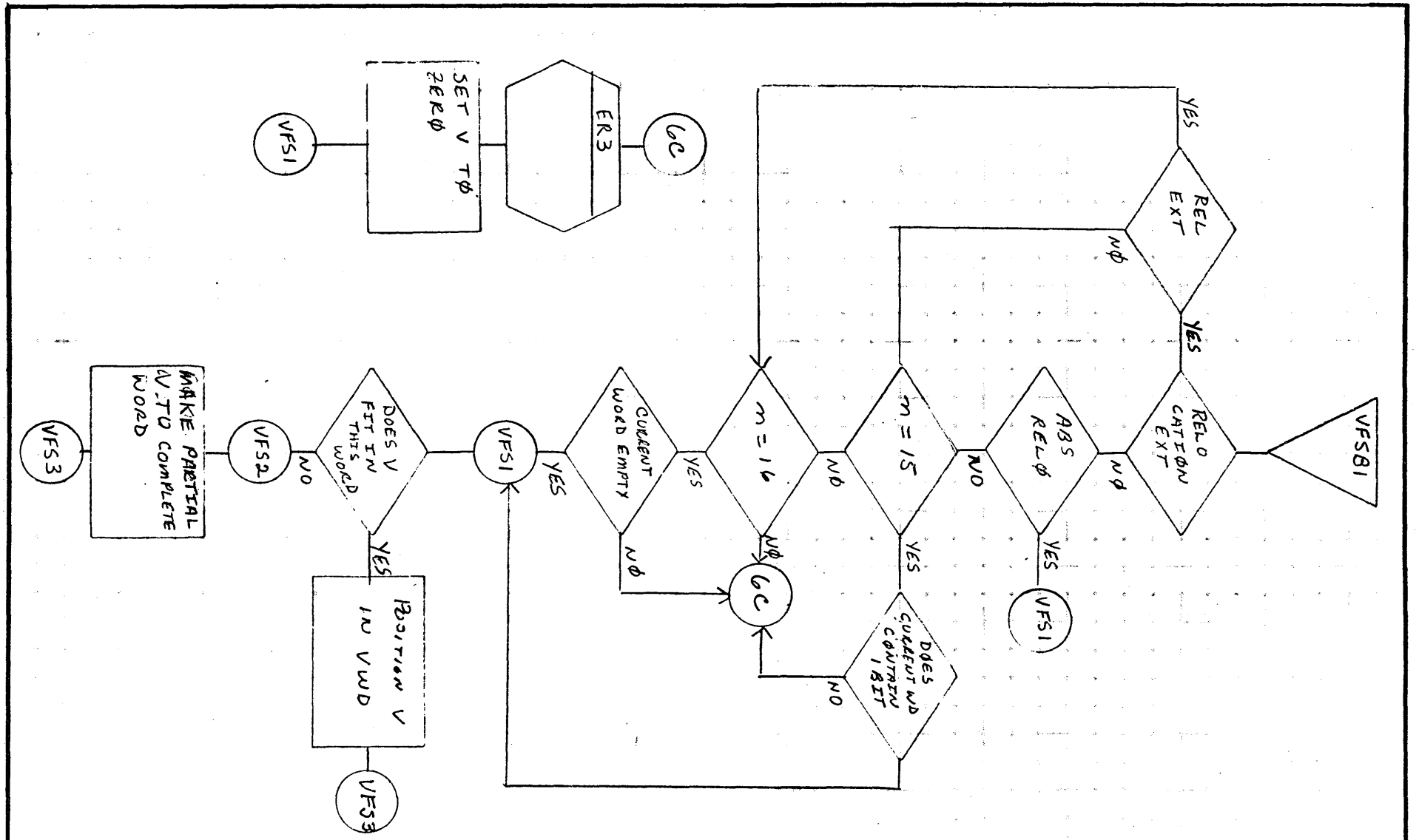


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
FLOWCHART ☐	DOCUMENT TITLE VFD PROCESSOR		PROJECT MGR.		
DECISION TABLE ☐	PASS 3	PAGE 3 OF 6	PROJECT NAME		
OTHER ☐	NUMBER 4.14.1	ISSUE DATE	TASK NO.		
	DRAWN BY	DATE	TASK NAME		

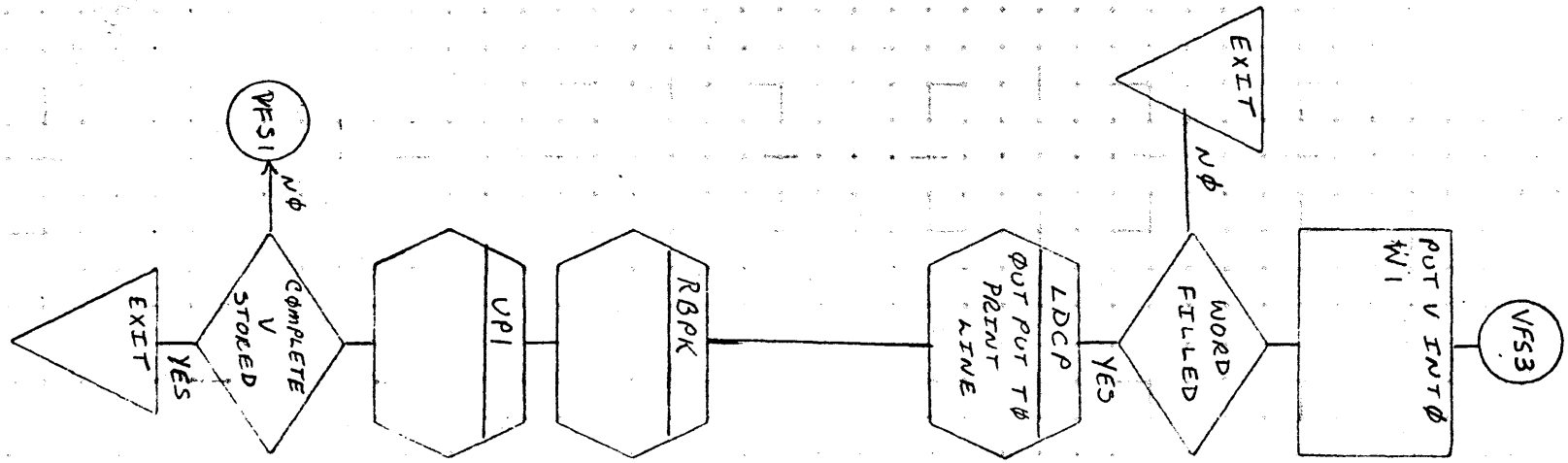


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS Ims MACH. TYPE	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE VFD PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 4 OF 6	PROJECT NAME			
	NUMBER 4.14.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORM CA127-1)

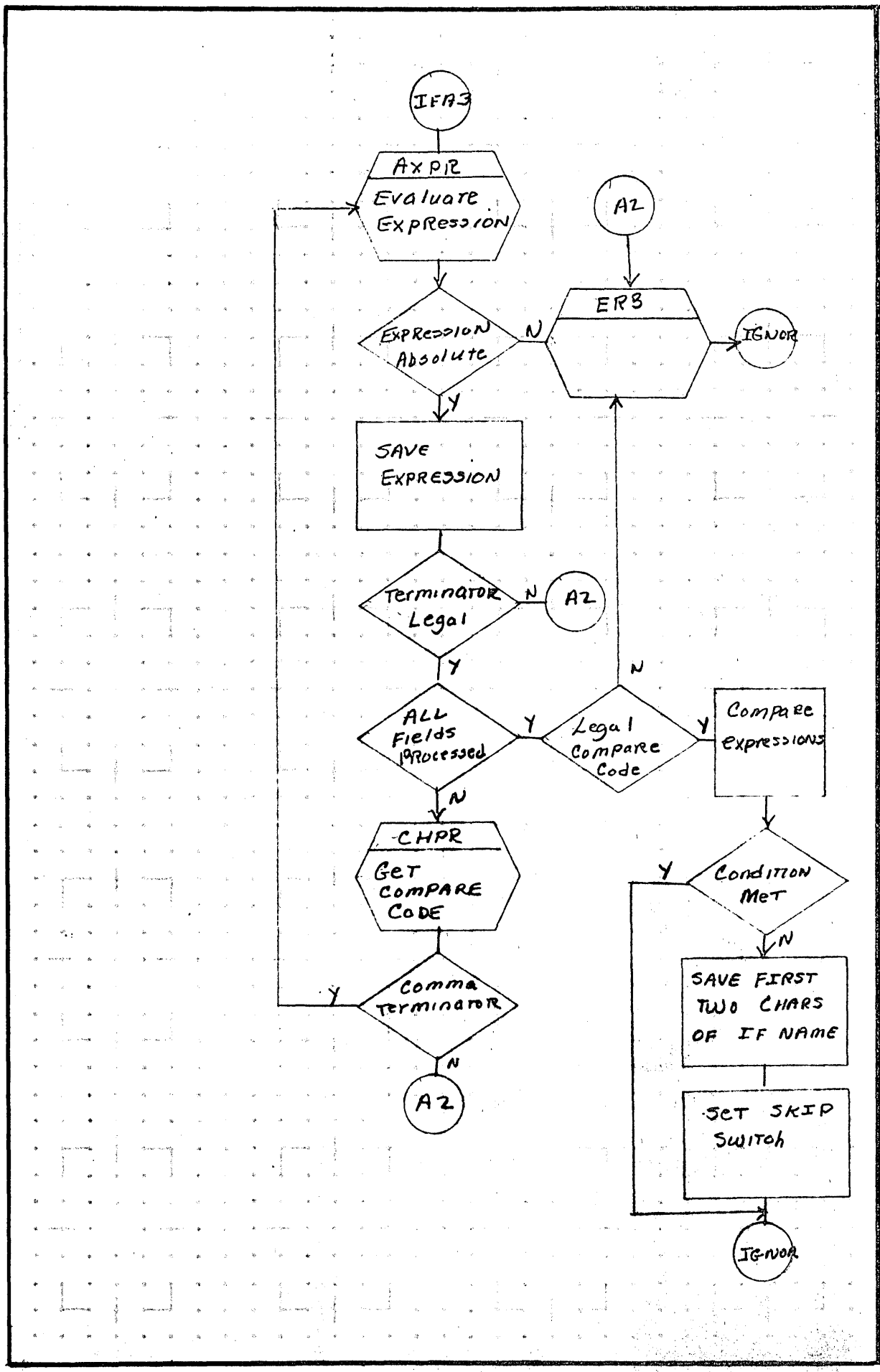


CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE VFD PROCESSOR	PROJECT MGR.			
	PASS3 PAGE 5 OF 6	PROJECT NAME			
	NUMBER 4.14.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE VFD PROCESSOR	PROJECT MGR			
FLOWCHART ☐	PASS 3 PAGE 6 OF 6	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.14.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

AA1385 (FORME) CA127-1



REV	APPROVED	DATE

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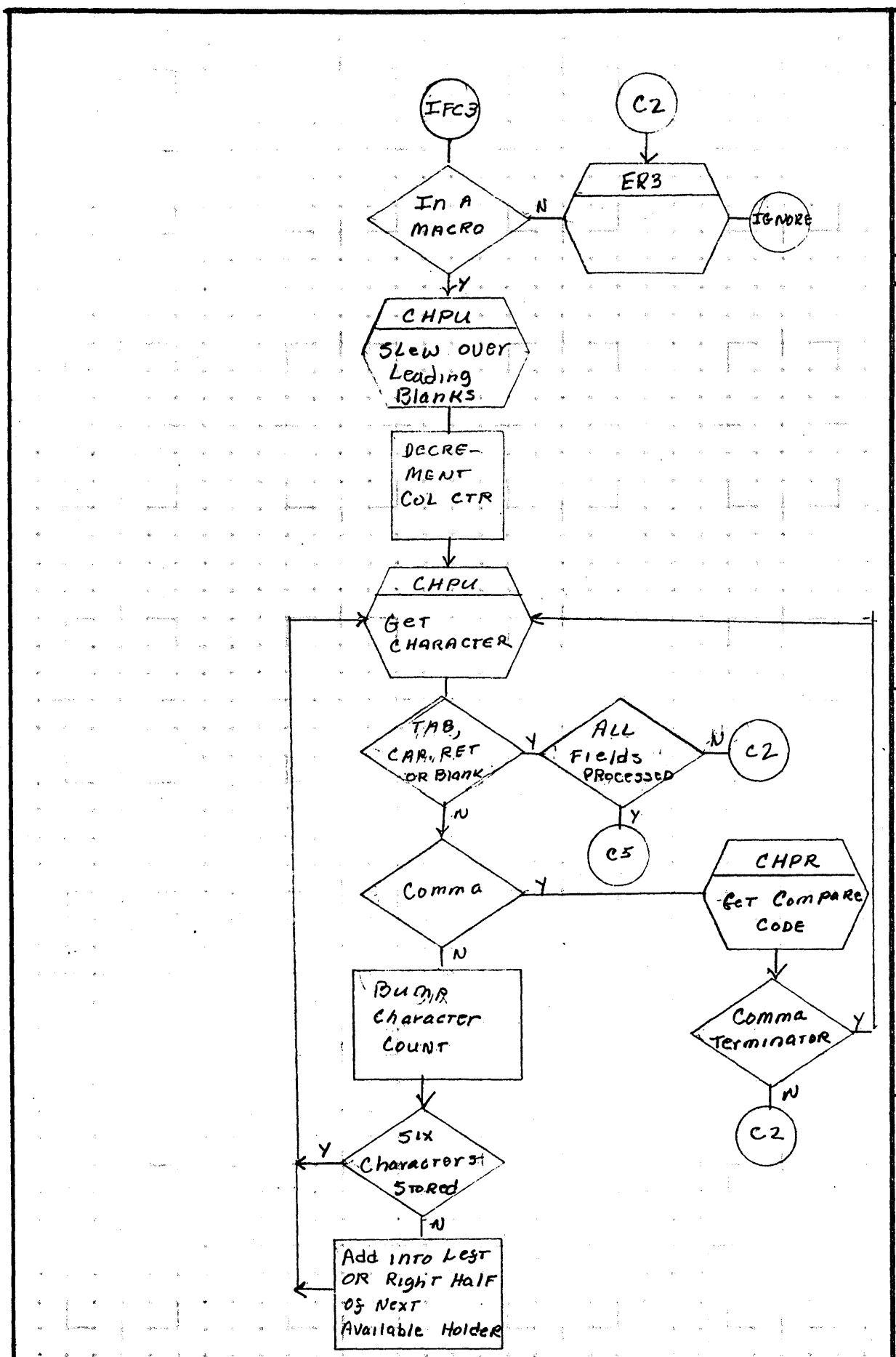
DOCUMENT TITLE IFA Processor		PROJECT MGR.		
PASS 3	PAGE 1 OF 1	PROJECT NAME		
NUMBER 4.15.1	ISSUE DATE	TASK NO.		
DRAWN BY	DATE	TASK NAME		

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE ☐
FLOWCHART ☐
DECISION TABLE ☐
OTHER ☐

AA1385 (FORMERLY CA127-1)



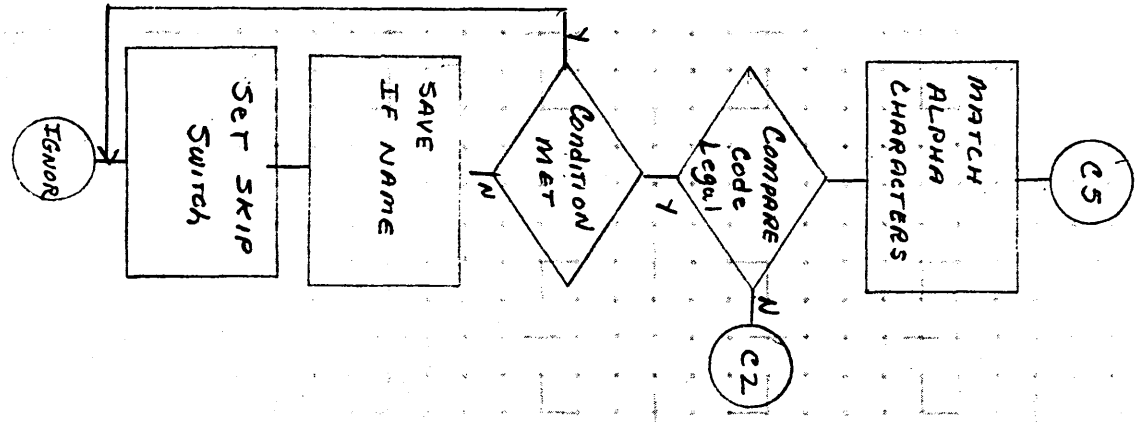
REV	APPROVED	DATE	
PROJECT NO.			
PROJECT MGR.			
PROJECT NAME			
TASK NO.			
TASK NAME			

DOCUMENT CLASS	IMS	MACH. TYPE	1700
DOCUMENT TITLE	IFC PROCESSOR		
PASS 3		PAGE 1 OF 2	
NUMBER	4.16.1	ISSUE DATE	
DRAWN BY		DATE	

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

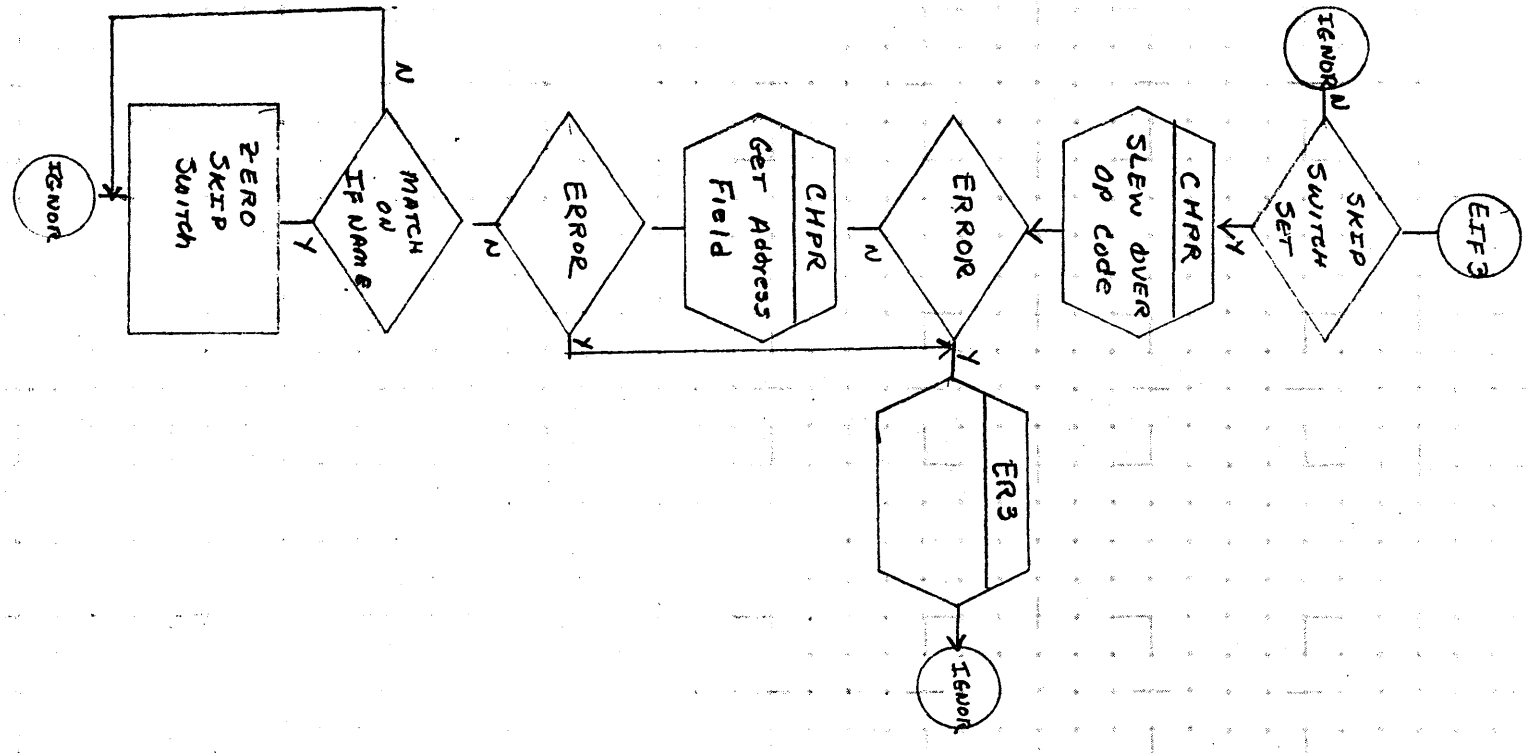
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

AA1385 (FOR CA127-1)



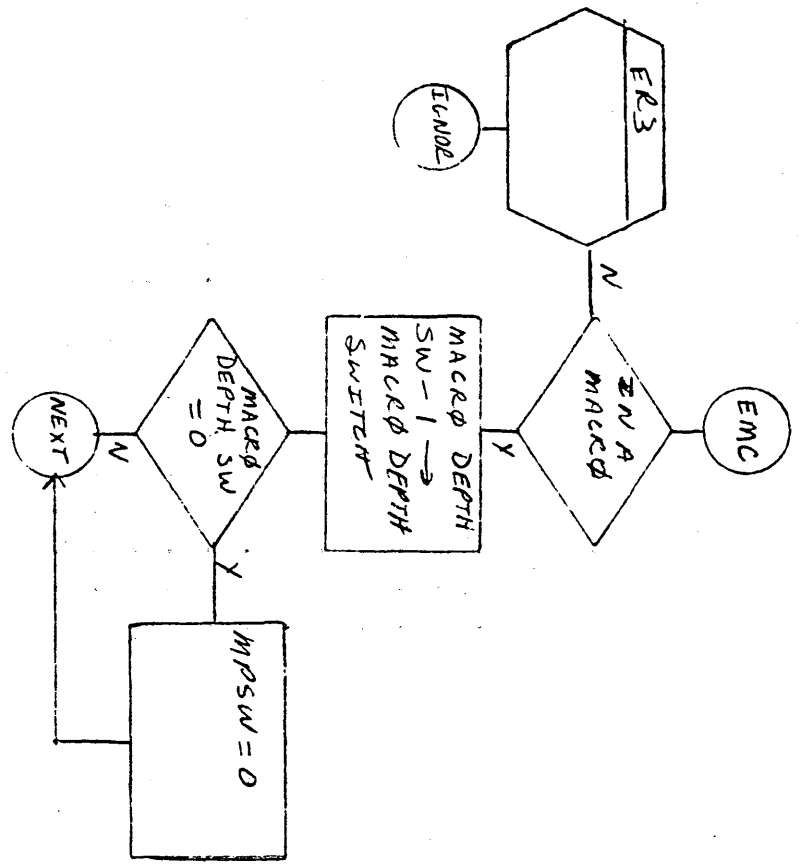
CONTROL DATA CORPORATION						
SOFTWARE DOCUMENT	DOCUMENT CLASS Ims	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE IFC PROCESSOR		PROJECT MGR.			
FLOWCHART ☐	PASS 3	PAGE 2 OF 2	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.16.1	ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY	DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)

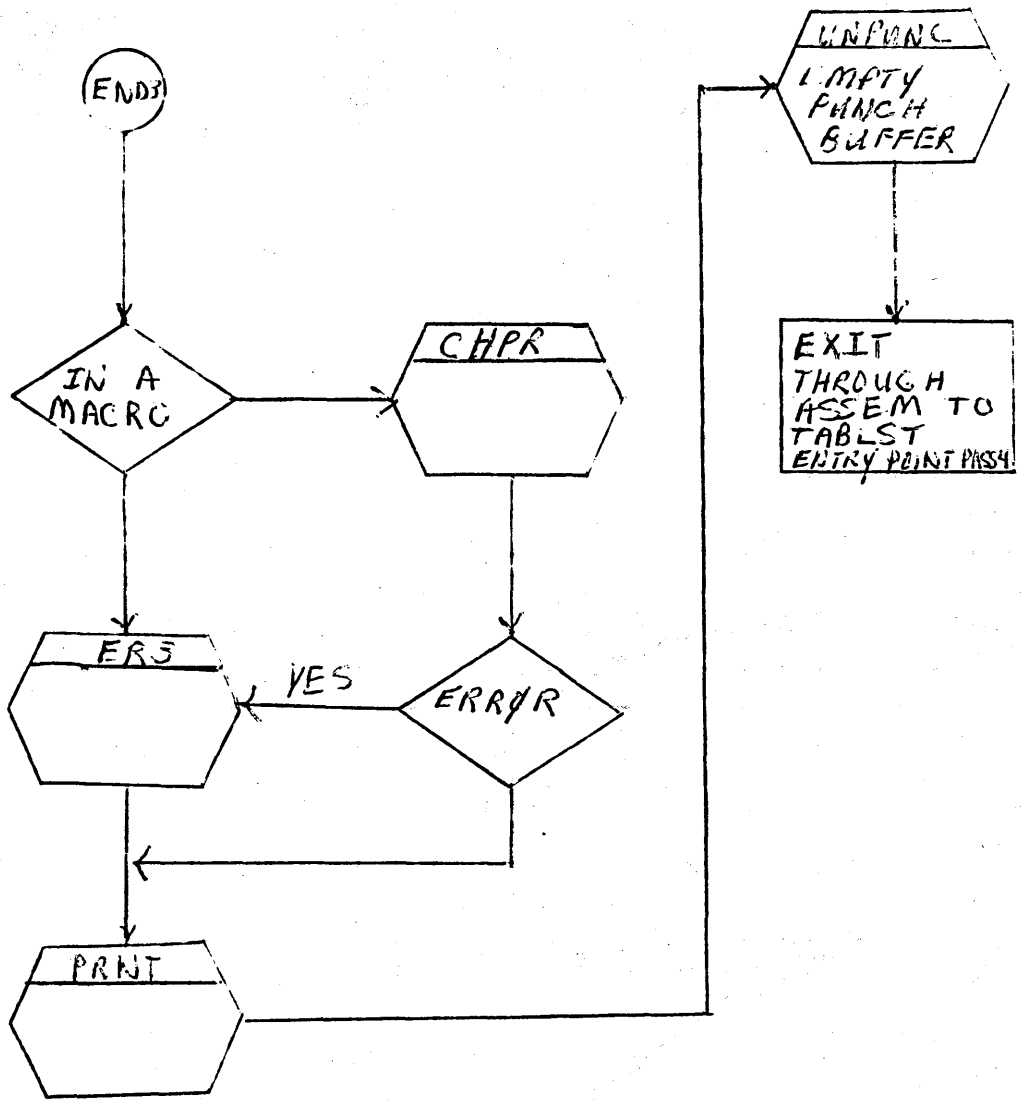


CONTROL DATA CORPORATION						
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE EIF PROCESSOR		PROJECT MGR.			
FLOWCHART ☐	PASS 3	PAGE 1 OF 1	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.17.1	ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY	DATE	TASK NAME			

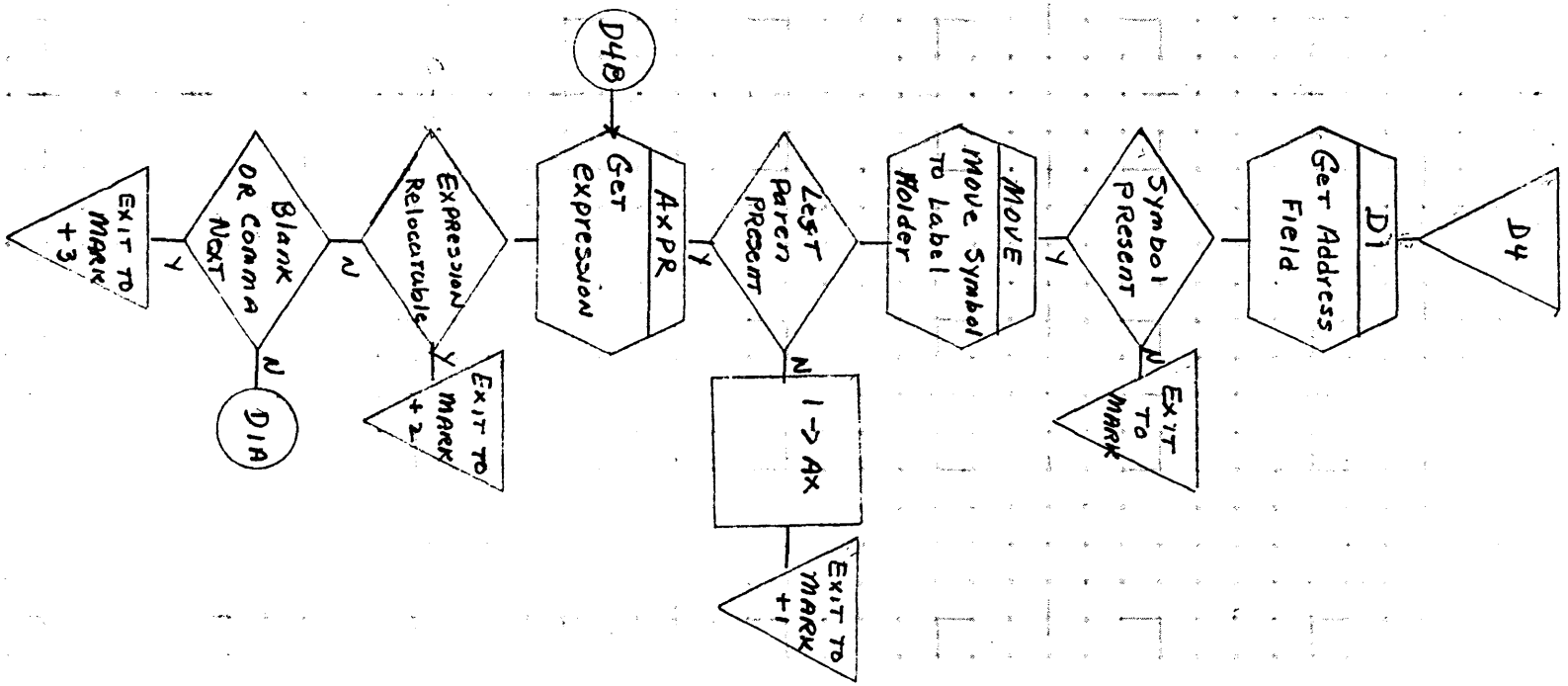
AA1385 (FORM CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS Ims MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE EMC PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 1 OF 1	PROJECT NAME			
	NUMBER 4.18.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

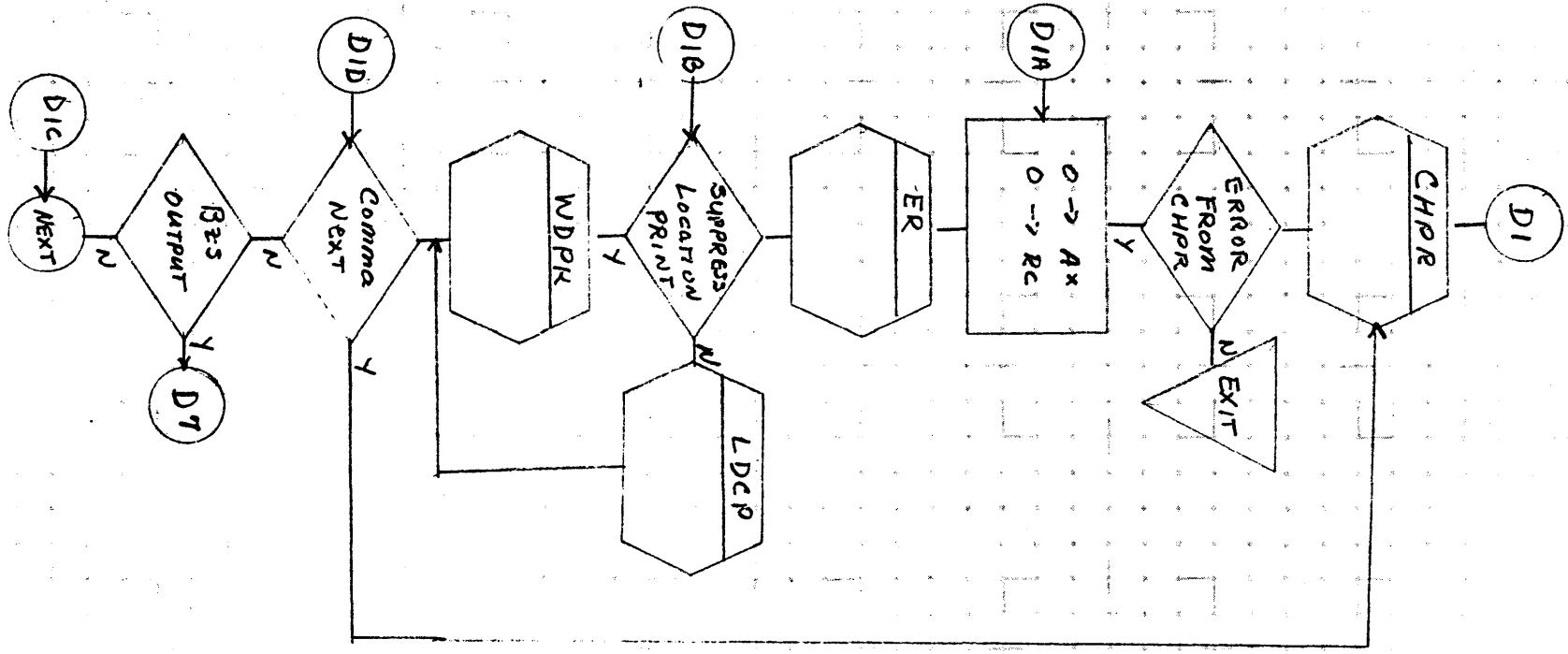


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☒ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE END PROCESSOR	PROJECT MGR.			
	PASS 3 PAGE 1 OF 1	PROJECT NAME			
	NUMBER 4.19.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



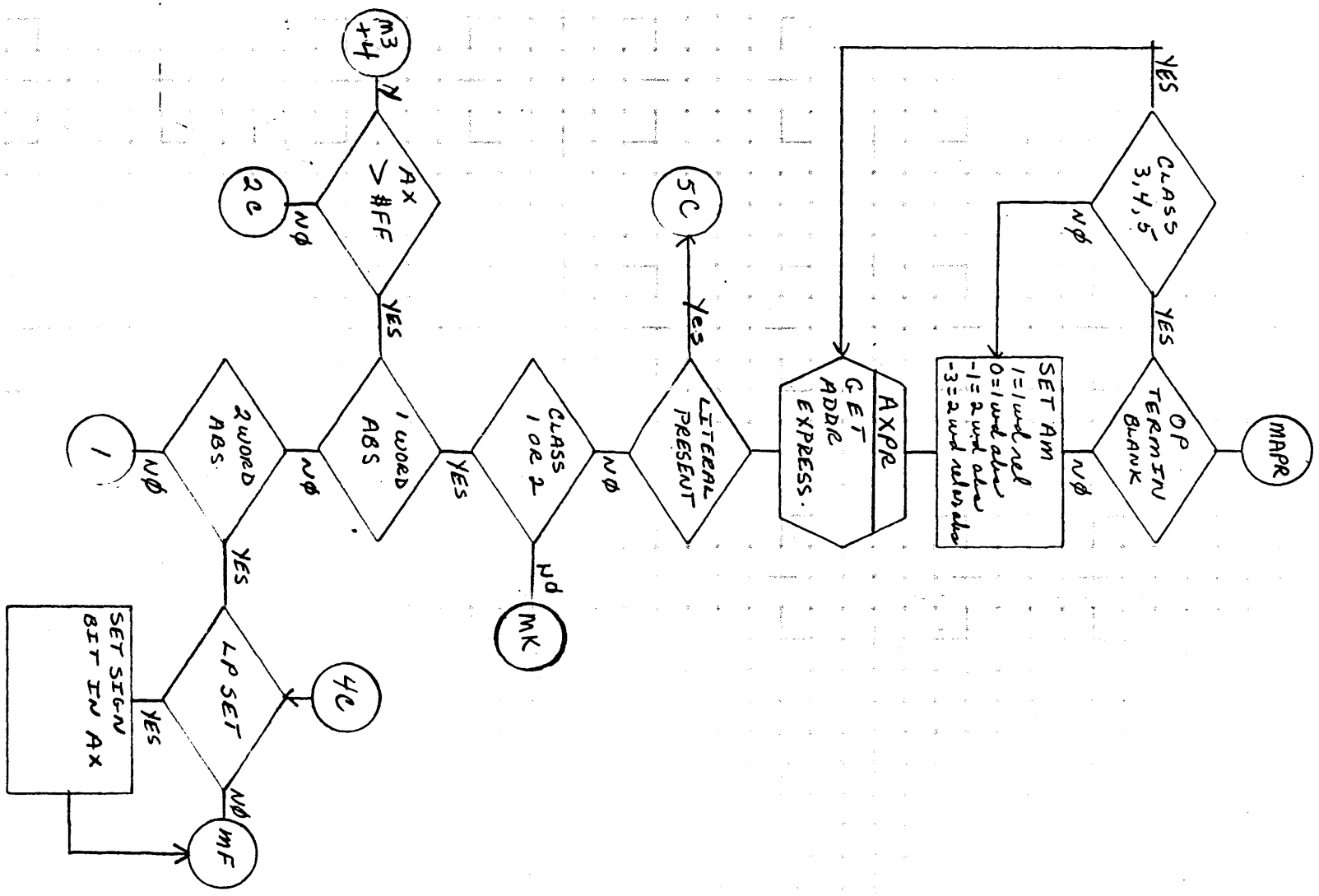
CONTROL DATA CORPORATION						
SOFTWARE DOCUMENT	DOCUMENT CLASS Ims	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE Miscellaneous Subroutine		PROJECT MGR.			
FLOWCHART ☐	FOR Pseudo OPS PASS 3 PAGE 1 OF 2		PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.20.1	ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY	DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



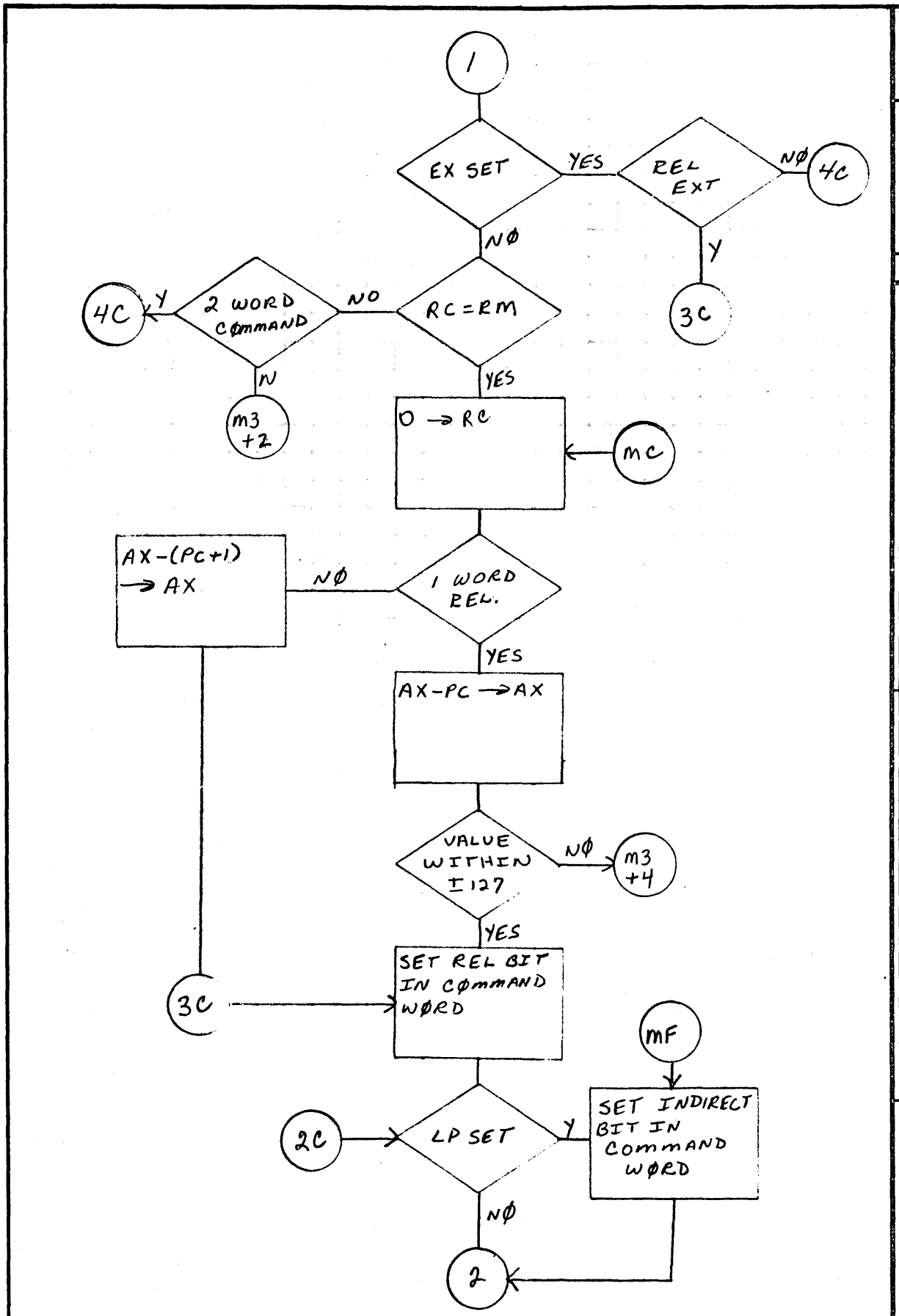
CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
	DOCUMENT TITLE Miscellaneous Subroutine		PROJECT MGR.		
	FOR Pseudo ops PA333 PAGE 2 OF 2		PROJECT NAME		
	NUMBER 4.21.1	ISSUE DATE	TASK NO.		
	DRAWN BY	DATE	TASK NAME		

AA1385 (FORME CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE Machine Address Proc	PROJECT MGR.			
FLOWCHART ☐	Pass 3 PAGE 1 OF 4	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.22.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

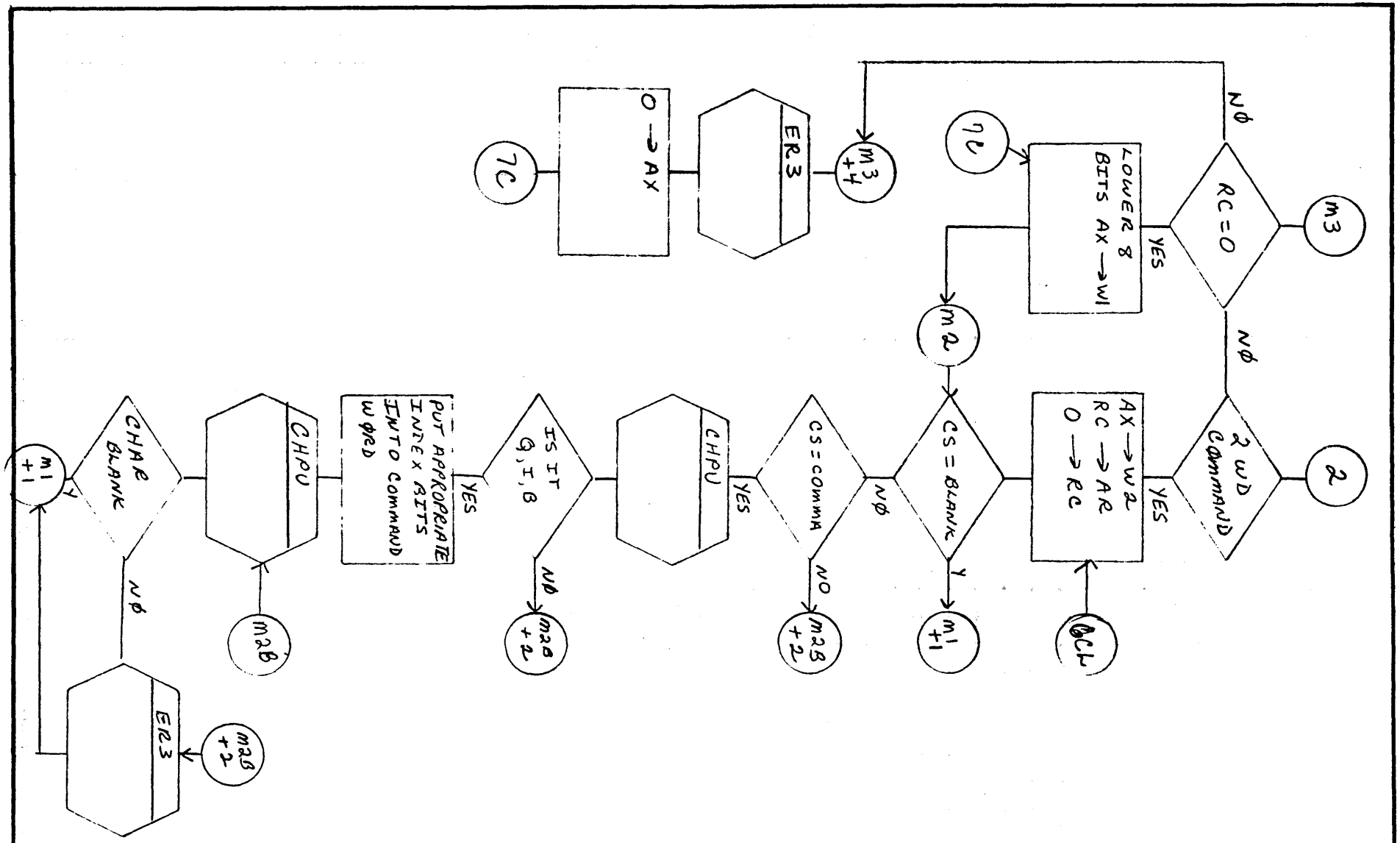
AA1385 (FORMERLY CA127-1)



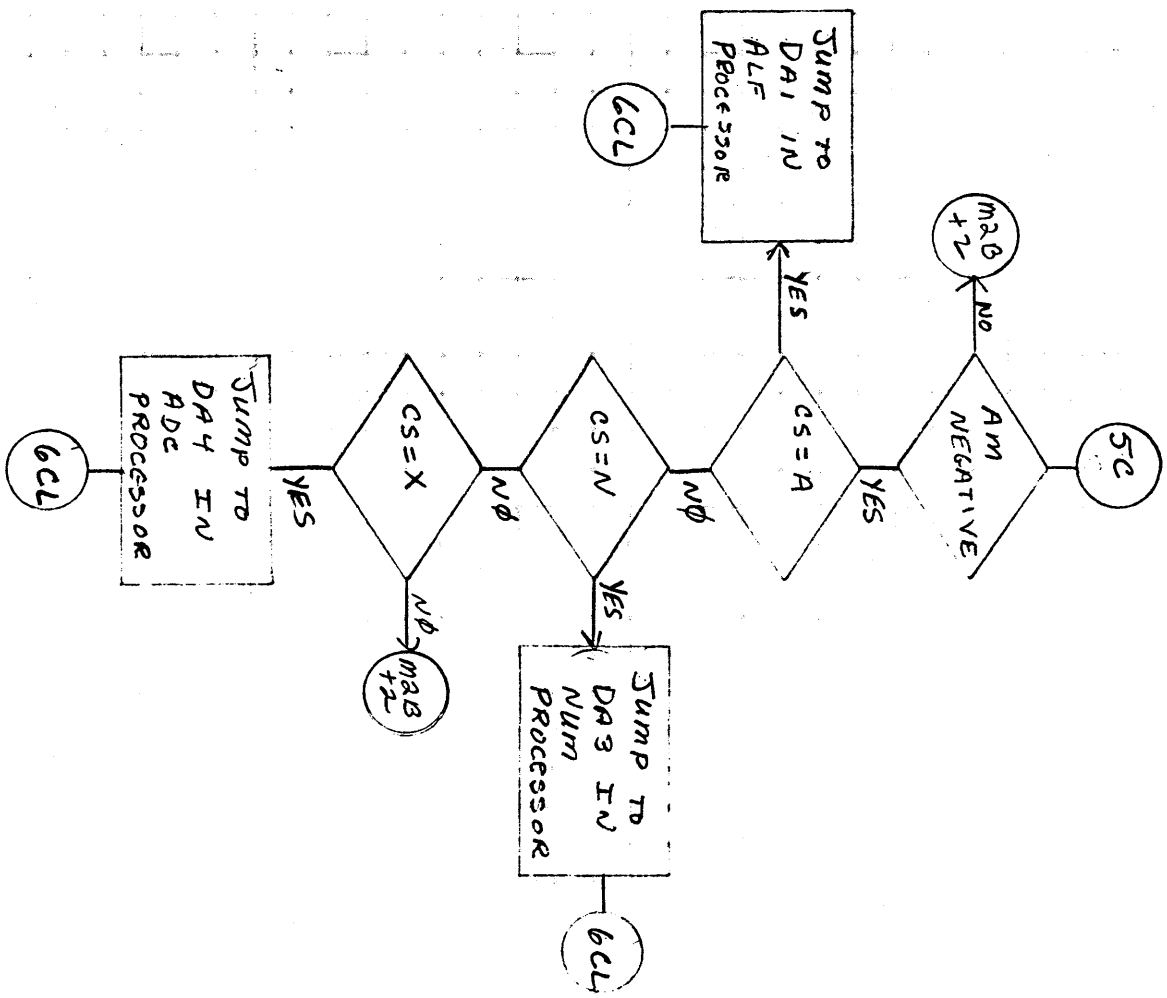
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS	LMS	MACH. TYPE	1700	PROJECT NO.	REV	APPROVED	DATE
DOCUMENT TITLE	Machine Address Pass 3			PROJECT MGR.			
		PAGE	2 OF 7	PROJECT NAME			
NUMBER	4.22.1	ISSUE DATE		TASK NO.			
DRAWN BY		DATE		TASK NAME			

AA1388 (FORM) CA127-1)

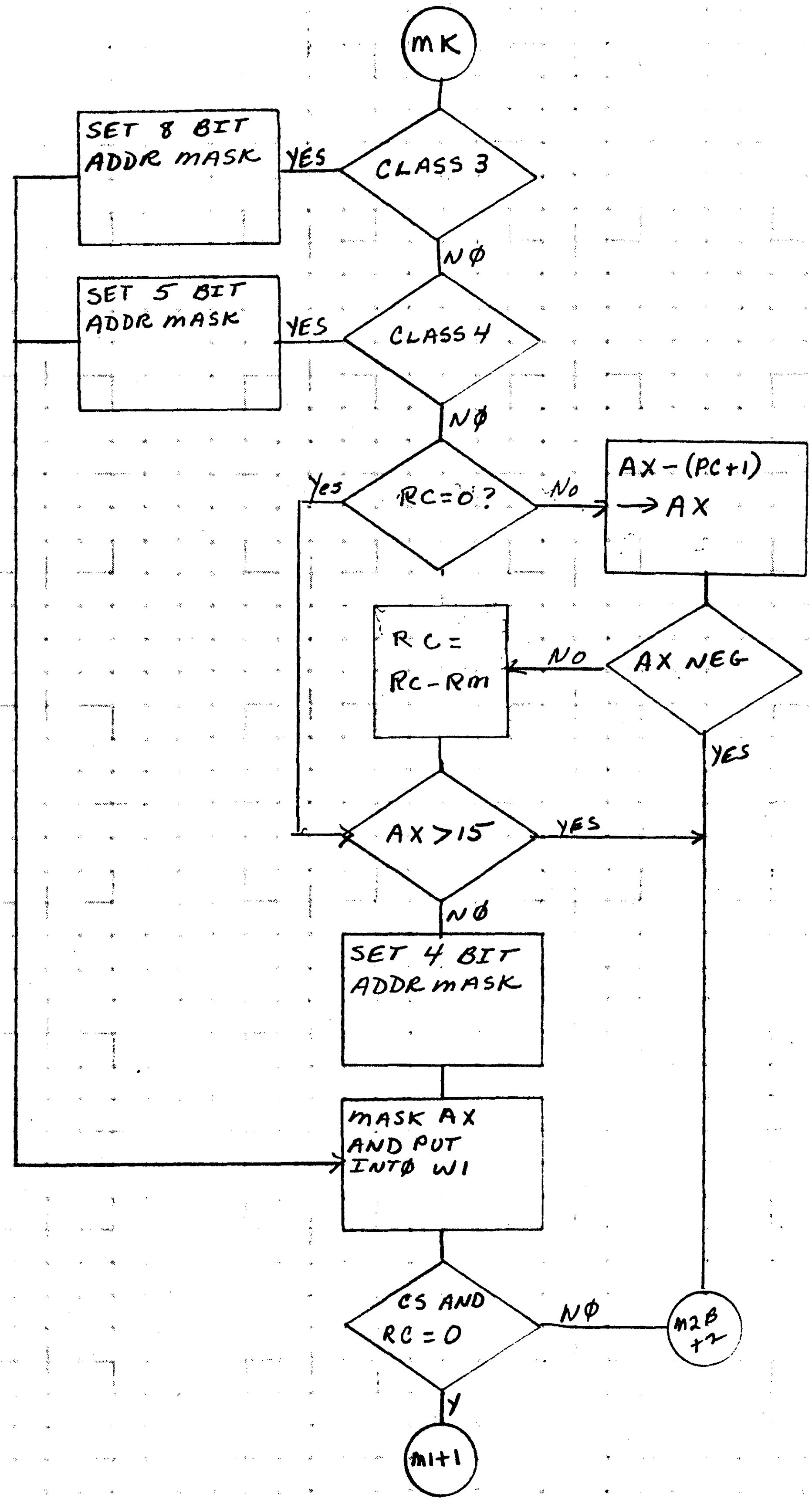


CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT TITLE Machine Address Proc	PROJECT MGR.			
	Pass 3 PAGE 3 OF 7	PROJECT NAME			
	NUMBER 4.22.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE Machine Address Proc	PROJECT MGR			
FLOWCHART ☐	Pass 3 PAGE 4 OF 7	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.2.2.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



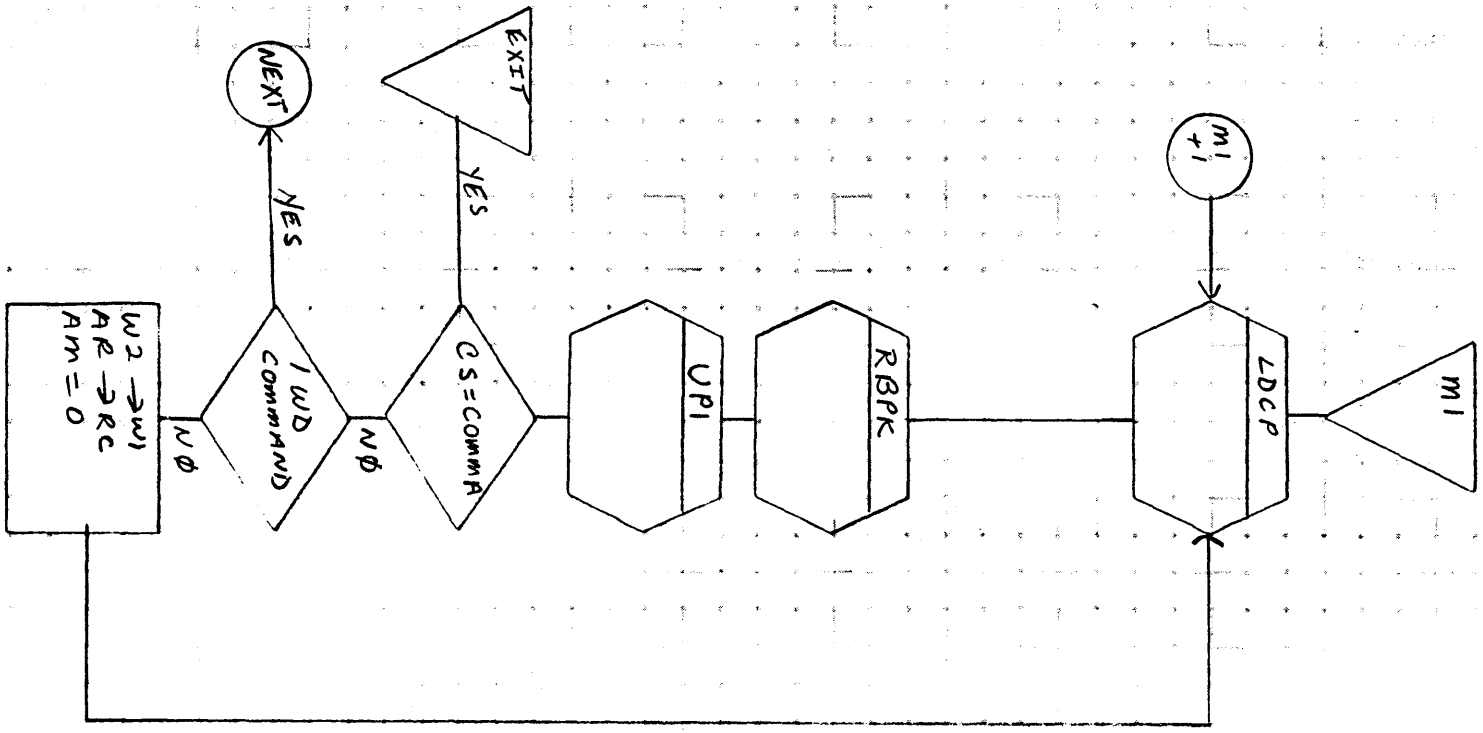
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS: IMS MACH. TYPE: 1700
DOCUMENT TITLE: Machine Address Proc Pass 3
NUMBER: 4.22.1 ISSUE DATE: PAGE 5 OF 7
DRAWN BY: DATE:

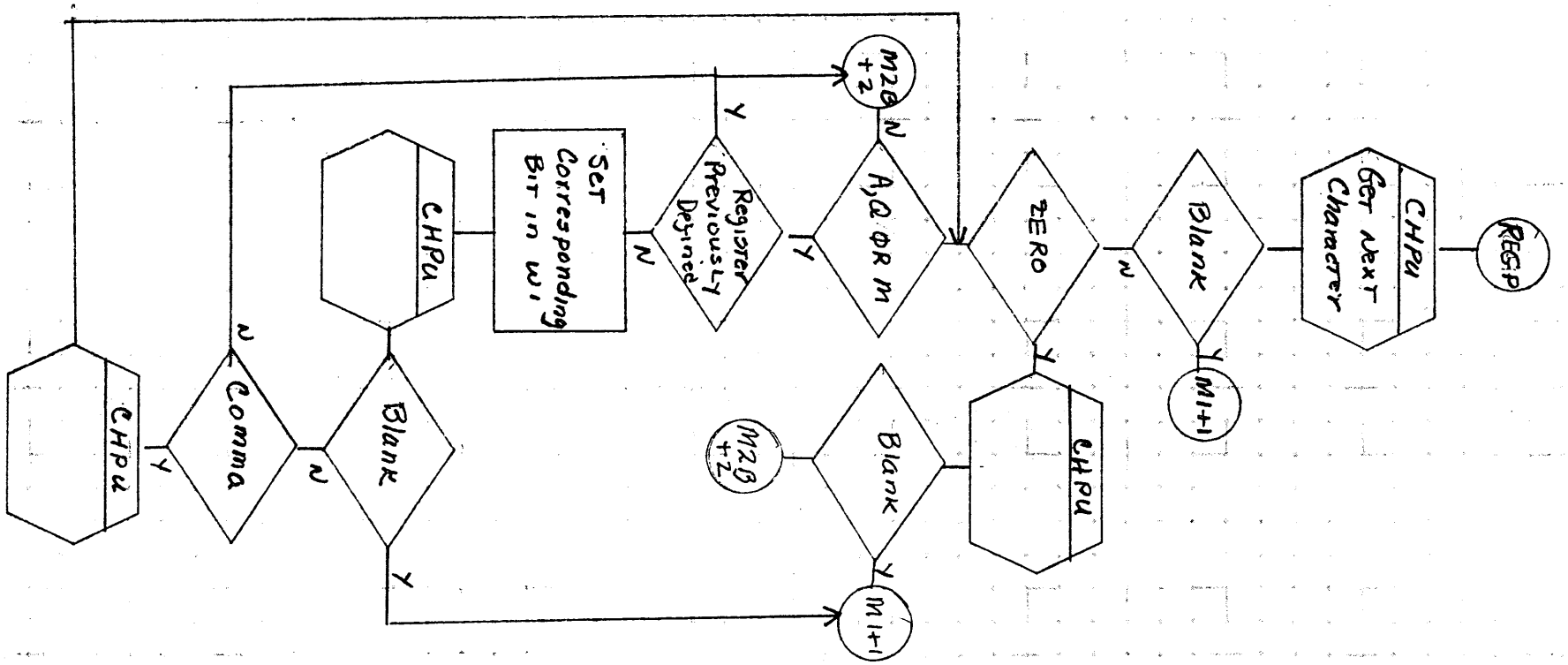
PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

REV | APPROVED | DATE



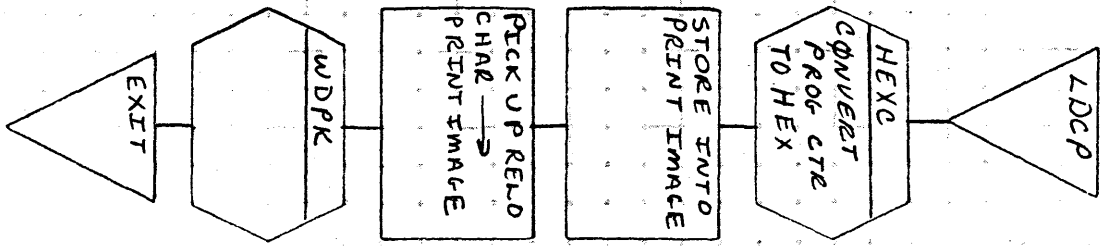
CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE Machine Address Proc	PROJECT MGR.			
	Pass 3 PAGE 6 OF 7	PROJECT NAME			
	NUMBER 4.22.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FOR CA127-1)



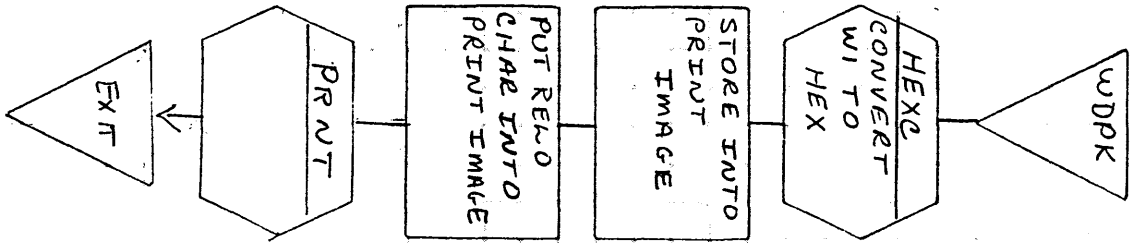
CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE Inter-Register Processor		PROJECT MGR.			
FLOWCHART ☐	PASS 3	PAGE 7 OF 7	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4,221	ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY	DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



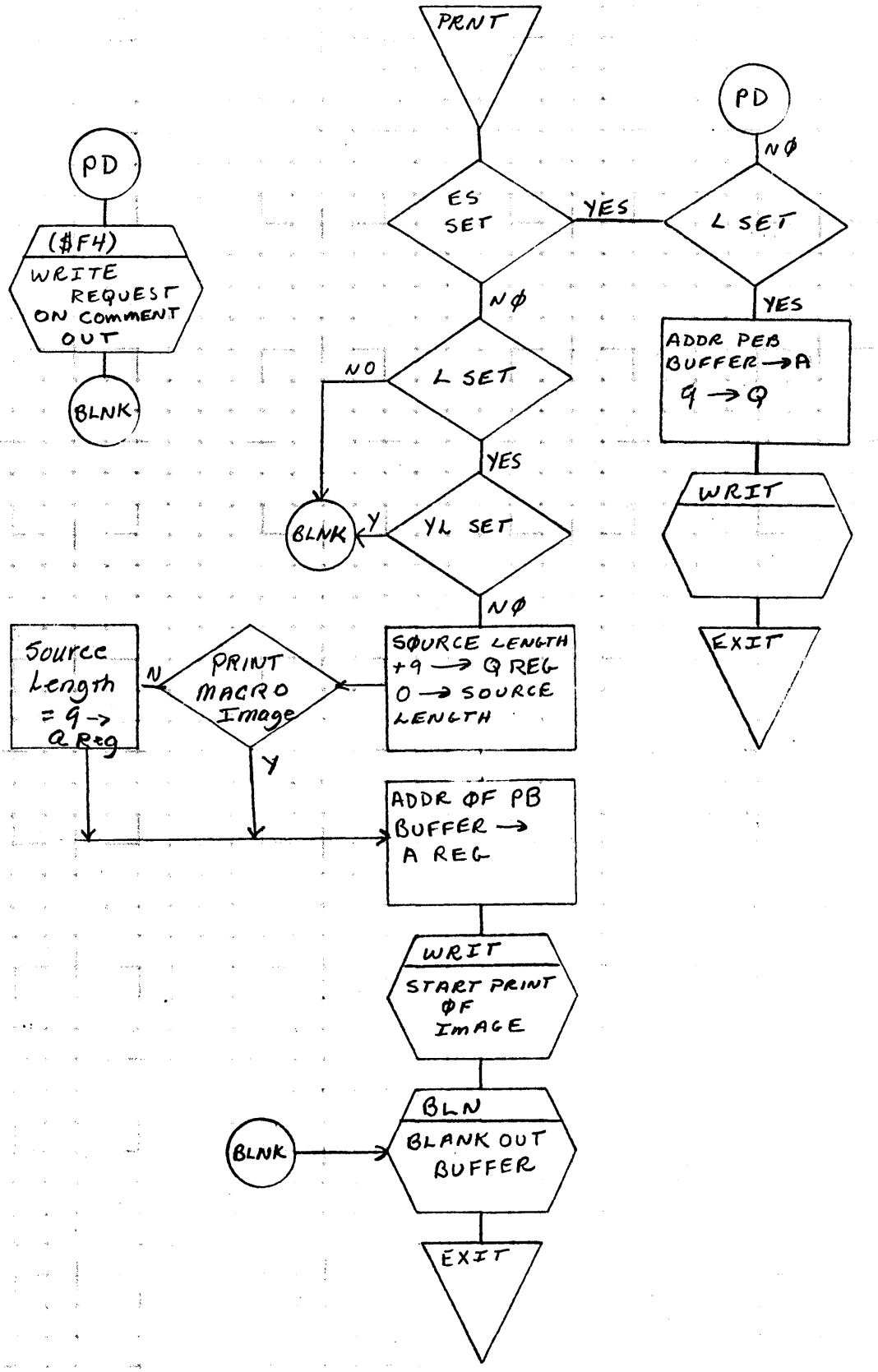
CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE LOCATION PACK SUBT.	PROJECT MGR.			
FLOWCHART ☐	PASS 3 PAGE 1 OF 1	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.23.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

AA1385 (FOR[illegible]Y CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE WORD PACK SBRT.	PROJECT MGR.			
	PASS 3 PAGE 1 OF 1	PROJECT NAME			
	NUMBER 4.24.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

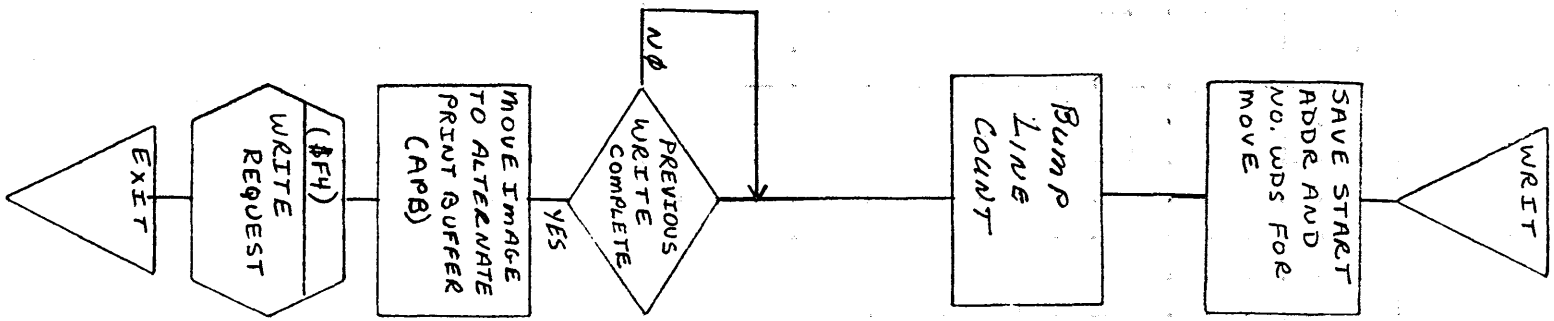
AA1385 (FORMERLY CA127-1)



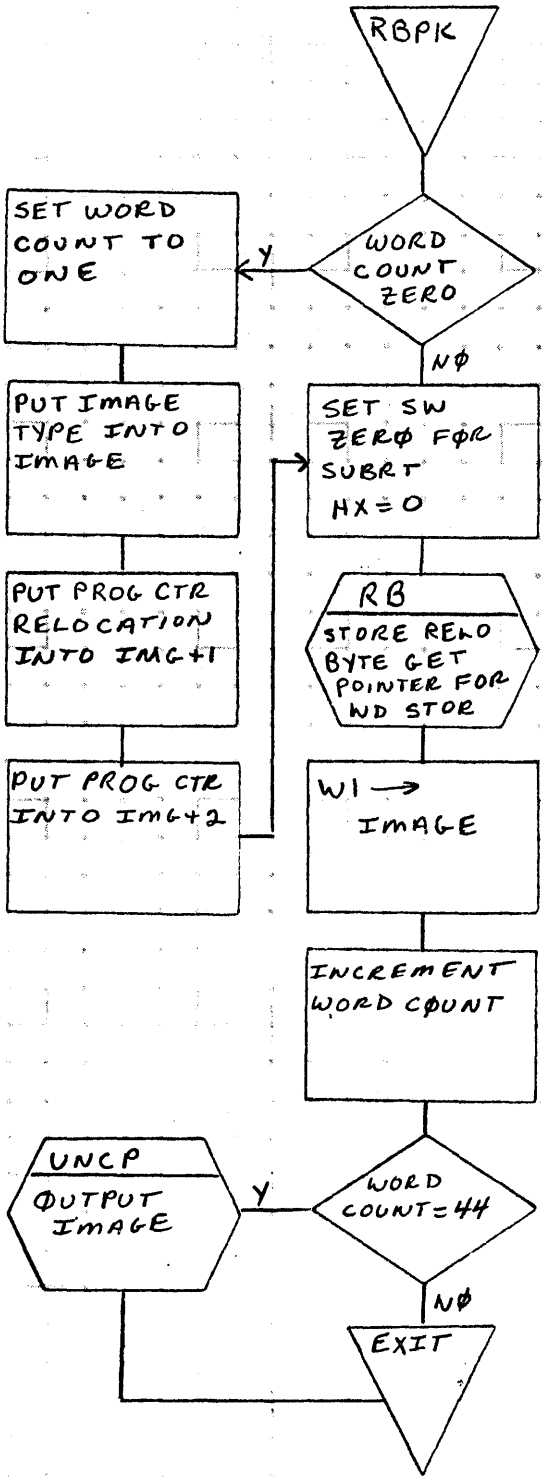
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS	IMS MACH. TYPE 1700	PROJECT NO.	REV / APPROVED / DATE
DOCUMENT TITLE PRINT ROUTINE		PROJECT MGR.	
PASS 3	PAGE 1 OF 2	PROJECT NAME	
NUMBER 4235.1	ISSUE DATE	TASK NO.	
DRAWN BY	DATE	TASK NAME	

AA1388 (FORMERLY CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐					
DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
DOCUMENT TITLE PRINT ROUTINE	PROJECT MGR.			
PASS 3 PAGE 2 OF 2	PROJECT NAME			
NUMBER 4.25.1 ISSUE DATE	TASK NO.			
DRAWN BY DATE	TASK NAME			



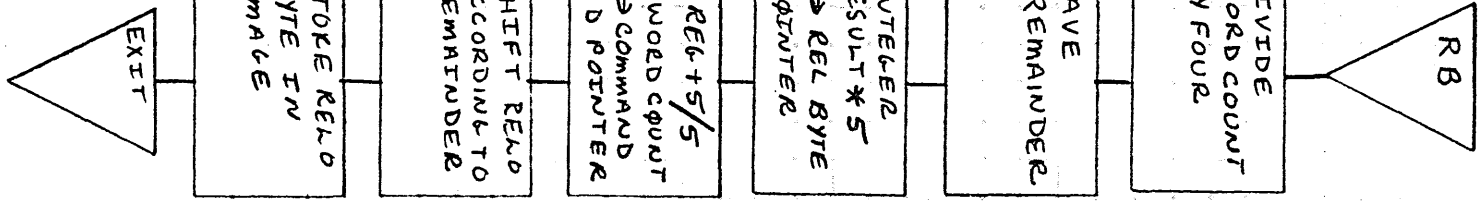
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS: IMS
MACH. TYPE: 1700
DOCUMENT TITLE: PACK RELO BINARY
IMAGE PASS 3
PAGE 1 OF 2
NUMBER 4.26.1
ISSUE DATE
DRAWN BY
DATE

PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

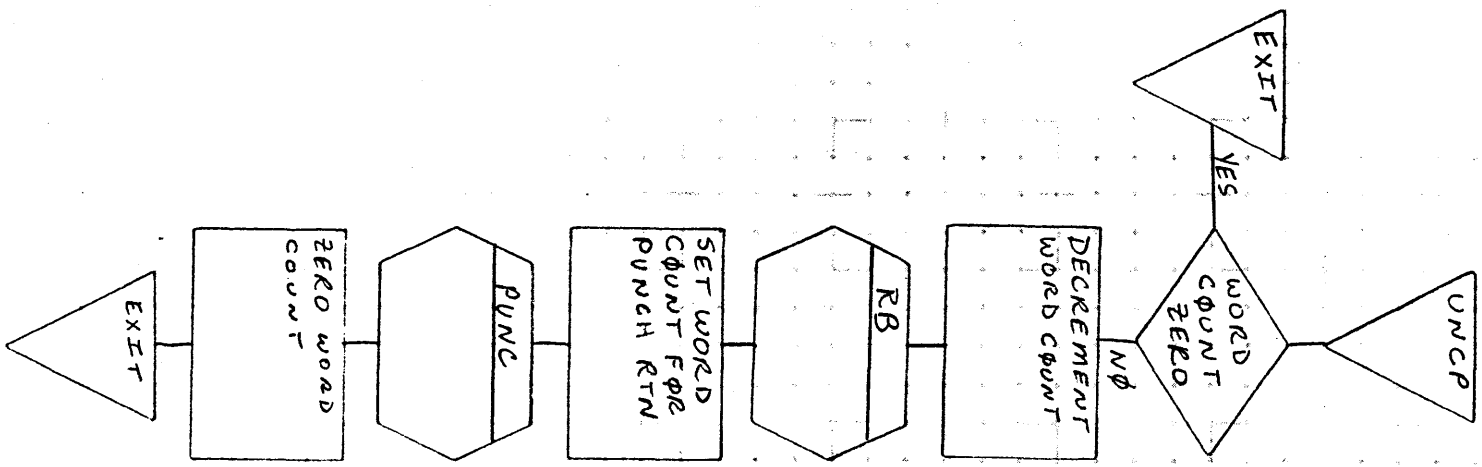
REV	APPROVED	DATE

AA1385 (FORME CA127-1)



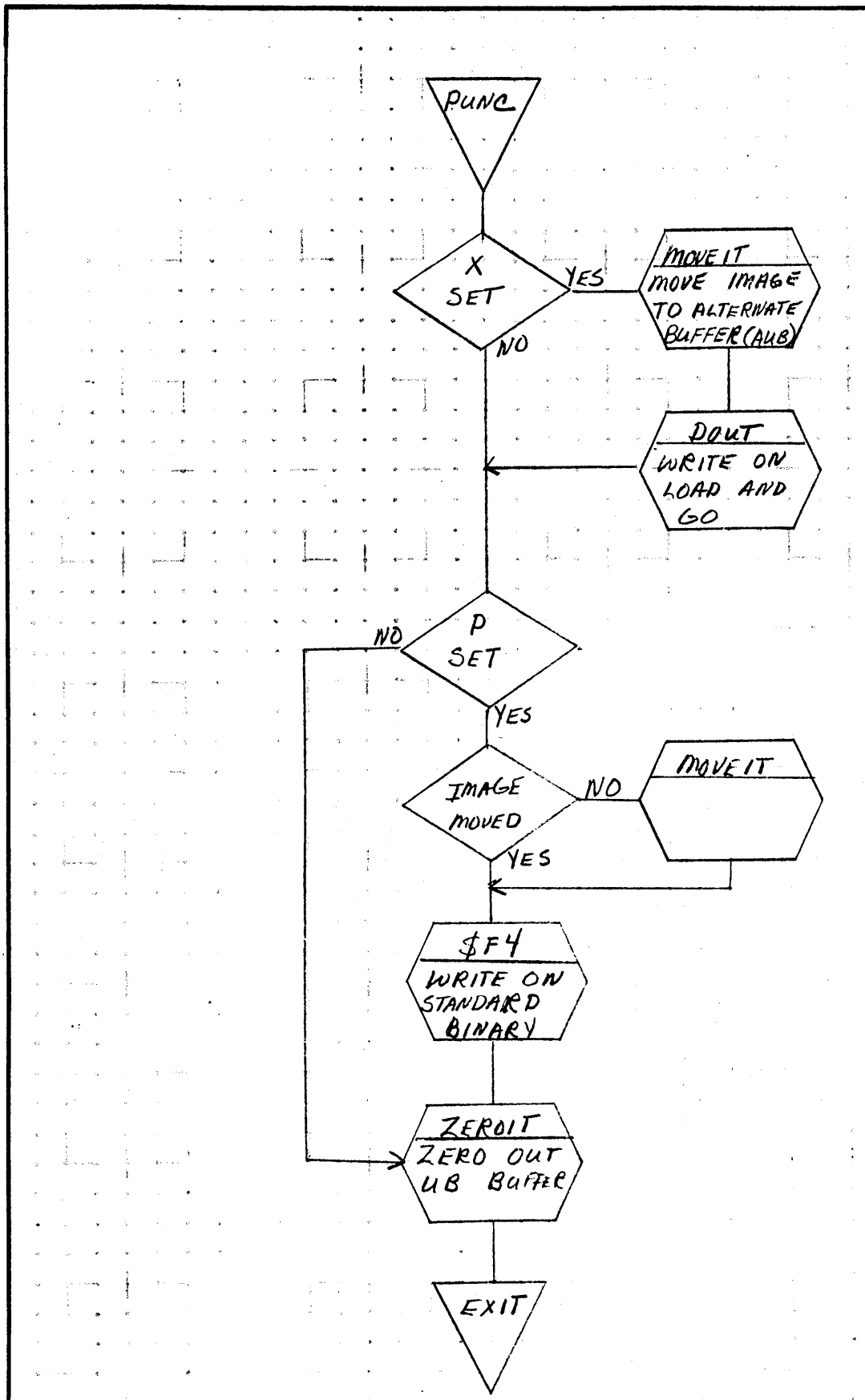
CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE PACK REL0 BINARY	PROJECT MGR.			
	IMAGE PASS 3 PAGE 2 OF 2	PROJECT NAME			
	NUMBER 4.26.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE UNCONDITIONAL BINARY	PROJECT MGR.			
	PUNCH PASS 3 PAGE 1 OF 1	PROJECT NAME			
	NUMBER 4.27.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

AA1385 (FORM CA127-1)



REV	APPROVED	DATE

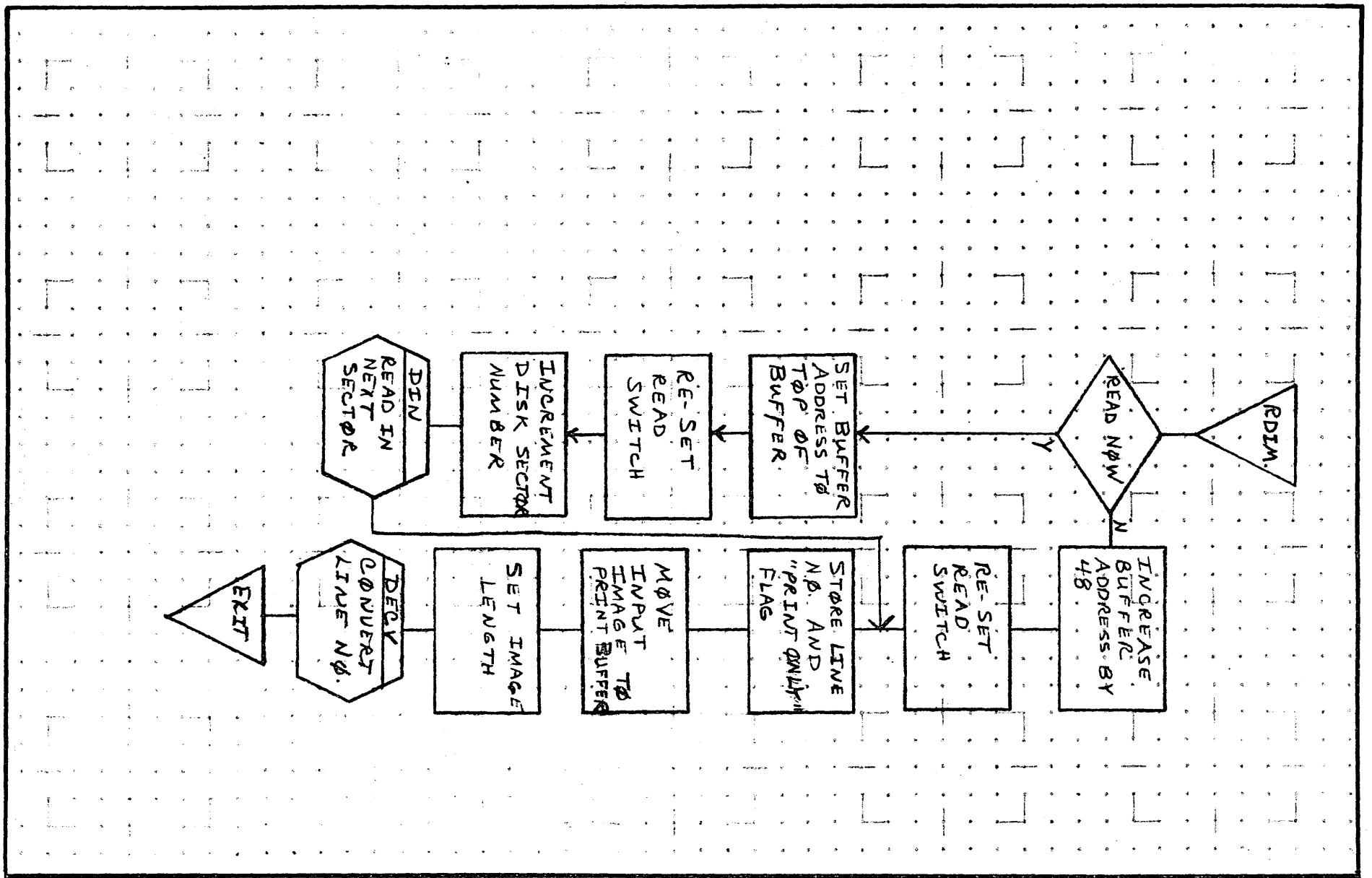
DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	
DOCUMENT TITLE BINARY PUNCH ROUTINE	PAGE 1 OF 1	PROJECT MGR.	
NUMBER	ISSUE DATE	PROJECT NAME	
DRAWN BY	DATE	TASK NO.	
		TASK NAME	

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

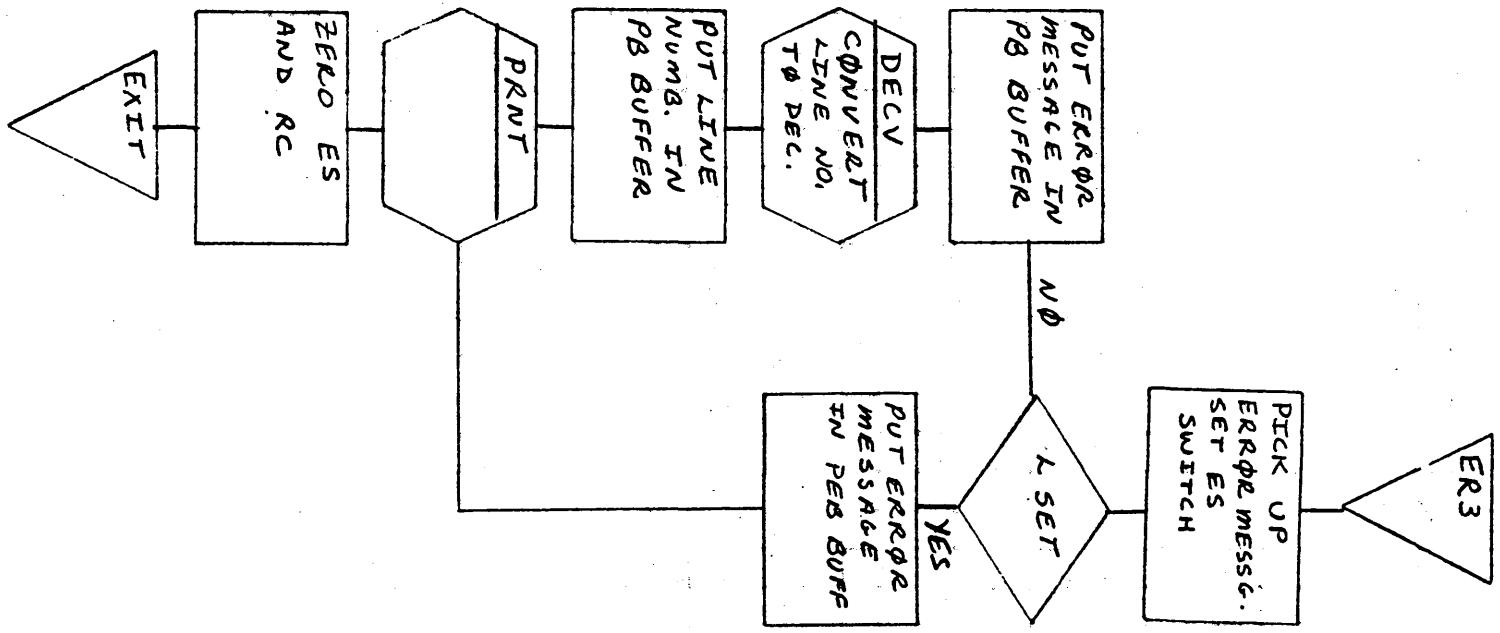
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

PRINTED IN U.S.A.

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
	DOCUMENT TITLE READ IMAGE ROUTINE		PROJECT MGR.		
	PASS 3	PAGE 1 OF 1	PROJECT NAME		
	NUMBER 4.29.1	ISSUE DATE	TASK NO.		
	DRAWN BY	DATE	TASK NAME		



CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS: IMS MACH. TYPE: 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE: ERROR ROUTINE	PROJECT MGR.			
FLOWCHART ☐	PASS 3 PAGE 1 OF 1	PROJECT NAME			
DECISION TABLE ☐	NUMBER 4.30.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)

SECTION V - TABLST

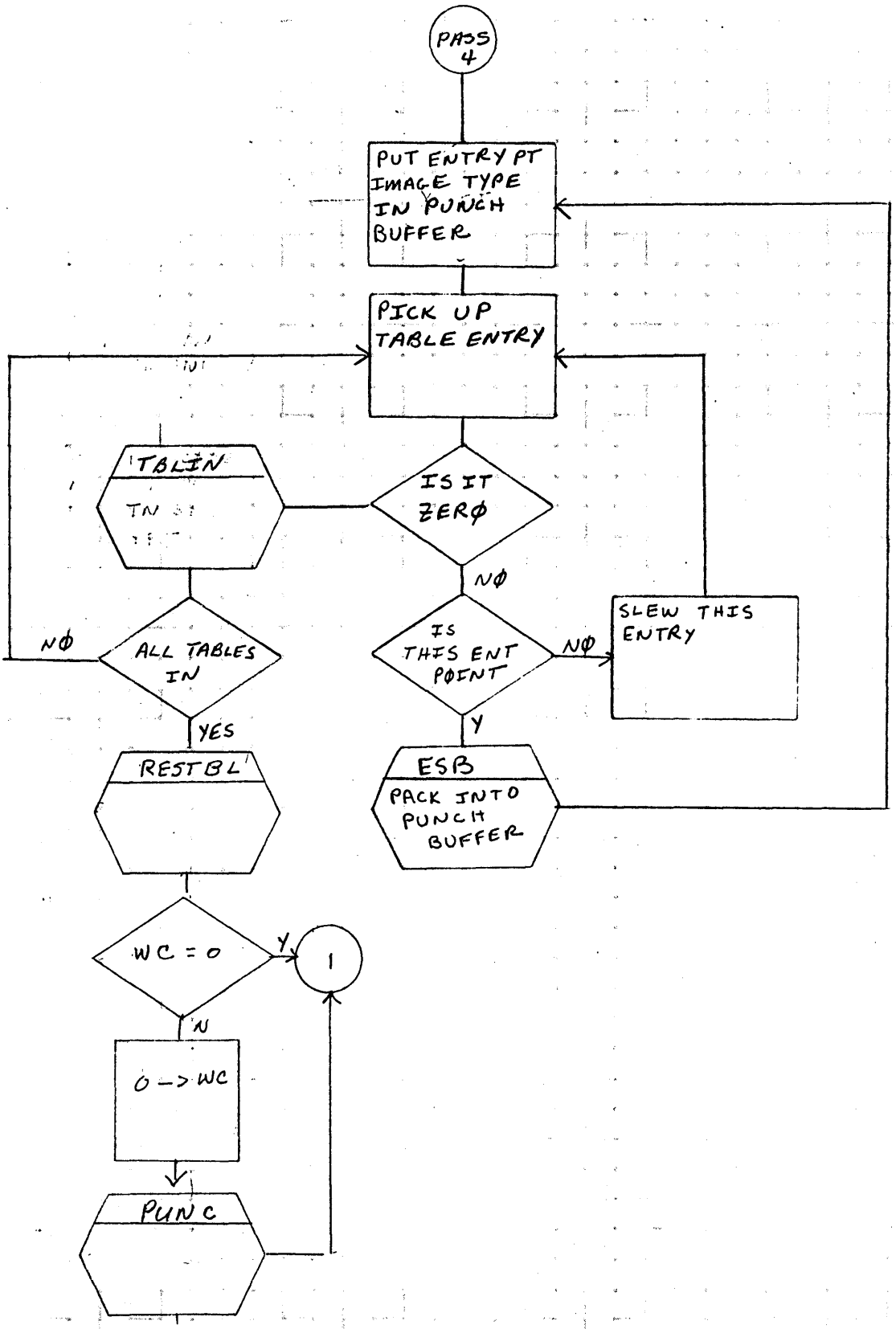
5. TABLST prints and punches the entry point and external images and punches the transfer image if the list and punch options have been selected. If the load and go option has been selected an end of file image is output to the next load and go sector on mass storage.

If the list switch is set, the symbol table is listed directly following the program listing. The number of errors, if any, is output following the symbol table.

TABLST exits through ASSEM to PASS1.

The subroutines used in TABLST have been described and flow charted in PASS3.

5.1 Flow Chart of TABLST.



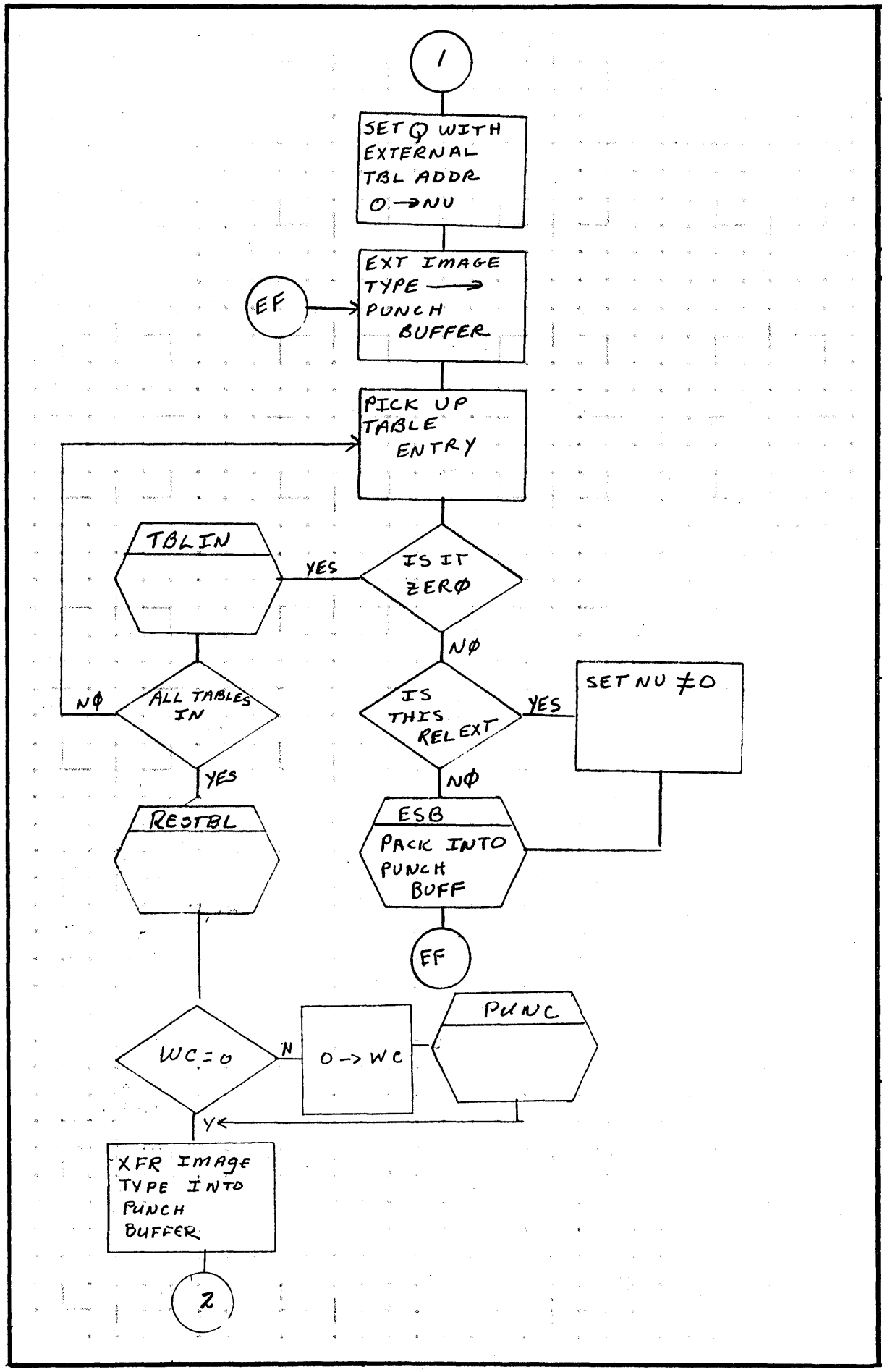
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE ☐
FLOWCHART ☐
DECISION TABLE ☐
OTHER ☐

DOCUMENT CLASS	EMS	MACH. TYPE	1700
DOCUMENT TITLE	PASS 4		PAGE 1 OF 6
NUMBER	5.1	ISSUE DATE	
DRAWN BY		DATE	

REV	APPROVED	DATE

PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

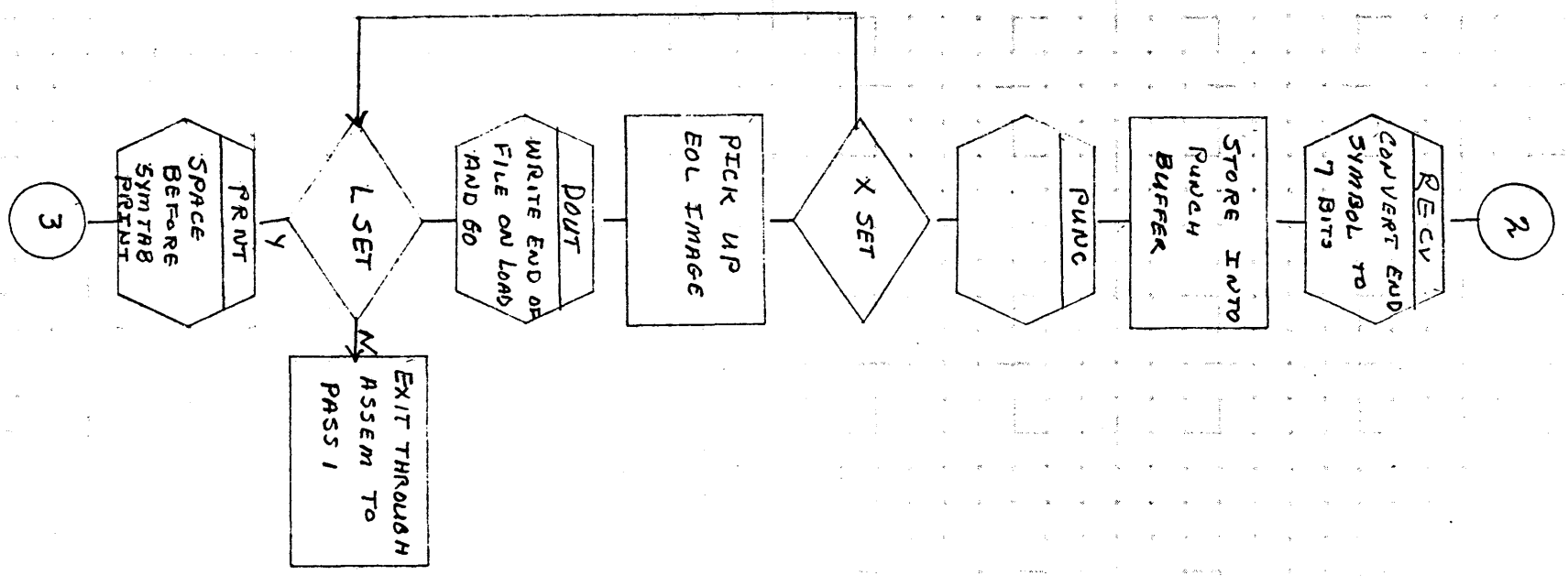
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS	IMS	MACH. TYPE	1700
DOCUMENT TITLE	PASS 4		
		PAGE 2 OF 6	
NUMBER	5.1	ISSUE DATE	
DRAWN BY		DATE	

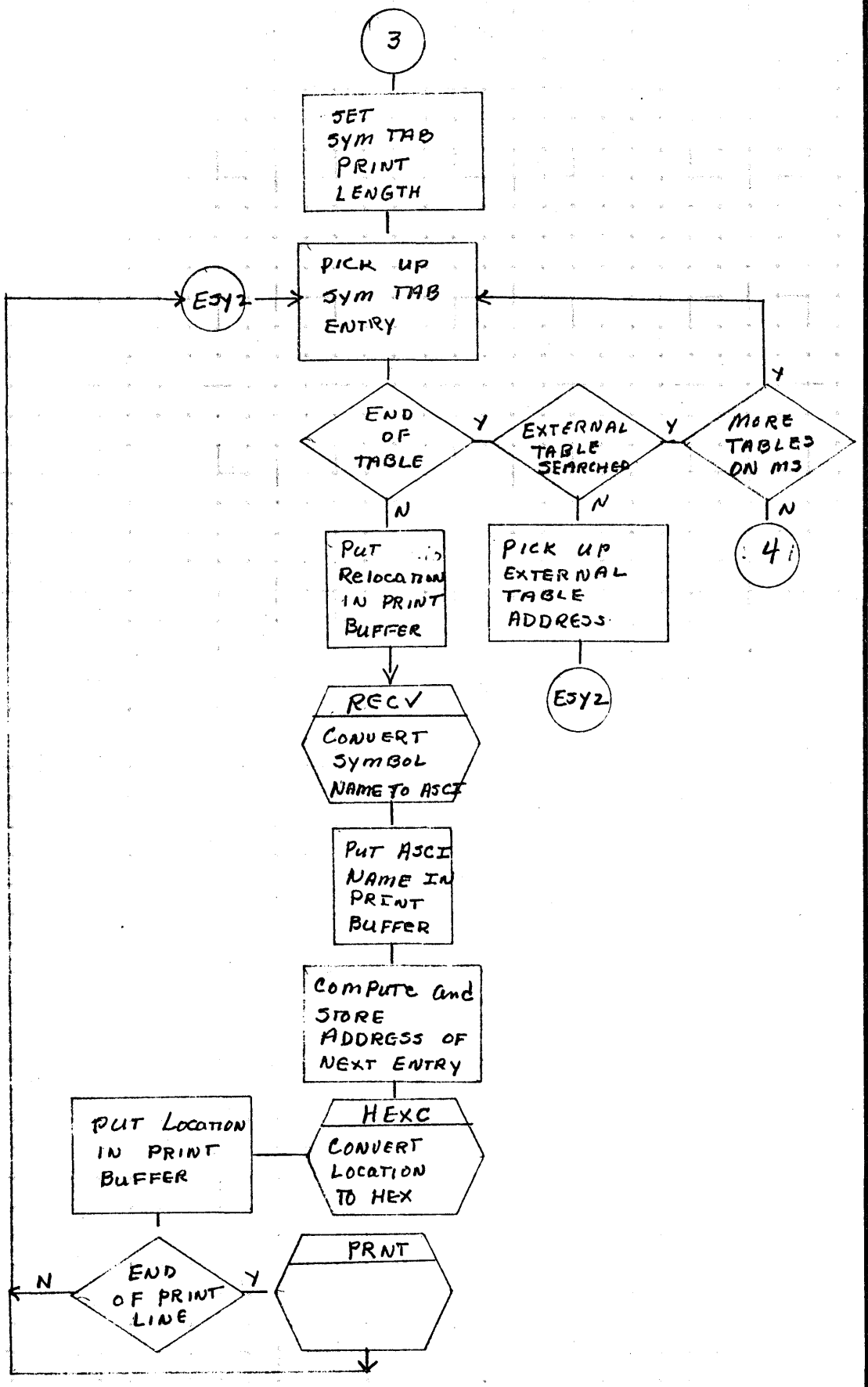
REV	APPROVED	DATE

PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME

AA1385 (FORME) (A127-1)



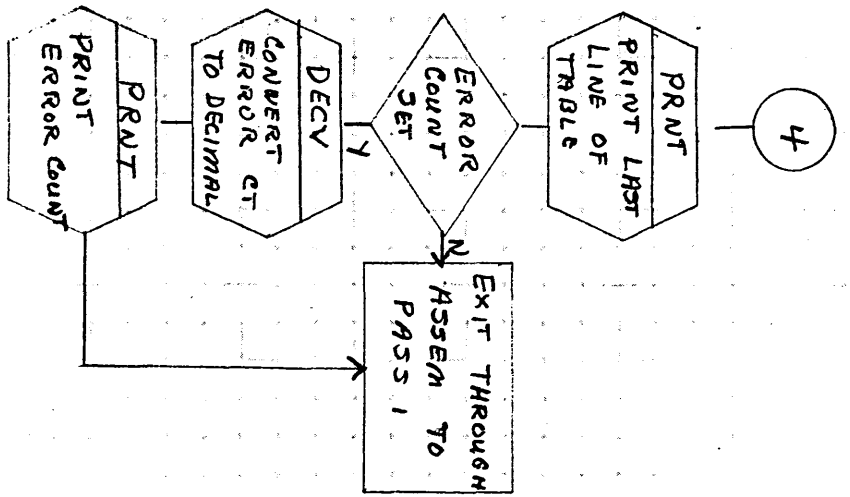
CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE PASS 4		PROJECT MGR.			
		PAGE 3 OF 6	PROJECT NAME			
	NUMBER 5.1	ISSUE DATE	TASK NO.			
	DRAWN BY	DATE	TASK NAME			



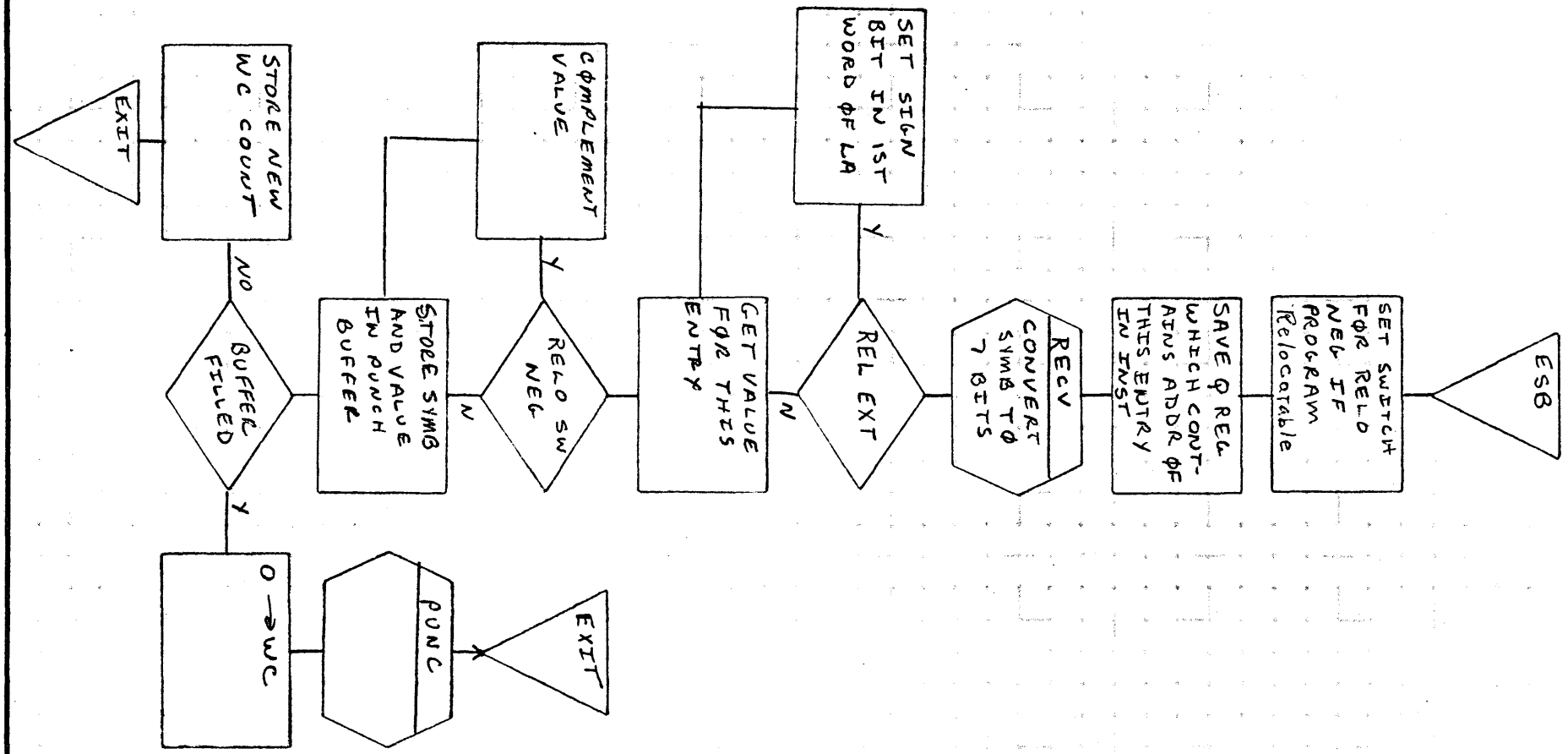
REV	APPROVED	DATE	
PROJECT NO.			
PROJECT MGR.			
PROJECT NAME			
TASK NO.			
TASK NAME			
DOCUMENT CLASS	IMS	MACH. TYPE	
DOCUMENT TITLE	PASS 4		
PAGE 4 OF 6			
NUMBER	5.1	ISSUE DATE	
DRAWN BY		DATE	

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

AA1385 (FORME A127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS: IMS MACH. TYPE	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE: PASS 4	PROJECT MGR.			
	PAGE 5 OF 6	PROJECT NAME			
	NUMBER: 5.1 ISSUE DATE	TASK NO.			
	DRAWN BY: DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
	DOCUMENT TITLE ROUTINE TO PACK PUNCH BUFFER PASS 4 PAGE 6 OF 6		PROJECT MGR.		
	NUMBER 5.1	ISSUE DATE	PROJECT NAME		
	DRAWN BY	DATE	TASK NO.		
			TASK NAME		

AA1385 (FORMERLY CA127-1)

SECTION VI - UNIVERSAL ROUTINES

6. These routines are used by more than one pass of the assembler. They are all subroutines.

6.1 Address Expression Processor

This routine evaluates an expression in the address field. The symbol and external tables are searched for the value of symbolic operands. The routine makes external links when externals are used as symbolic operands. The value of the expression is output in AX. The relocation of the expression is output in RC. If the expression was an external, EX is set to 1 for non-relative and 2 for relative.

The value of the expression in the address field is computed MOD $2^{15}-1$ except when the flag, AX16, has been set by the VFD processor. In this case the value is calculated MOD $2^{16}-1$.

The address expression processor exits with the value of the expression in the A register and the relocation of the expression in the Q register.

6.1.1 Flow Chart of Address Expression Processor

6.2 Character Processor

This routine processes a subfield to a terminator. Terminators are plus, minus, asterisk, slash, blank, comma, and left parenthesis. Input switches to the routine are:

(1) IS set if leading sign illegal
(2) NS set if 16 bit hexadecimal operand legal

Output from the routine is as follows:

(1) SY Three word hold for symbolic operand
(2) NU Numeric operand holder
(3) ES Set if error occurred in CHPR
(4) LP Set if left paren encountered
(5) CS Contains code for terminator
(6) SY+1 If SY equals zero and SY+1 does not equal zero, a null field was encountered
(7) SY+2 If SY equals zero and SY+2 does not equal zero, an asterisk is the operand
(8) SY+3 Contains a count of the number of characters in SY
(9) SG Set negative if leading sign minus; set greater than one if leading sign plus

6.2.1 Flow Chart of Character Processor

6.3 Character Pickup Routine

This routine gets a character from the input image. An input switch, IG, is used to signal the routine to ignore leading blanks. If the input switch AF is set, the routine exits with 7 bit character output. Normal output is a 6 bit character in CS.

6.3.1 Flow Chart of Character Pickup Routine

6.4 Symbol Table In Subroutine

This routine is used to read in symbol table blocks from the mass storage device. If there are no more blocks on mass storage, the subroutine RESTBL is entered to restore the original symbol table. The A register is set negative at exit to indicate there are no more blocks to input.

6.4.1 Flow Chart of Symbol Table In Subroutine

6.5 Restore Symbol Table Subroutine

This routine is used to restore the original symbol table to core if it is not already there.

6.5.1 Flow Chart of Restore Symbol Table Subroutine

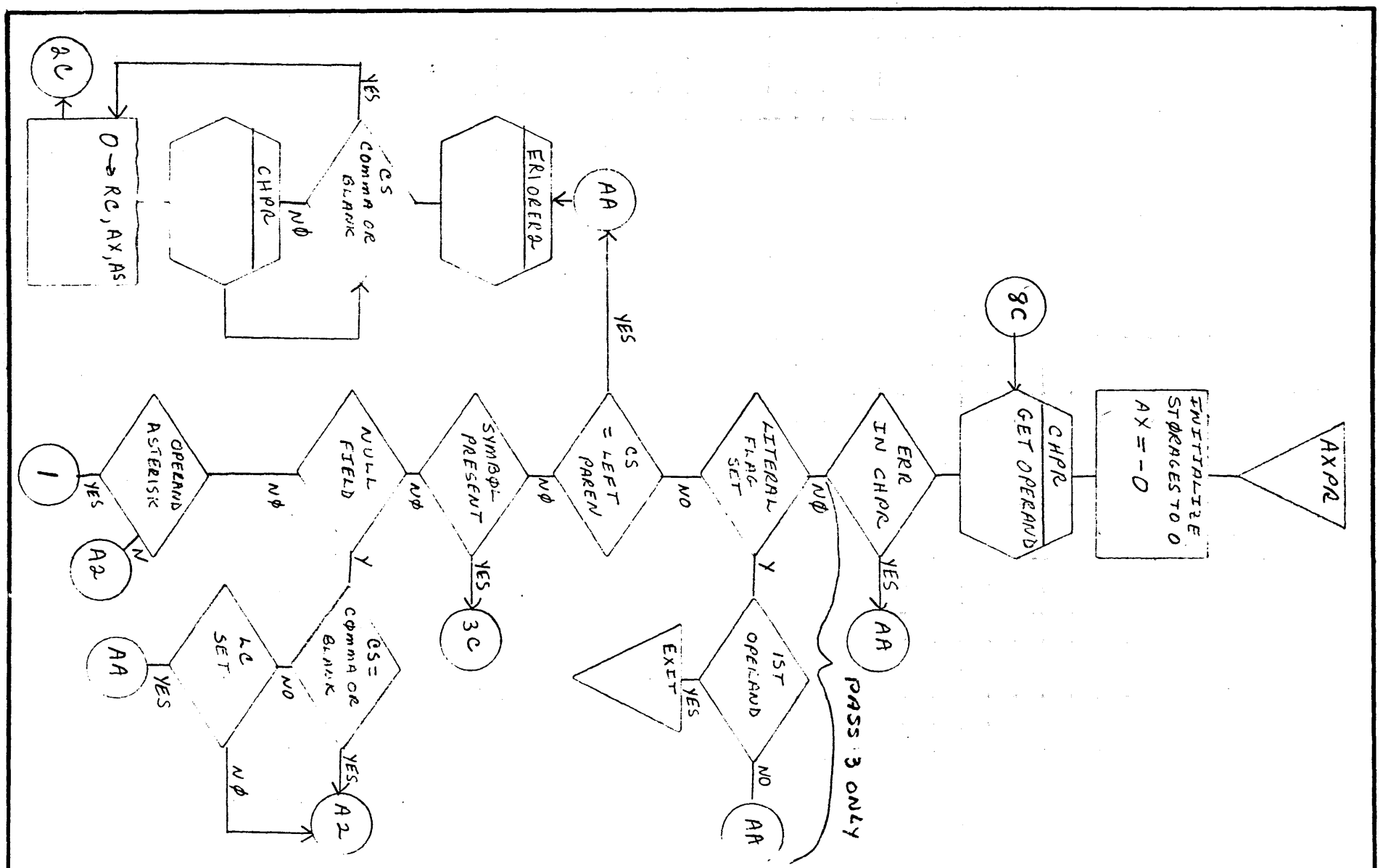
6.6 Symbol Table Search Subroutine

This routine is used to search the symbol or external table for a given symbol. The address of the table to be searched is input in the Q register. Q is set negative at exit to indicate that the symbol was not found. If Q is positive at exit it contains the address of the first word of the symbol entry in the table.

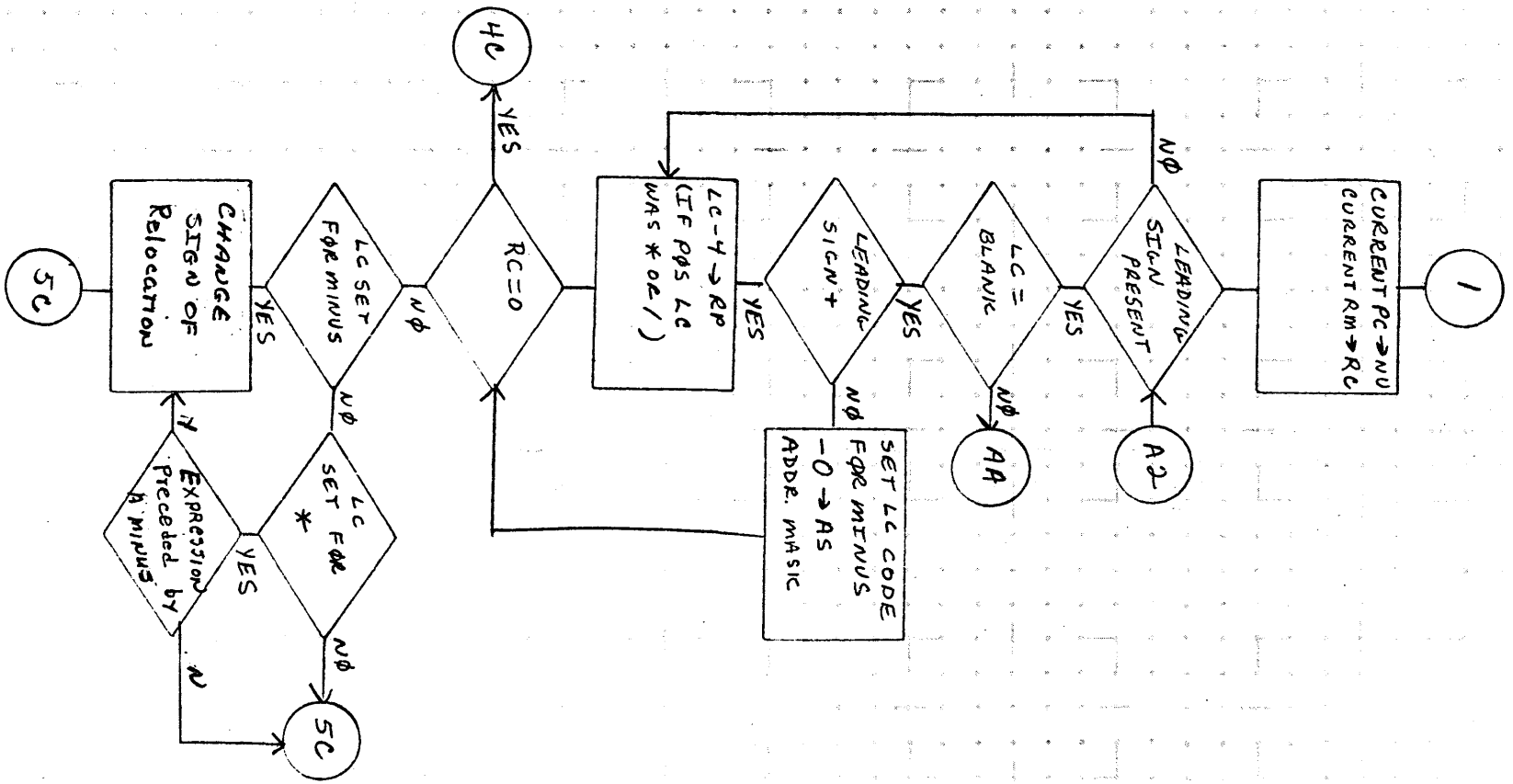
6.6.1 Flow Chart of Symbol Table Search Routine

6.7 Core Allocation Format Pass 2 and 3

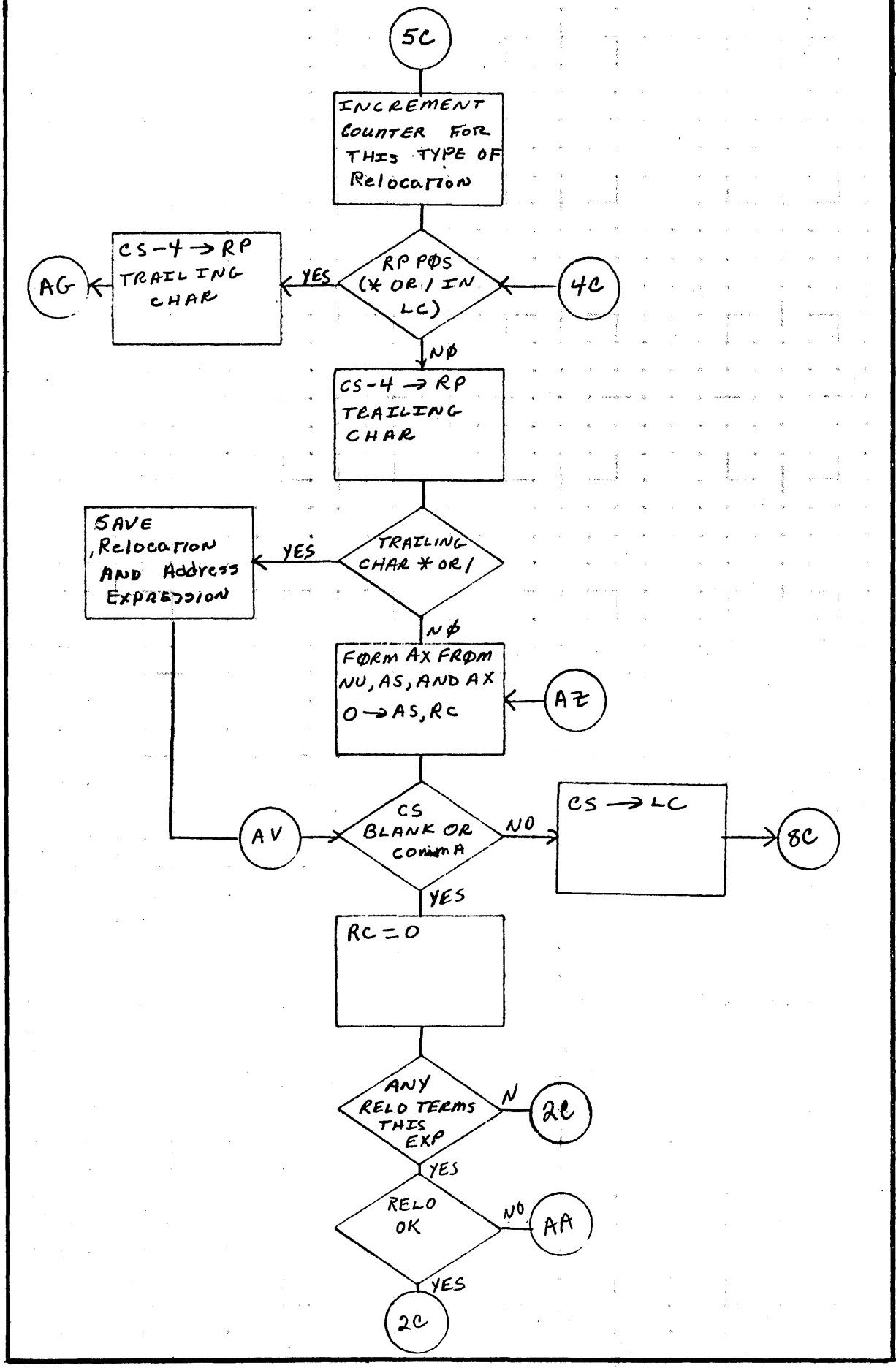
6.8 Mass Storage Allocation Format Pass 2 and 3



CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS J. IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT TITLE ADDL. EXP. PROCESSOR	PROJECT MGR.			
	PASS 2 AND 3 PAGE 1 OF 6	PROJECT NAME			
	NUMBER 6.1.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS EMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE ADDR. EXP. PROCESSOR	PROJECT MGR.			
	PASS 2 AND 3 PAGE 9 OF 6	PROJECT NAME			
	NUMBER 6.1.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



REV	APPROVED	DATE

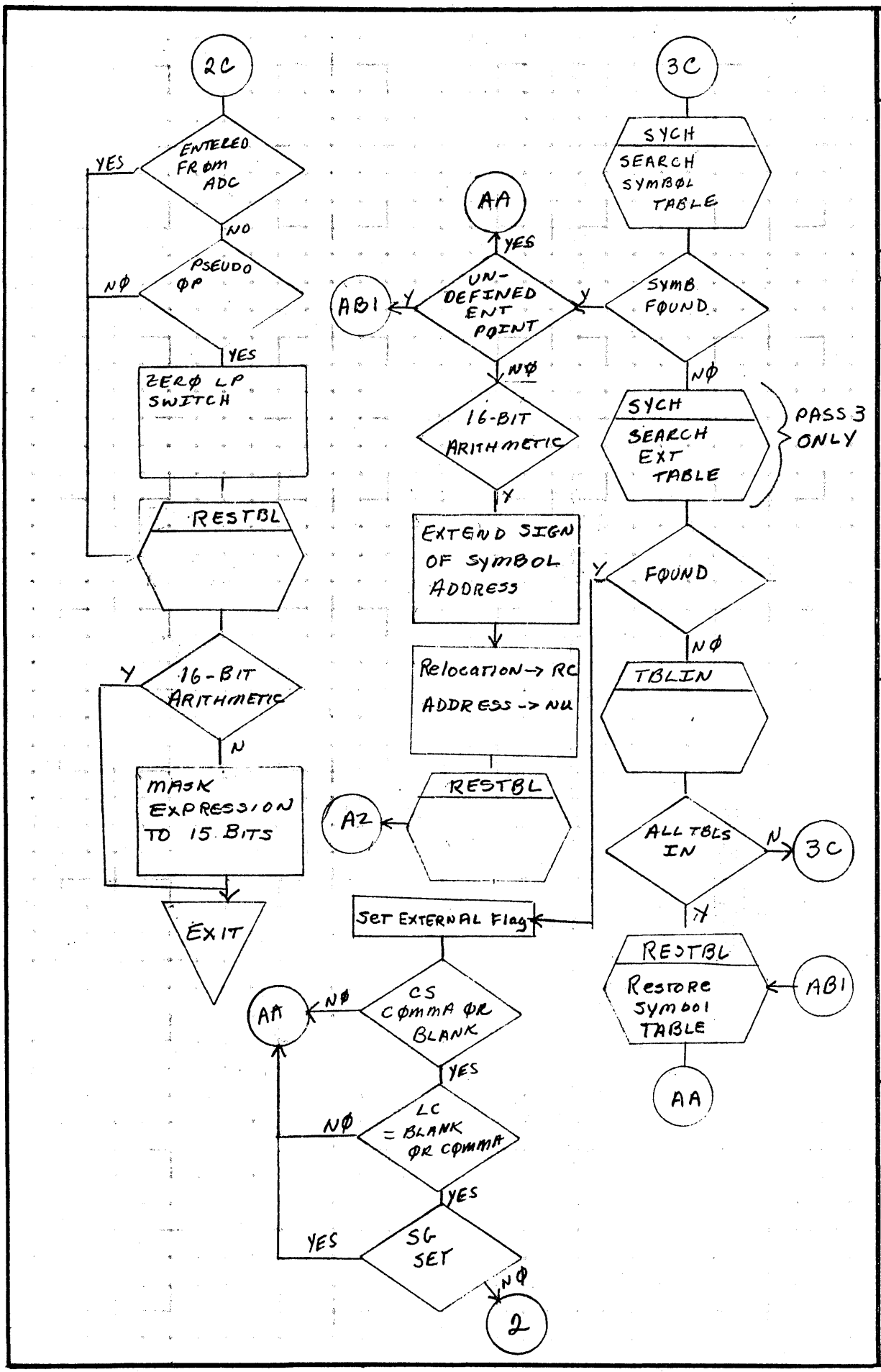
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS	IMS	MACH. TYPE	1700
DOCUMENT TITLE	ADDG EXP PROCESSOR PASS 2 AND 3	PAGE	3 OF 6
NUMBER	G.I.I	ISSUE DATE	
DRAWN BY		DATE	

PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

AA1385 (FORMERLY CA127-1)



REV	APPROVED	DATE

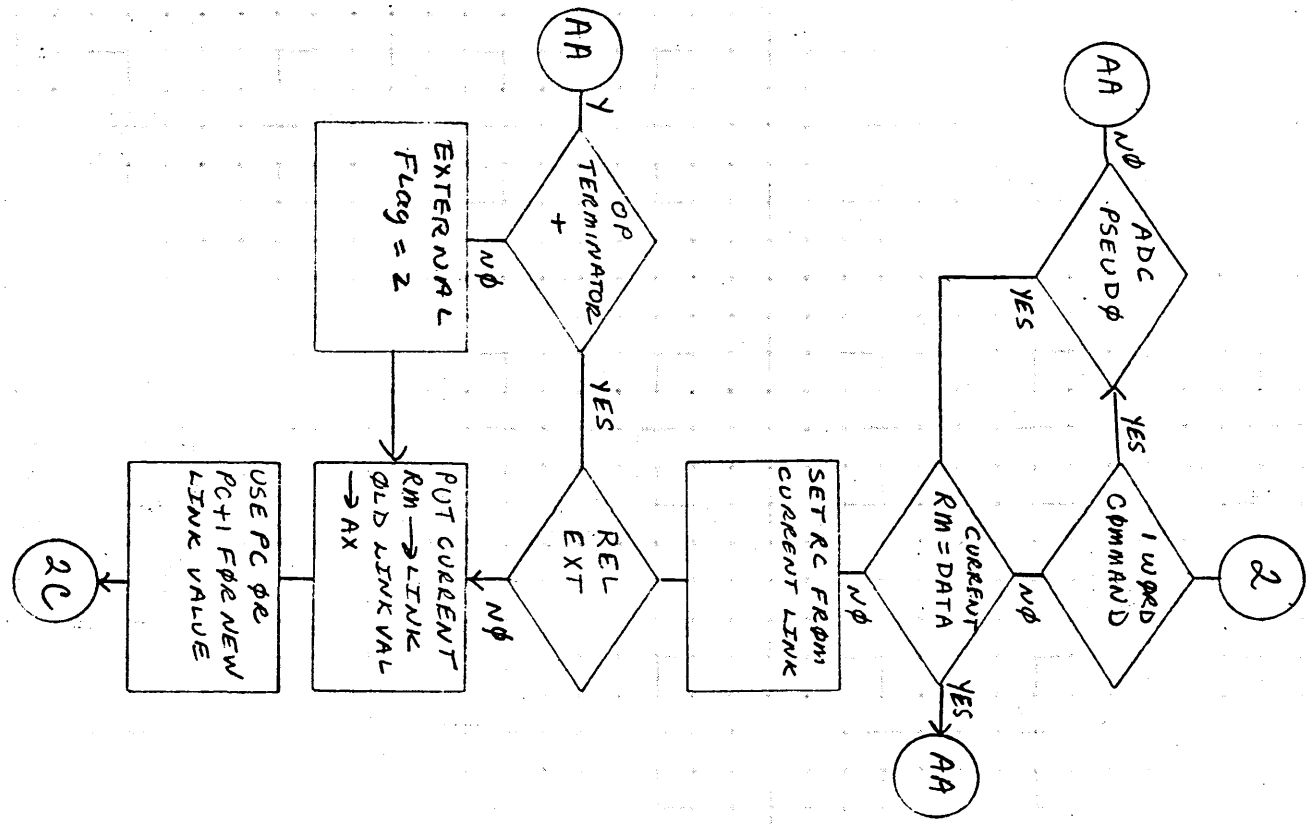
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE ☐☐☐☐
FLOWCHART
DECISION TABLE
OTHER

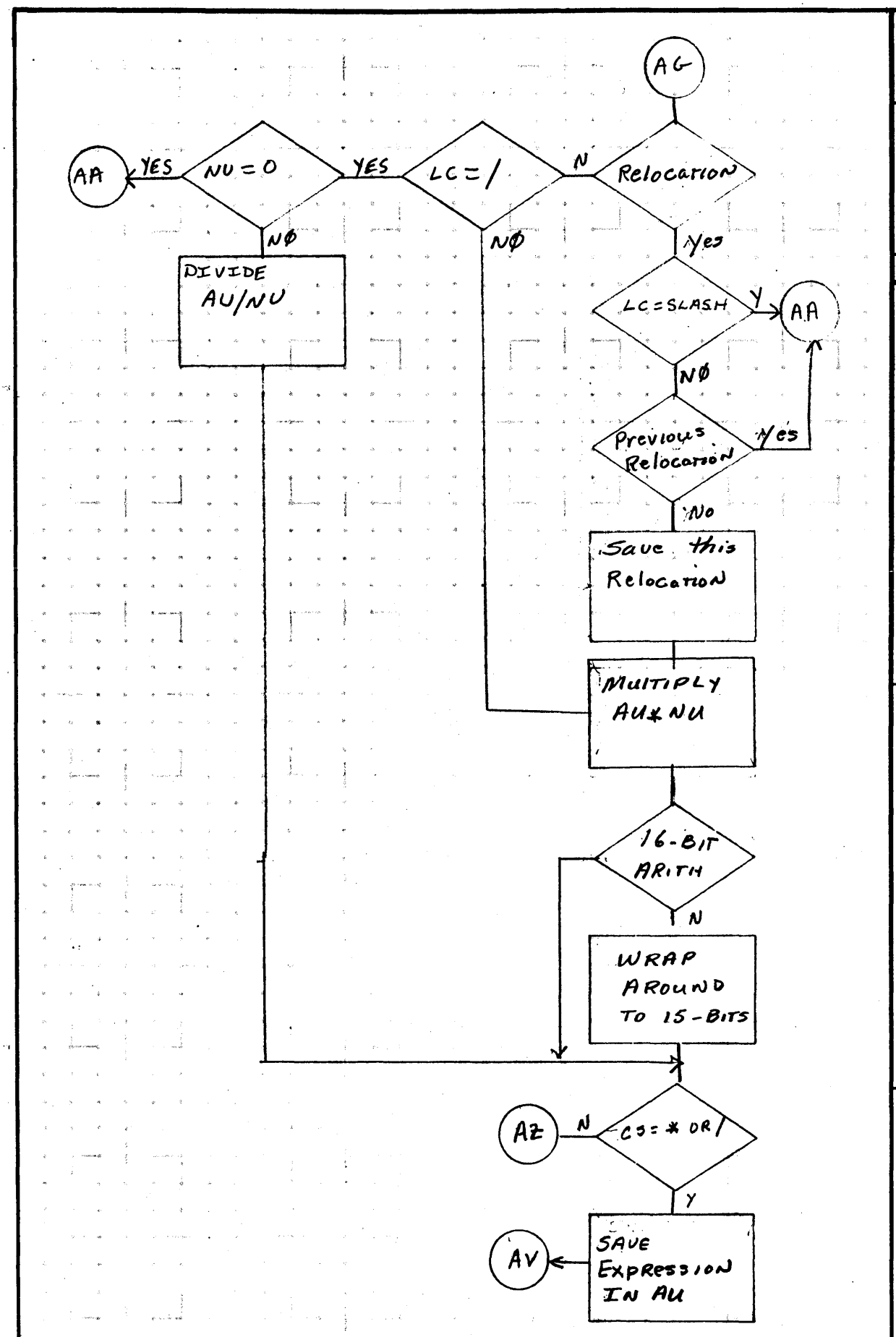
DOCUMENT CLASS	IMS	MACH. TYPE	1700
DOCUMENT TITLE	ADDR EXP PROCESSOR		
	PASS 2 AND 3	PAGE 4 OF 6	
NUMBER	6.1.1	ISSUE DATE	
DRAWN BY		DATE	

PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

AA1385 (FORMERLY CA127-1)



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE ADDR. EXP. PRØCESSOR	PROJECT MGR.			
	PASS 2 AND 3 PAGE 5 OF 6	PROJECT NAME			
	NUMBER 6.1.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



REV	APPROVED	DATE

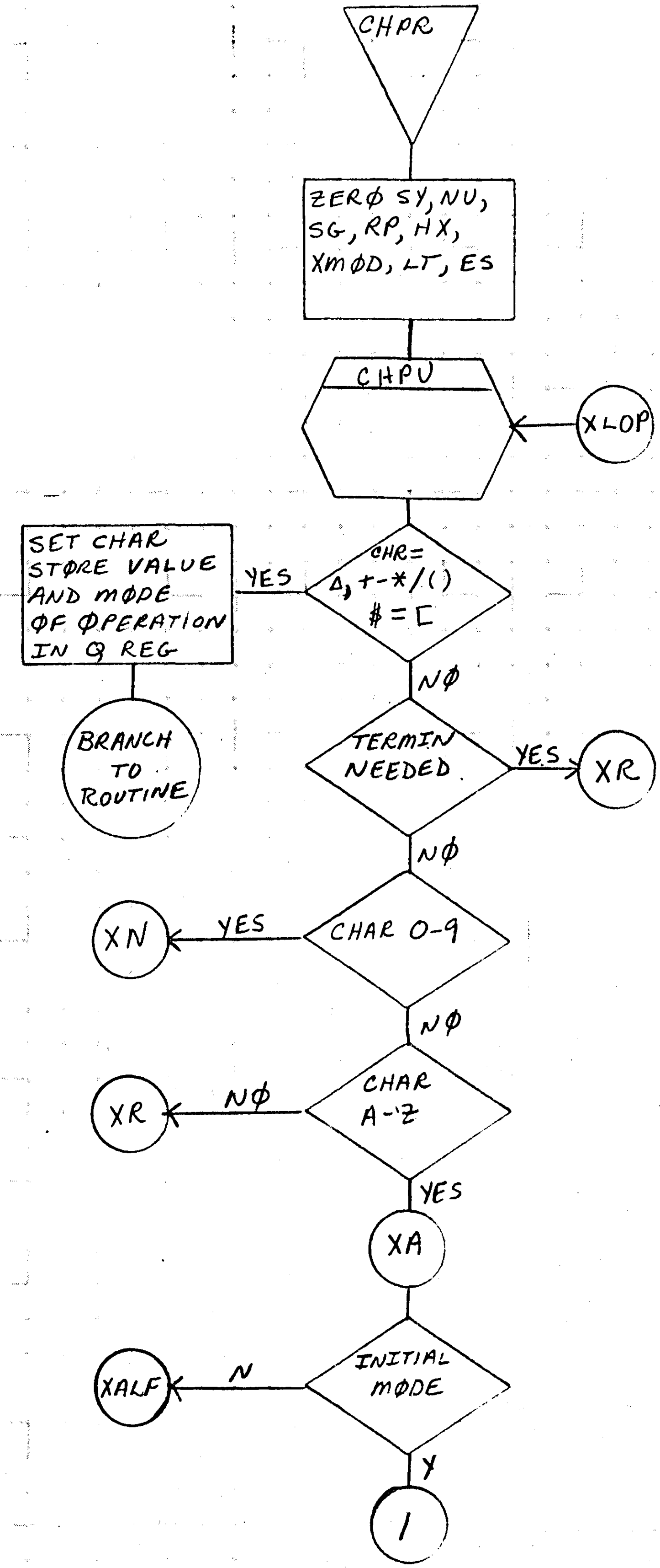
PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

DOCUMENT CLASS		MACH. TYPE	1700
DOCUMENT TITLE	ADDC. EXP. PROCESSOR		
	PASS 2 AND 3	PAGE	6 OF 6
NUMBER	6.1.1	ISSUE DATE	
DRAWN BY		DATE	

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

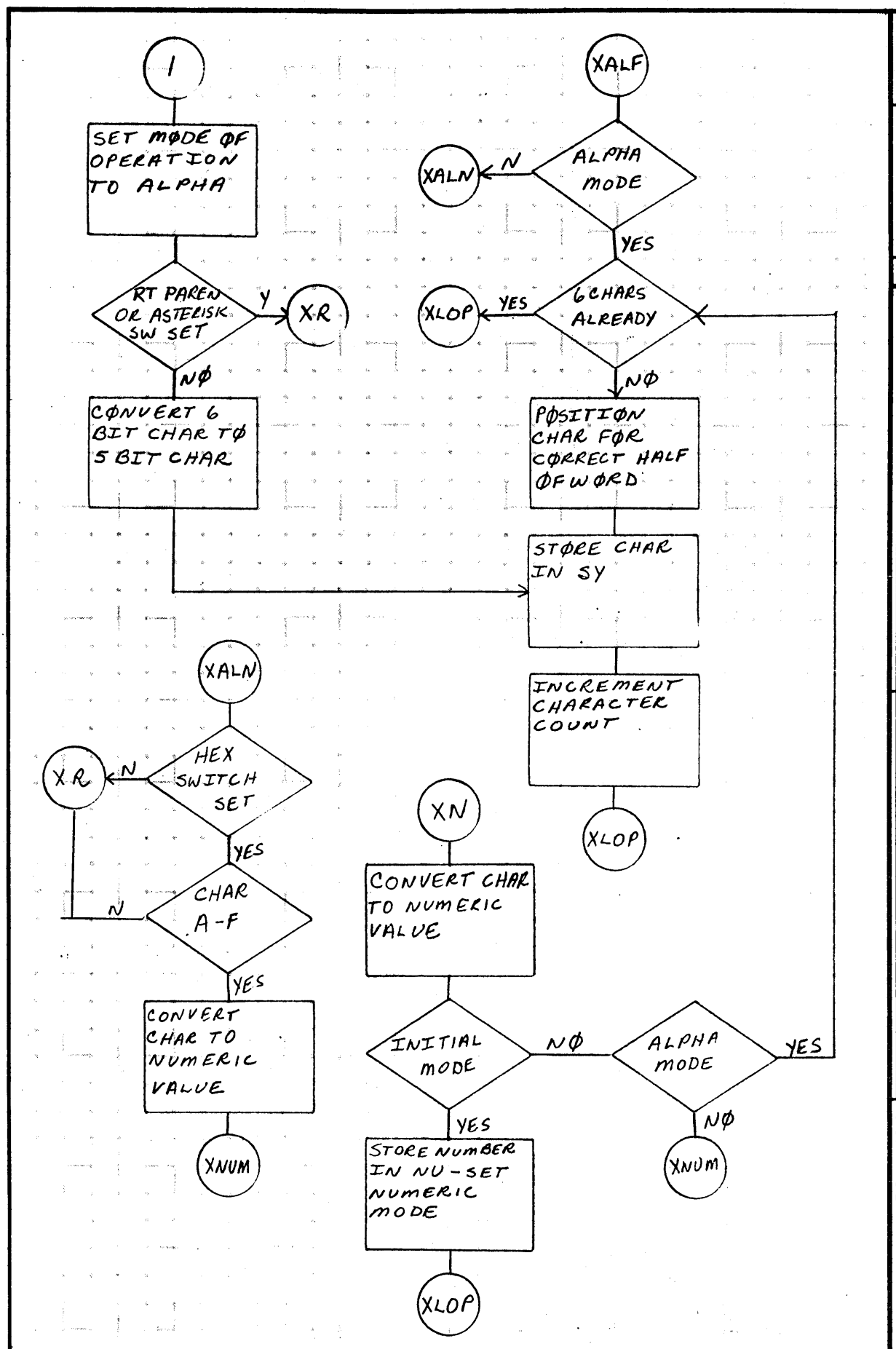
AA1385 (FOR CA127-1)



CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS: IMS MACH. TYPE 1700
DOCUMENT TITLE: CHARACTER PRØCESSØR SUBRØUTINE PASS 2 AND 3 PAGE 1 OF 6
NUMBER 6.2.1 ISSUE DATE
DRAWN BY DATE
PROJECT NO.
PROJECT MGR.
PROJECT NAME
TASK NO.
TASK NAME
REV APPROVED DATE

AA1385 (FORMERLY CA127-1)



REV	APPROVED	DATE

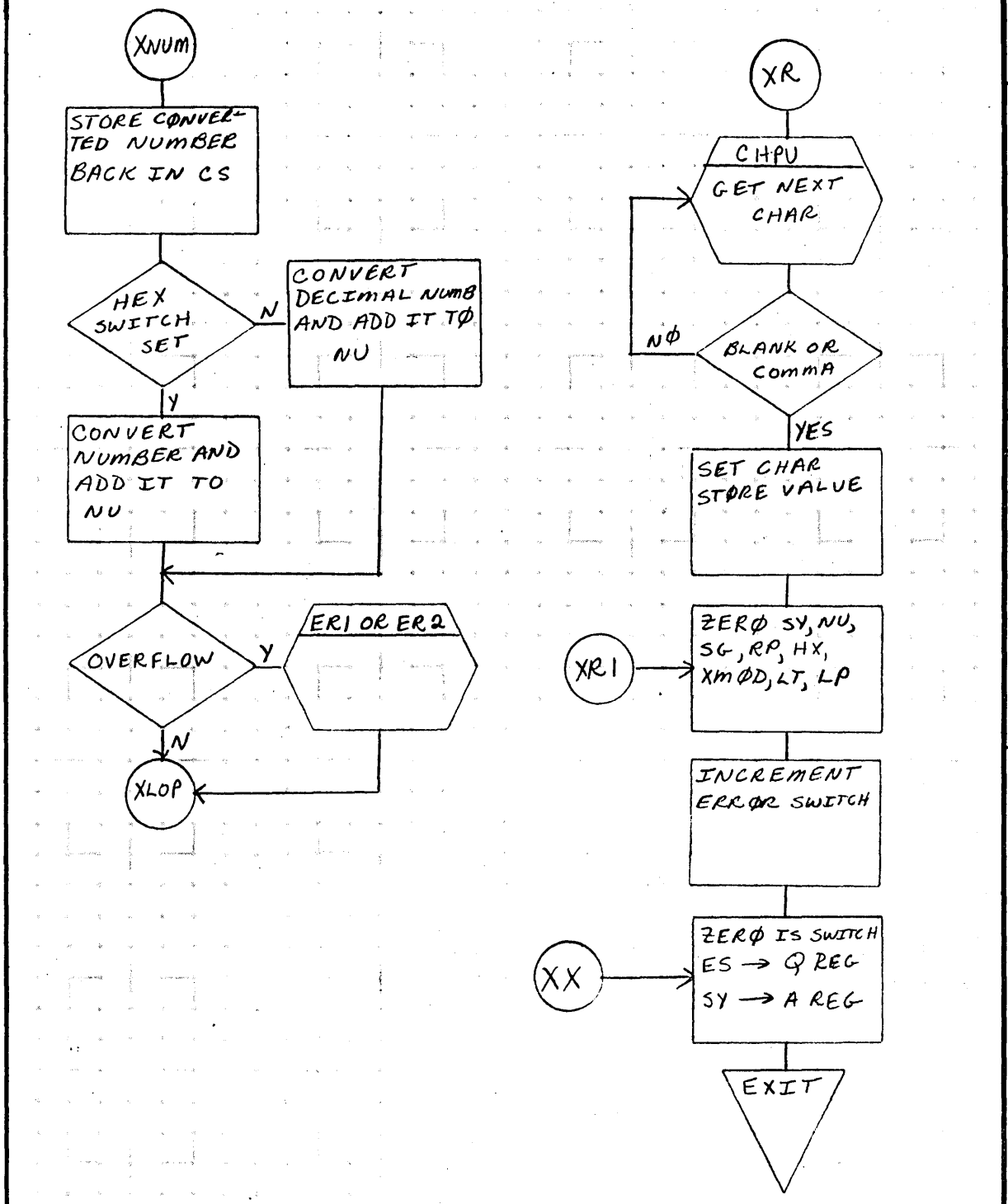
PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

DOCUMENT CLASS	IMS MACH. TYPE 1700
DOCUMENT TITLE	CHARACTER PROCESSOR
	SORT PASS 2 AND 3 PAGE 2 OF 6
NUMBER	6.2.1 ISSUE DATE
DRAWN BY	DATE

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT

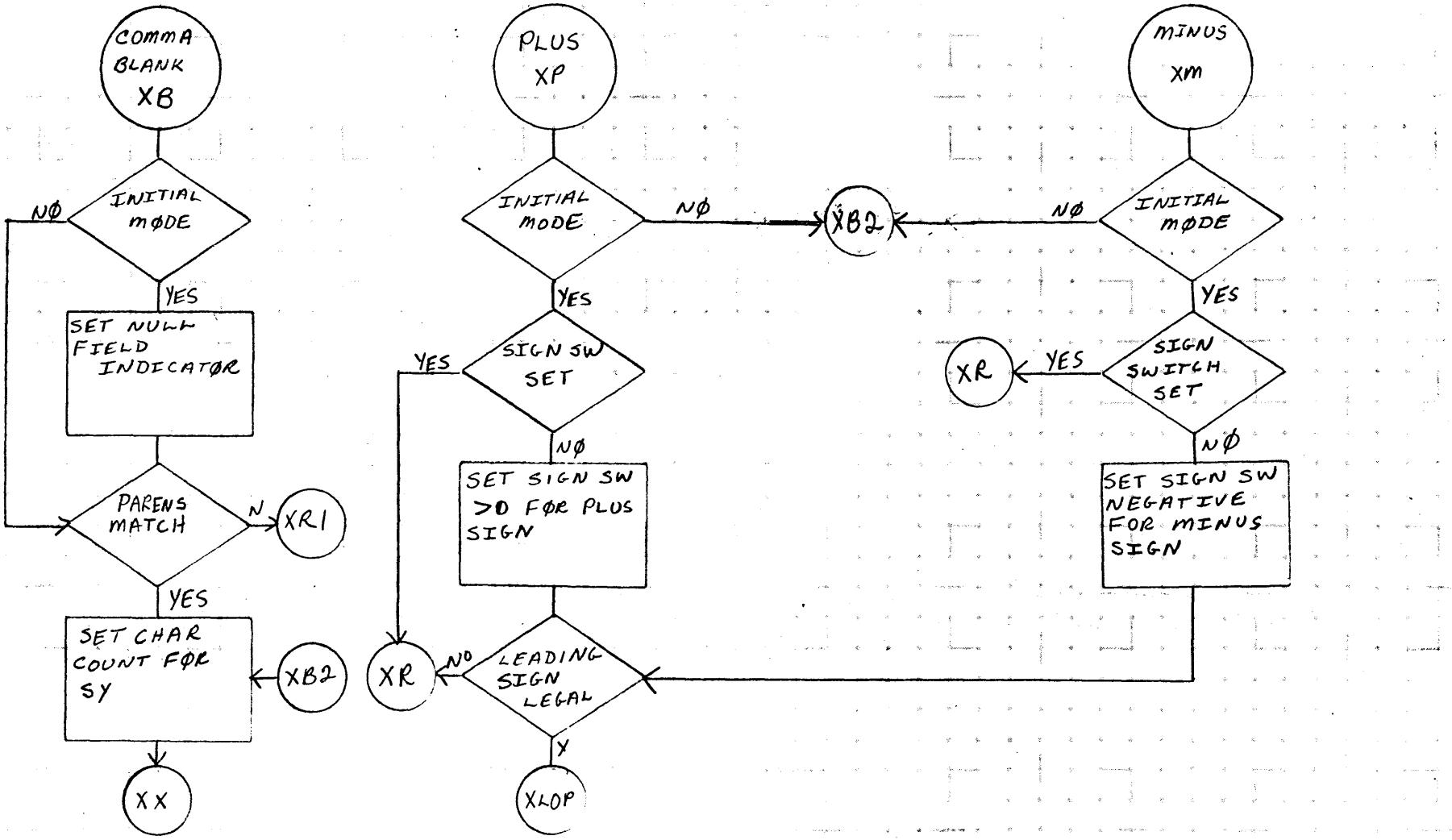
SAMPLE CODE ☐
FLOWCHART ☐
DECISION TABLE ☐
OTHER ☐

AA1385 (FORM CA127-1)

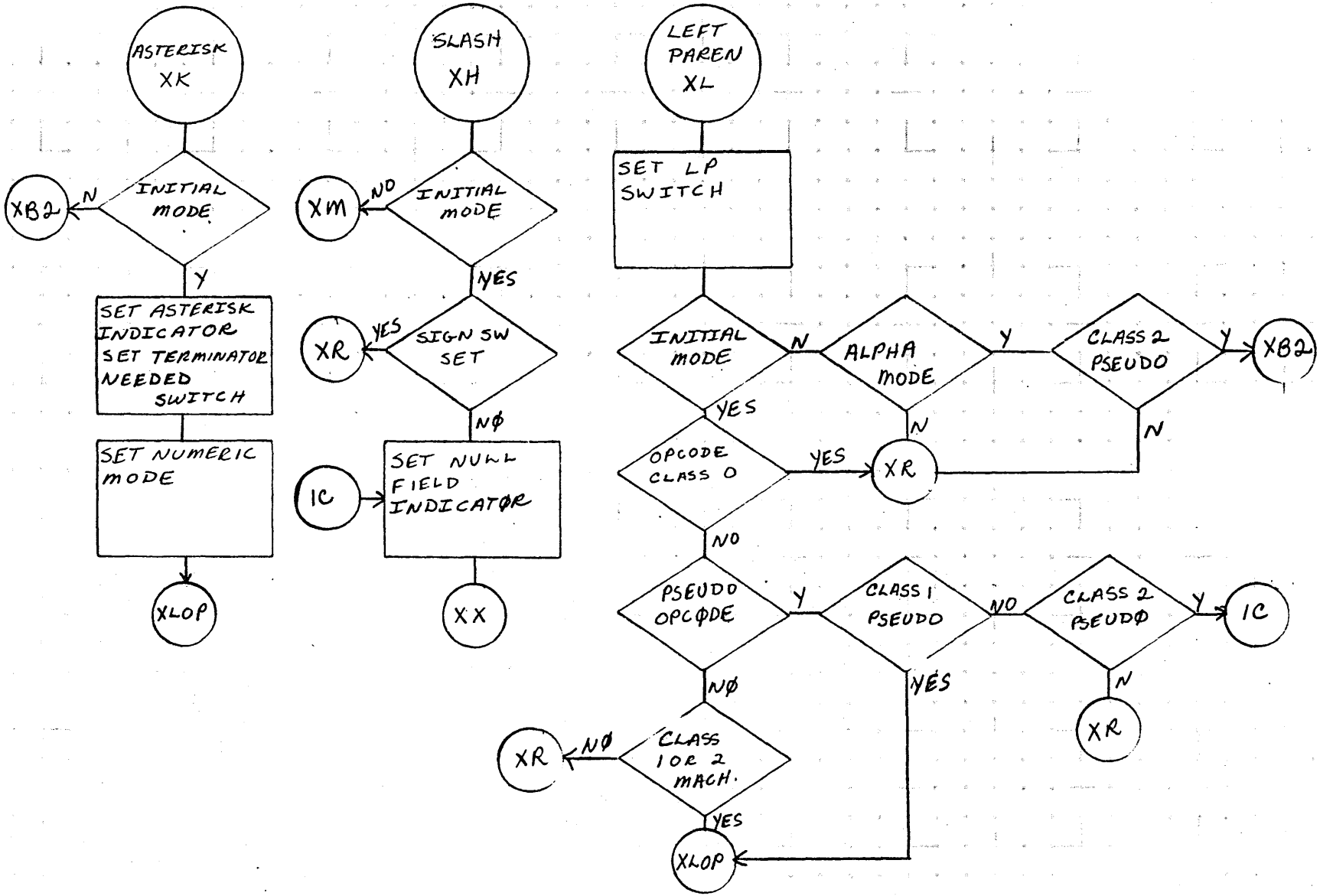


CONTROL DATA CORPORATION	DOCUMENT CLASS	PROJECT NO.	REV / APPROVED / DATE
SOFTWARE DOCUMENT	DOCUMENT TITLE SORT PASS 2 AND 3 CHARACTER PROCESSOR	PROJECT MGR.	
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	NUMBER 6,2,1 ISSUE DATE	PROJECT NAME	
	DRAWN BY DATE	TASK NO.	
	MACH. TYPE 1700 IMS PAGE 3 OF 6	TASK NAME	

AA1385 (FORMERLY CA127-1)

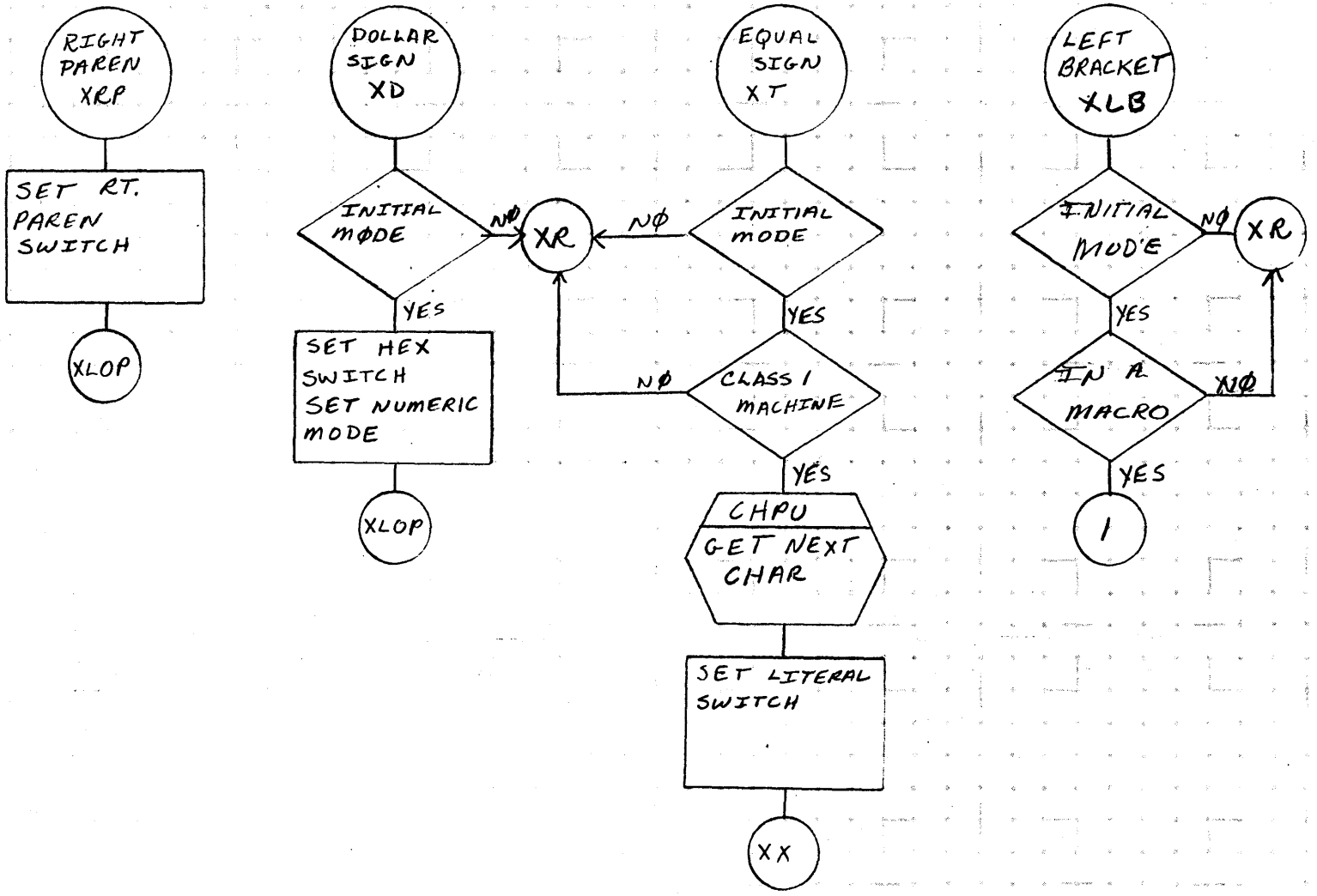


CONTROL DATA CORPORATION SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE CHARACTER PROCESSØR	PROJECT MGR.			
FLOWCHART ☐	SBRT PASS 2 AND 3 PAGE 4 OF 6	PROJECT NAME			
DECISION TABLE ☐	NUMBER 6.2.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			

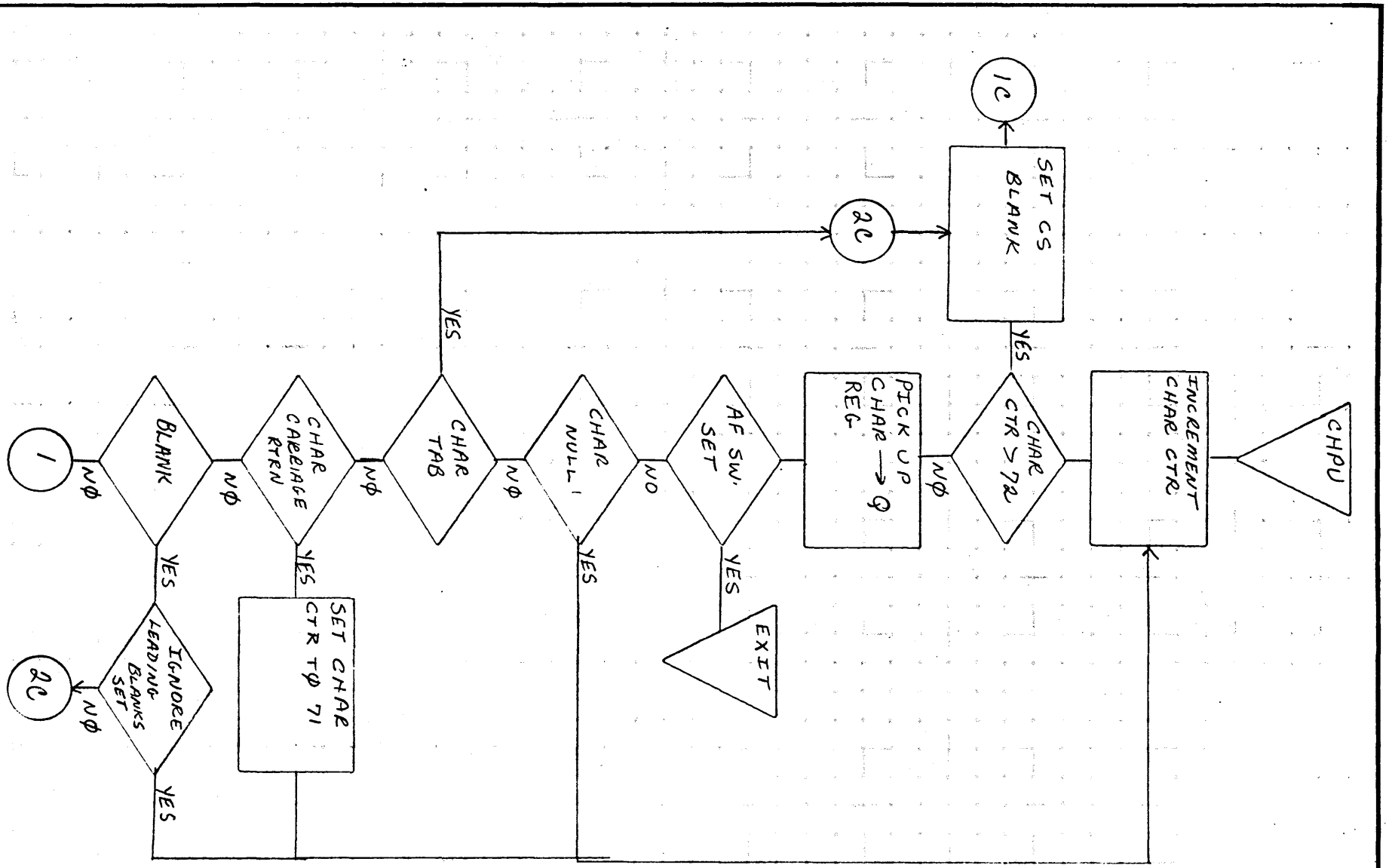


CONTROL DATA CORPORATION SOFTWARE DOCUMENT SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS TMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE CHARACTER PROCESSOR	PROJECT MGR.			
	SBRT PASS 2 AND 3 PAGE 5 OF 6	PROJECT NAME			
	NUMBER 6.2.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			

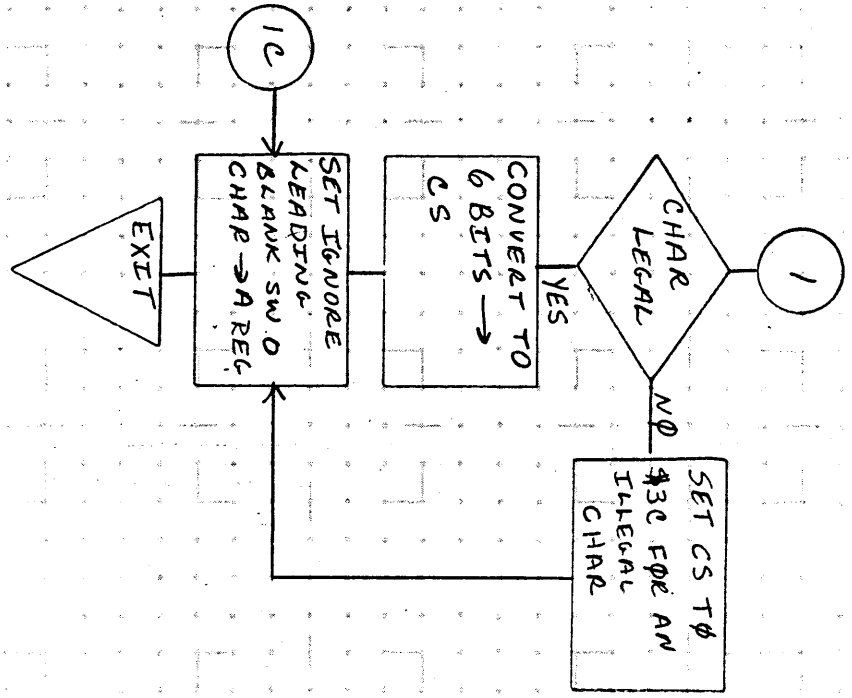
AA1385 (FORMERLY CA127-1)



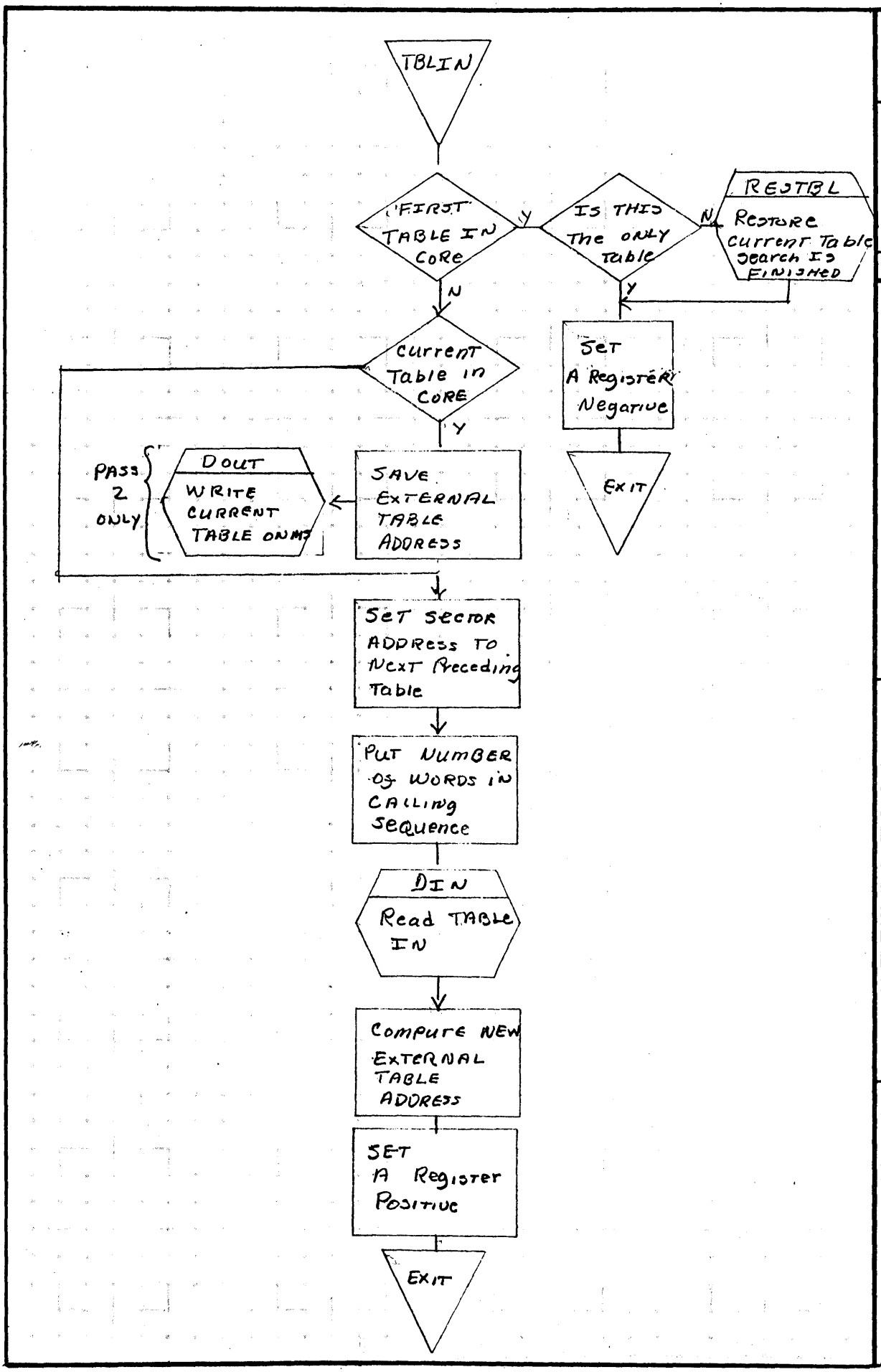
CONTROL DATA CORPORATION						
SOFTWARE DOCUMENT	DOCUMENT CLASS TMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE CHARACTER PROCESSOR		PROJECT MGR.			
FLOWCHART ☐	SORT PASS 2 AND 3	PAGE 6 OF 6	PROJECT NAME			
DECISION TABLE ☐	NUMBER 6.2.1	ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY	DATE	TASK NAME			



CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
	DOCUMENT TITLE CHARACTER PICKUP	PROJECT MGR.			
	SBRT. PASS 2 AND 3 PAGE 1 OF 2	PROJECT NAME			
	NUMBER 6.3.1 ISSUE DATE	TASK NO.			
	DRAWN BY DATE	TASK NAME			



CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	REV	APPROVED	DATE
SAMPLE CODE ☐	DOCUMENT TITLE CHARACTER PICKUP	PROJECT MGR.			
FLOWCHART ☐	SBRT. PASS 2 AND 3 PAGE 2 OF 2	PROJECT NAME			
DECISION TABLE ☐	NUMBER 6.3.1 ISSUE DATE	TASK NO.			
OTHER ☐	DRAWN BY DATE	TASK NAME			



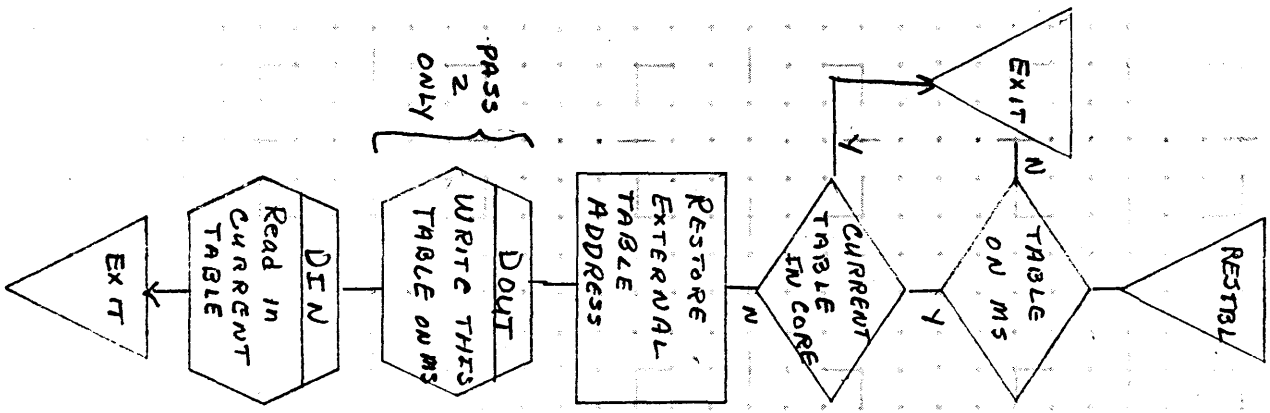
REV	APPROVED	DATE

CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS	IMS	MACH. TYPE	1700
DOCUMENT TITLE	SYMBOL TABLE IN PASS 2 & 3	PAGE	1 OF 1
NUMBER	6.4.1	ISSUE DATE	
DRAWN BY		DATE	

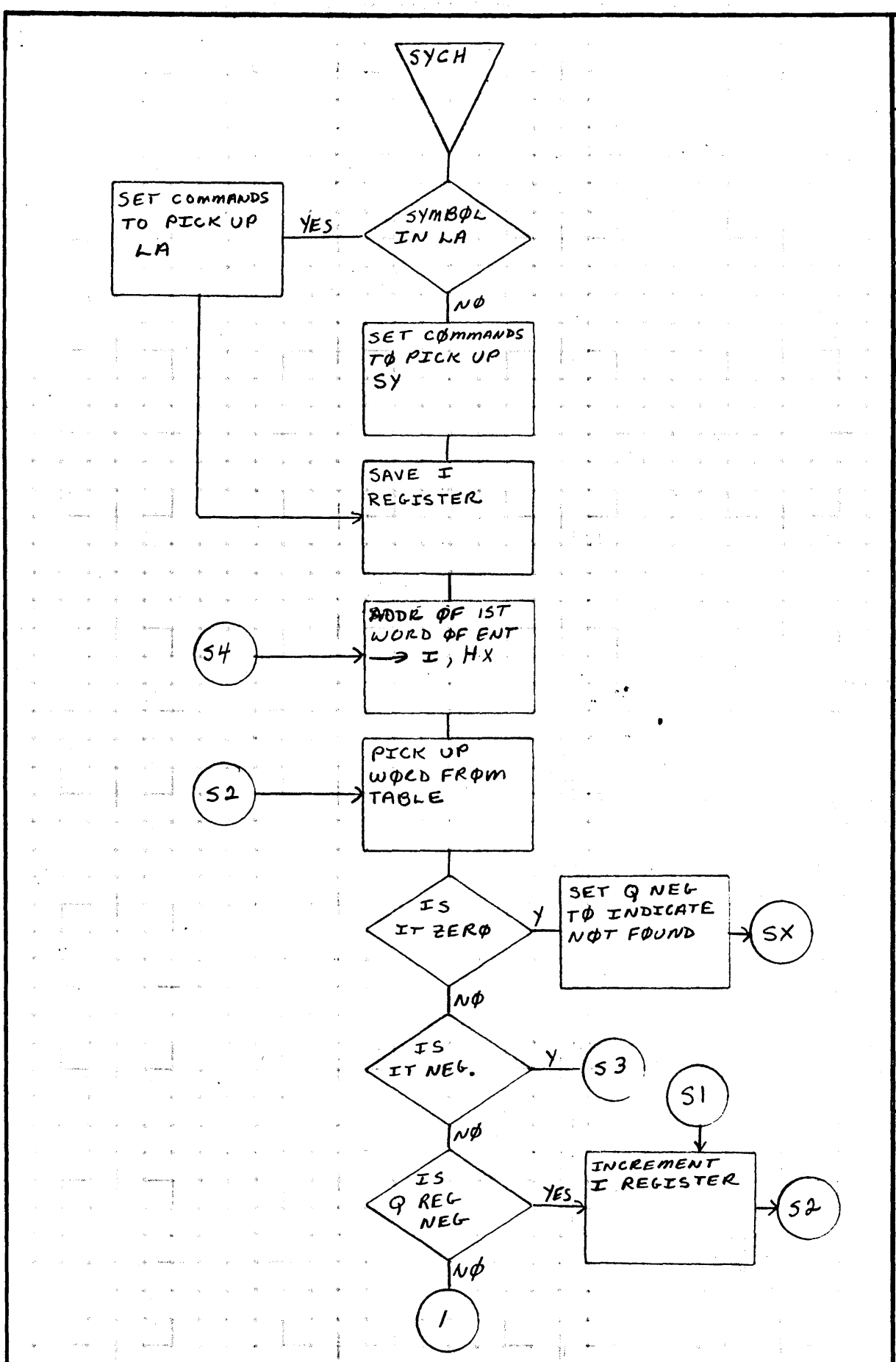
PROJECT NO.	
PROJECT MGR.	
PROJECT NAME	
TASK NO.	
TASK NAME	

AA1385 (FORMERLY CA127-1)



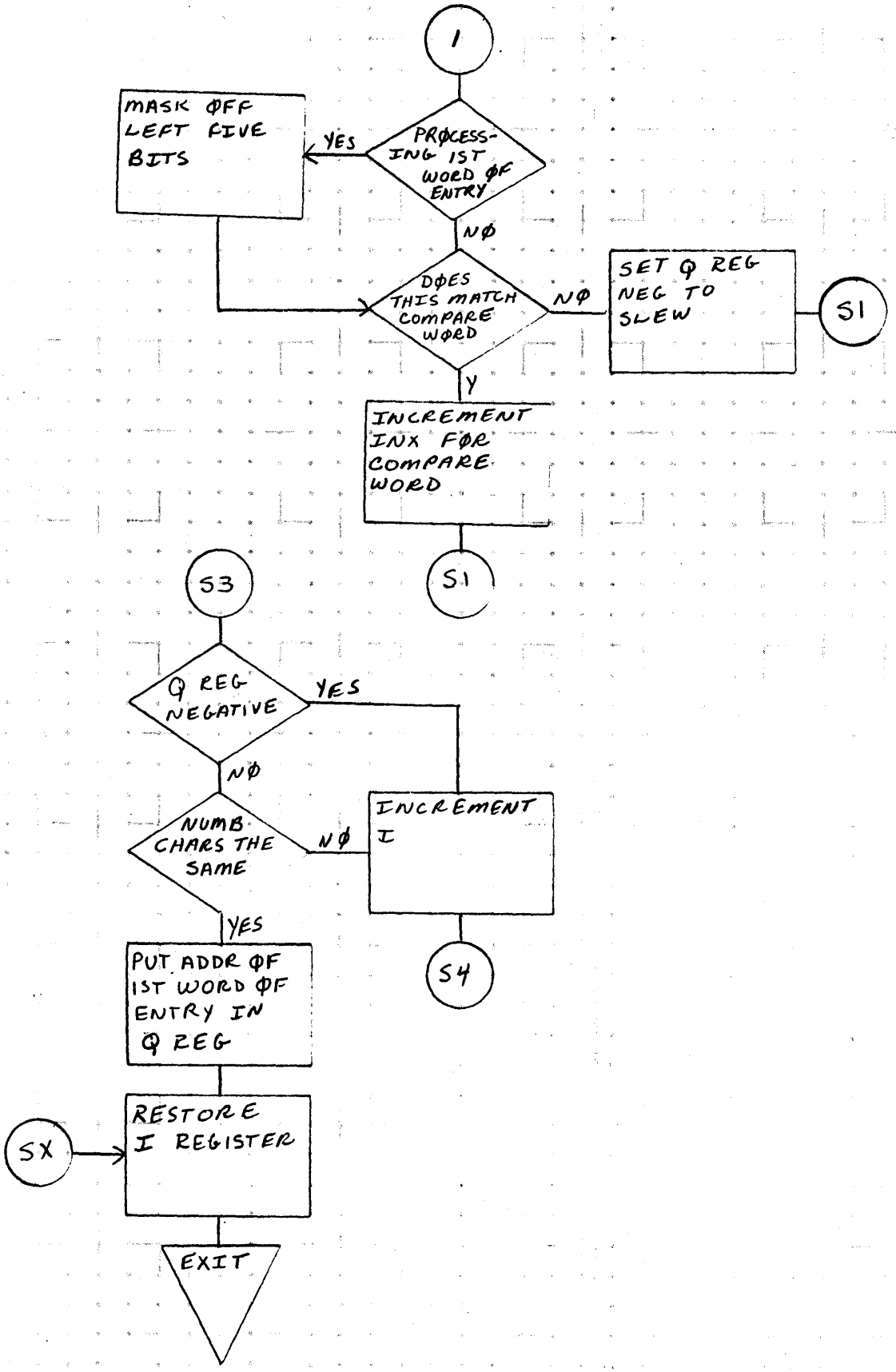
CONTROL DATA CORPORATION SOFTWARE DOCUMENT					
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
	DOCUMENT TITLE RESTORE SYMBOL TABLE		PROJECT MGR.		
	PASS 2.4.3	PAGE 1 OF 1	PROJECT NAME		
	NUMBER 6.5.1	ISSUE DATE	TASK NO.		
	DRAWN BY	DATE	TASK NAME		

AA1385 (FORM CA127-1)



CONTROL DATA CORPORATION	DOCUMENT CLASS	MACH. TYPE	PROJECT NO.	REV	APPROVED	DATE
SOFTWARE DOCUMENT		IMS 1700				
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT TITLE	SYMBOL TABLE SEARCH PASS 2+3	PROJECT MGR.			
		PAGE 1 OF 2	PROJECT NAME			
	NUMBER	ISSUE DATE	TASK NO.			
	DRAWN BY	DATE	TASK NAME			

AA1385 (FORMERLY CA127-1)

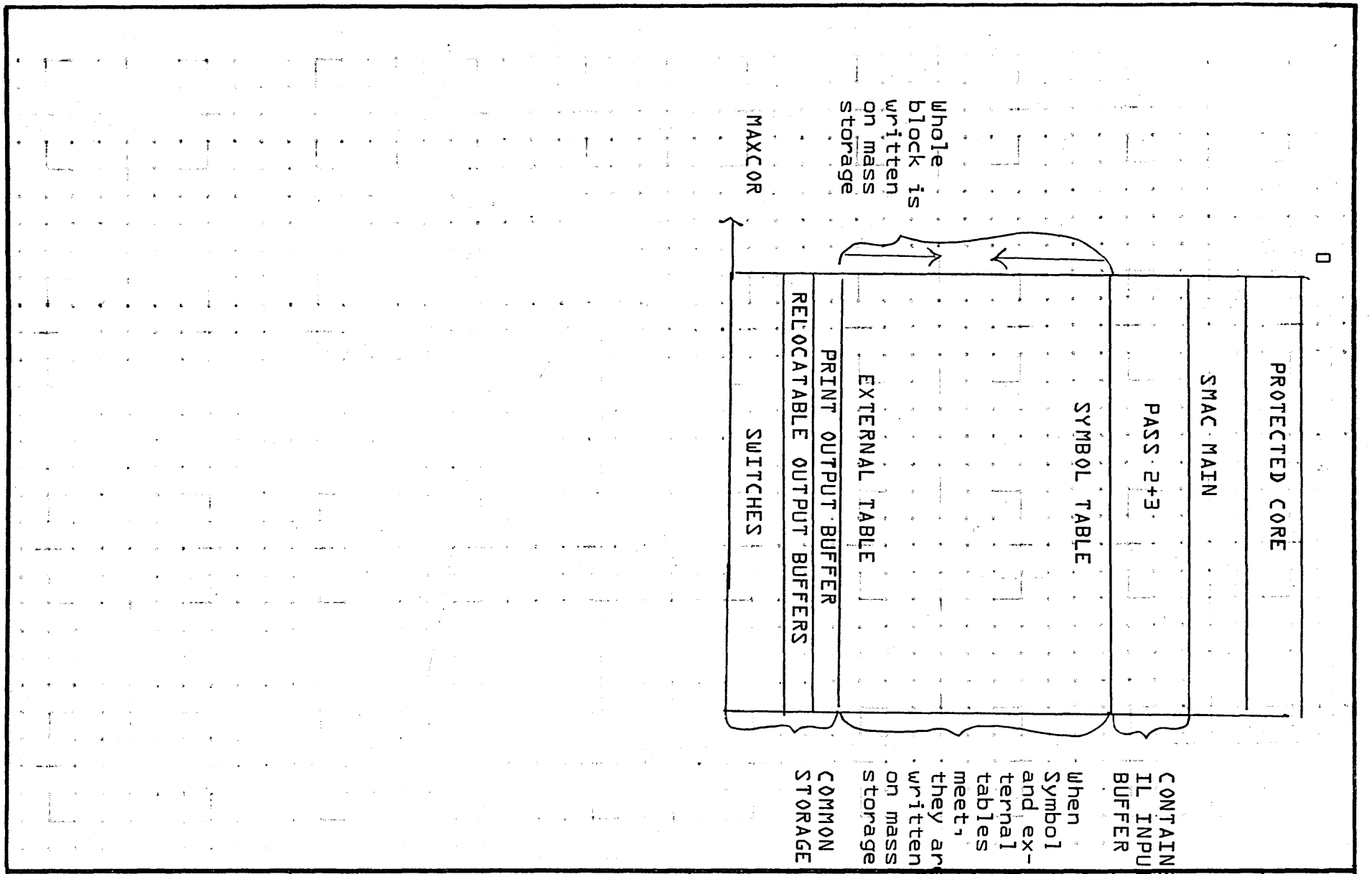


REV	APPROVED	DATE

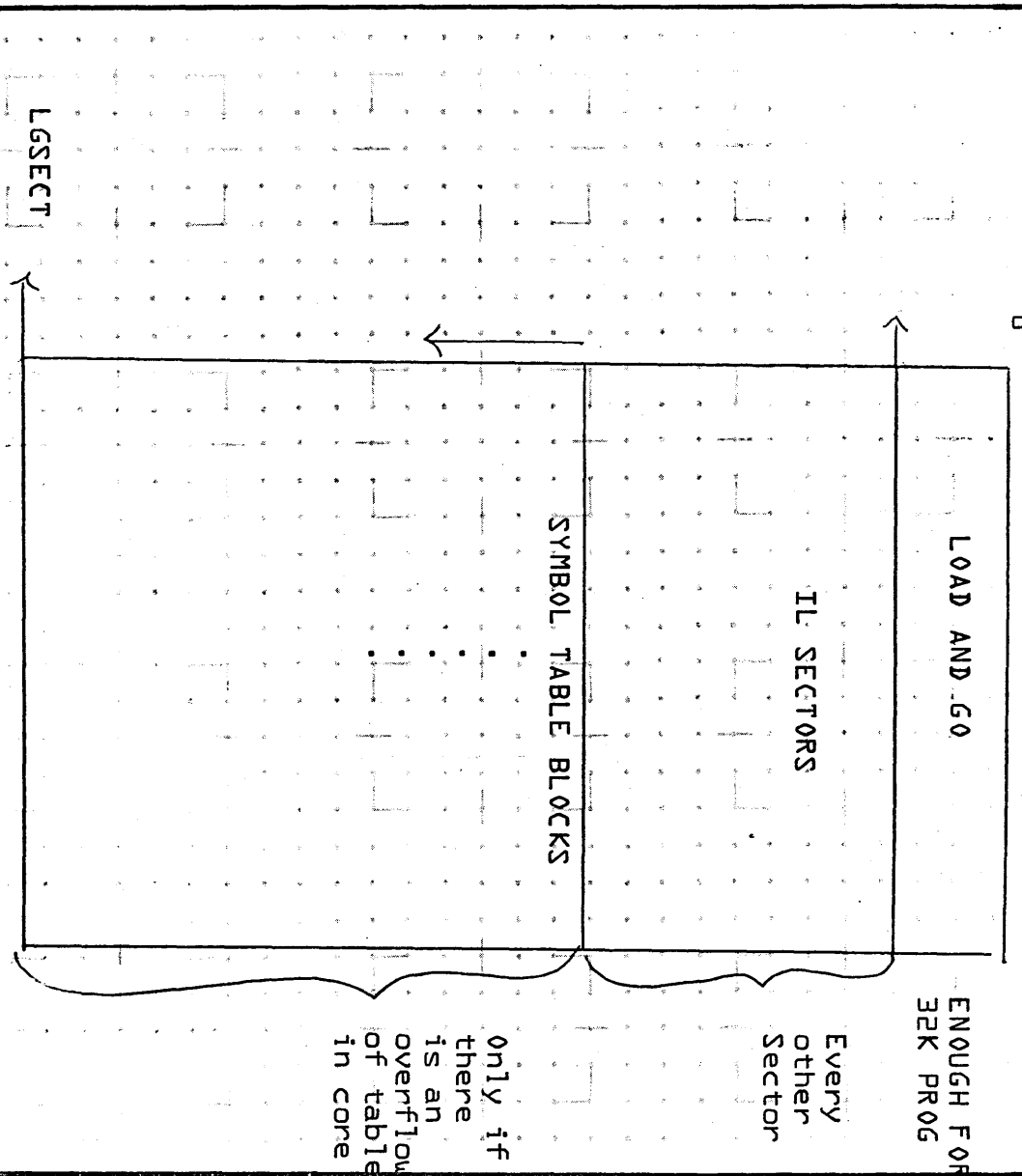
CONTROL DATA CORPORATION
SOFTWARE DOCUMENT
SAMPLE CODE
FLOWCHART
DECISION TABLE
OTHER

DOCUMENT CLASS	MACH. TYPE TMS 1700	PROJECT NO.	
DOCUMENT TITLE	SYMBOL TABLE SEARCH	PROJECT MGR.	
PASS 2+3	PAGE 2 OF 2	PROJECT NAME	
NUMBER G.6.1	ISSUE DATE	TASK NO.	
DRAWN BY	DATE	TASK NAME	

AA1385 (FORM CA127-1)



CONTROL DATA CORPORATION					
SOFTWARE DOCUMENT	DOCUMENT CLASS IMS	MACH. TYPE 1700	PROJECT NO.	REV	APPROVED / DATE
SAMPLE CODE ☐	DOCUMENT TITLE CORE ALLOCATION		PROJECT MGR.		
FLOWCHART ☐	PASS 2 and 3	PAGE 1 OF 1	PROJECT NAME		
DECISION TABLE ☐	NUMBER 6.7	ISSUE DATE	TASK NO.		
OTHER ☐	DRAWN BY	DATE	TASK NAME		



CONTROL DATA CORPORATION SOFTWARE DOCUMENT			
SAMPLE CODE ☐ FLOWCHART ☐ DECISION TABLE ☐ OTHER ☐	DOCUMENT CLASS IMS MACH. TYPE 1700	PROJECT NO.	
	DOCUMENT TITLE MASS STORAGE	PROJECT MGR.	
	ALLOCATION PASS2+3 PAGE 1 OF 1	PROJECT NAME	
	NUMBER 6.8 ISSUE DATE	TASK NO.	
	DRAWN BY DATE	TASK NAME	

REV	APPROVED	DATE

AA1385 (FORM CA127-1)

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SECTION VII

Switches, holders, flags, and buffers used in passes 2, 3 and 4

SYMBOLIC NAME	MEANING
AD	Flag indicating opcode is ADC
AF	Flag indicating opcode is ALF
AM	Flag indicating type of opcode terminator for class 1 and 2 instructions

Value	Terminator
-3	blank
-2	not used
-1	+
0	-
1	*

APB	Alternate 49 word print buffer
AR	Temporary holder for relocation code in AXPR
AS	Holds negative or positive mask in AXPR
AU	Temporary holder for address expression value in AXPR Used elsewhere as a temporary holder
AUB	Alternate 57 word punch buffer
AX	Holder for final address expression value from AXPR
AX16	Flag signalling 16-bit arithmetic in AXPR
BS	Buffer switch in RDIM
CC	Common counter
CL	Class code
CS	Holds output character from CHPU Holds terminator indicator from CHPR

=0	blank
=1	comma
=2	plus
=3	minus
=4	asterisk
=5	slash
=6	left parenthesis

CSW	Completion switch for punched binary output
CSYSCT	Sector number of symbol table currently in core
CT	Image column counter
DC	Data counter
DSW	Completion switch for DOUT
DSWW	Completion switch for DIN

SYMBOLIC NAME	MEANING
DVFL	Overlay flag =0 VFD processor is in core =1 DEC processor is in core
DX	Flag identifying pseudo processors that are processed in the same routine. Used elsewhere as a temporary holder
ES	Error switch
ET	Holder for current external table address
ETSAVE	Save storage for external table address in TBLIN and RESTBL
EX	Flag indicating external =1 Non-relative external =2 relative external
HX	Flag indicating hex value in CHPR. Used elsewhere as temporary storage
IB	Input buffer for IL image
ID	If depth counter
IFNAM	Holder for first two characters of the label of an IFA or IFC instruction
IG	Ignore leading blanks switch =0 leading blanks processed ≠0 leading blanks ignored
IL	Holder for flag bits from input image
IS	Flags legality of leading sign for CHPR =0 leading sign legal ≠0 leading sign illegal
LA	Four word holder for label LA+3 contains number of characters in the label minus 1
LC	Holder for leading operator in AXPR. Codes are the same as CS
LN	Holder for line number
LP	Flag indicating left parenthesis present in address expression
LT	Flag indicating address field contains a literal
MD	Macro depth counter
MPSW	Macro print switch
NU	Holder for numeric address value from CHPR
NS	Flag indicating a 16-bit value is legal in CHPR

SYMBOLIC NAME	MEANING
0C	Save storage for the program counter in 0RG
0R	Save storage for program relocation in 0RG
PAGL	Page length
PB	49-word print buffer
PC	Program counter
PER	Holder for number of words to be punched. Used as temporary storage elsewhere.
PNAM	3 word hold for name of program to print on top of page
PSW	List output completion switch
RC	Relocation code of the address expression =0 absolute =1 program =2 common =3 data =5 negative program =6 negative common =7 negative data
RP	Flag indicating right parenthesis is present in the address expression
SC	Count of entries in the symbol table
SC0UNT	Number of MS sectors occupied by one symbol table block
SECTN0	Current IL sector number
SG	Leading sign indicator from CHPR <0 leading minus =0 no leading sign >0 leading plus

SYMBOLIC NAME	MEANING
SKF	Flag indicating assembler is skipping images on an IF condition
SL	Length of the source image
SS	Flag for SYCH indicating location of symbol =0 symbol in LA =1 symbol in SY
ST	Holder for beginning symbol table address
SY	4 word symbol holder from CHPR SY+3 holds number of characters in the name minus 1 If no symbol is present the following flags may be inserted SY+1 ≠ 0 null field SY+2 ≠ 0 symbol is an asterisk
SZ	Size of a BZS block
TR	7 word holder for relocation codes in AXPR. Used elsewhere for temporary storage
TSW	Typewriter completion switch
UB	57 word punch buffer
VBT	Total bit count used in VFD. Used elsewhere as temporary storage
VCT	Bit count of current address field used VFD. Used elsewhere as temporary storage
VMS	Mode switch in VFD =1 A =2 N =3 X Used elsewhere as temporary storage
VWD	Holder for binary word in VFD. Used elsewhere for temporary storage
W1	Holder for first command output word

SYMBOLIC NAME	MEANING
W2	Holder for second command output word
WC	Number of words currently stored in the punch buffer
WMS	Number of storages available for each symbol table block
XMOD	Initial mode switch in CHPR. Used elsewhere as temporary storage
XSYSCT	Number of next available sector for a symbol table block on mass storage
YL	List - No list switch set by LST and NLS pseudo instructions =0 list ≠0 no list