

3400

Control Data[®] 3400 Computer System
General Information Manual

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INTRODUCTION

The Control Data® 3400 computer system, a complex data processing system with maximum computing power, combines hardware of advanced design with a complete set of automatic programming systems. It operates under program control with minimum operator intervention.

Primarily scientific in orientation, the 3400 system can be easily adapted to business data processing needs. Engineering, administration, manufacturing and marketing can all be handled efficiently by one 3400 computer system.

Using a 160A computer with the 3400 will result in an off-line system capable of handling great quantities of data. The 160A computer can perform all off-line functions in the system as well as many routine conversion and computation operations. Simultaneously, the 3400 computer can deal exclusively with high speed tape units, insuring maximum speed and efficiency for the over-all system.

CONTROL DATA 3400 COMPUTER SYSTEM

The CONTROL DATA 3400 Computer System has a storage capacity of 32,768 words and rapid data transmission. It is compatible with the 3600 Computer System. Available options permit a wide variety of configurations. Peripheral equipment includes the following:

- Single or dual channel capability on high speed printers, card readers, card punches, and disc files
- Tapes with three density operation (200, 556, or 800 characters per inch at speeds up to 120,000 characters per second) and backward reading capability
- Dual, triple, or quadruple channel capability on tape controllers with either 604 or 607 tape transports
- 1200 card per minute reader
- 1000 line per minute printer with 136 columns
- 200 million bit capacity disc units with 80,000 cycle transfer rate

The computation section may be functionally divided into an arithmetic and a control section. The control section directs the operations required to execute instructions and establishes the timing relationships for performing operations in proper sequence. It also sends the commands necessary to begin processing input/output data.

Non-numeric instructions are available for logical data handling, test commands for two-way branching, control transfer, character handling, indexing, and storage searching.

ARITHMETIC OPERATION

The arithmetic section performs the arithmetic and logical operations necessary for executing instructions.

Register	No. of Stages	Modulus	Complement Notation	Arithmetic	Result
A	48	$2^{48}-1$	one's	subtractive	signed
Q	48	$2^{48}-1$	one's	----	signed
P	15	2^{15}	two's	additive	unsigned
Index	15	$2^{15}-1$	one's	----	----

Table 1 - Arithmetic Properties of Registers

The arithmetic in a standard 3400 system is in fixed point and in floating point. Examples are shown in Figure 1. In the minimum configuration, arithmetic instructions are in fixed point only. The range of values is:

$$\begin{aligned} \text{Fixed Point Number} & \quad \pm 2^{47} - 1 \\ \text{Floating Point Number} & \quad \pm 10^{\pm 308} \end{aligned}$$

INTERRUPT SYSTEM The interrupt system tests for the following internal and external hardware conditions:

- Shift or divide fault
- Overflow
- Underflow
- Channel inactive
- Parity error
- Interrupts
- Memory bound fault
- Clock

Conditions are sampled after each main program instruction is executed; if a condition exists, execution halts and the contents of the program address register are stored. After the necessary action is taken by the program interrupt routine, control returns to the next main program step.

Table 2
Machine Language Instructions

<u>Octal Code</u>	<u>Mnemonic Code</u>	<u>Name</u>	<u>Indirect</u>	<u>Address</u>	<u>Modification</u>
<u>Inter-Register Transmission</u>					
	IAQ	Interchange A and Q (00700554)	No		No
<u>Full-Word Transmission</u>					
12	LDA	Load A	Yes		Yes
16	LDQ	Load Q	Yes		Yes
20	STA	Store A	Yes		Yes
21	STQ	Store Q	Yes		Yes
13	LAC	Load A, Complement	Yes		Yes
17	LQC	Load Q, Complement	Yes		Yes
<u>Address Transmission</u>					
01	SAL	Substitute Address (lower)	Yes		Yes
60	SAU	Substitute Address (upper)	Yes		Yes
04	ENQ	Enter Q	Yes		Yes
10	ENA	Enter A	Yes		Yes
53	LIL	Load Index (lower)	Yes		No
52	LIU	Load Index (upper)	Yes		No
57	SIL	Store Index (lower)	Yes		No
56	SIU	Store Index (upper)	Yes		No
50	ENI	Enter Index	Yes		No
	ATI	Transmit A to Index (0074054b)	No		No
<u>Fixed Point Arithmetic</u>					
14	ADD	Add	Yes		Yes
15	SUB	Subtract	Yes		Yes
24	MUI	Multiply Integer	Yes		Yes
25	DVI	Divide Integer	Yes		Yes
<u>Address Arithmetic</u>					
11	INA	Increase A	Yes		Yes
51	INI	Increase Index	Yes		No
54	ISK	Index Skip	Yes		No
<u>Logical</u>					
40	SST	Selective Set	Yes		Yes
41	SCL	Selective Clear	Yes		Yes
42	SCM	Selective Complement	Yes		Yes
43	SSU	Selective Substitute	Yes		Yes
44	LDL	Load Logical	Yes		Yes
45	ADL	Add Logical	Yes		Yes
46	SBL	Subtract Logical	Yes		Yes
47	STL	Store Logical	Yes		Yes
<u>Shifting</u>					
01	ARS	A Right Shift	Yes		Yes
02	QRS	Q Right Shift	Yes		Yes
03	LRS	Long Right Shift (AQ)	Yes		Yes
05	ALS	A Left Shift	Yes		Yes
06	QLS	Q Left Shift	Yes		Yes
07	LLS	Long Left Shift (AQ)	Yes		Yes
34	SCA	Scale A	Yes		No
35	SCQ	Scale AQ	Yes		No

<u>Octal Code</u>	<u>Mnemonic Code</u>	<u>Name</u>	<u>Indirect</u>	<u>Address</u>	<u>Modification</u>
<u>Replace</u>					
70	RAD	Replace Add	Yes		Yes
71	RSB	Replace Subtract	Yes		Yes
72	RAO	Replace Add One	Yes		Yes
73	RSO	Replace Subtract One	Yes		Yes
<u>Storage Test</u>					
36	SSK	Storage Skip	Yes		Yes
37	SSH	Storage Shift	Yes		Yes
<u>Search</u>					
64	EQS	Equality Search	Yes		Yes
65	THS	Threshold Search	Yes		Yes
66	MEQ	Masked Equality Search	Yes		Yes
67	MTH	Masked Threshold Search	Yes		Yes
<u>Jumps and Stops</u>					
22	AJP	A Jump	No		No
23	QJP	Q Jump	No		No
55	IJP	Index Jump	Yes		No
75	SLJ	Selective Jump	No		No
76	SLS	Selective Stop	No		No
<u>Input/Output</u>					
74.0	CONN	Connect	No		No
74.1	EXTF	Function	No		No
74.2	BEGR	Read	No		No
74.3	BEGW	Write	No		No
74.4	COPY	Copy Status	No		No
74.5	CLCH	Clear Channel	No		No
74.6	CCWD	Change Control Word	No		No
77.2	CIS	Copy Interrupt Status	No		No
77.3	SEN	Internal Sense	No		No
77.4	CPR	Copy Product Register	No		No
77.0	INF	Internal Function	No		No
<u>Miscellaneous</u>					
77.1	AUG	Augment	Yes		Yes
77.5	EUB	Enter Upper Bound	No		No
77.6	ELB	Enter Lower Bound	No		No
	LDC	Load Character (63bv0006500m)	Yes		Yes
	STC	Store Character (63bv0006505m)	Yes		Yes
<u>Illegal Codes</u>					
26	}	Return Jump to Address 00020			
27					
74.7					
77.7					
<u>Single Precision Floating Point Arithmetic</u> (floating point option)					
30	FAD	Floating Add	Yes		Yes
31	FSB	Floating Subtract	Yes		Yes
32	FMU	Floating Multiply	Yes		Yes
33	FDV	Floating Divide	Yes		Yes

Table 3
3400 Instruction Times

<u>Octal Code</u>	<u>Mnemonic Code</u>	<u>Name</u>	<u>Execution in usec</u>
24	MUI	Multiply Integer	22.5
25	DVI	Divide Integer	22.5
01-03 05-07	All Shifts		3.0+0.2 (K-2) (K is modified shift count - for K less than 3, T = 3.0 usec).
34-35	Scale A and Scale AQ		3.0+0.2 (P-2) (P is number of places shifted).
70	RAD	Replace Add	} 5.3
71	RSB	Replace Subtract	
72	RAD	Replace Add One	
73	RSO	Replace Subtract One	
37	SSH	Storage Shift	6.1
64	EQS	Equality Search	} 3.0+N (2.2)
65	THS	Threshold Search	
66	MEQ	Masked Equality Search	
67	MTH	Masked Threshold Search	
22	AJP	A Jump	upper, jump taken 2.2
23	QJP	Q Jump	upper, jump not taken 3.0
55	IJP	Index Jump	lower, jump taken 1.4
75	SLJ	Selective Jump	lower, jump not taken 3.0
76	SLS	Selective Stop	
63.0	UBJP	Unconditional Jump	3.8 no jump 2.2 jump made
63.0	BRTJ	Unconditional Return Jump	3.8 no jump 3.8 jump made
63.1	BJPL	Unconditional Jump to Lower	3.8 no jump 3.0 jump made
74.0	CONN	Connect	2.2 if rejected by channel active.
74.1	EXTF	Function	5.8 and up depending on external equipment. Up to a maximum of 100 usec if the time reject is taken.
74.2	BEGR	Read	2.2 reject
74.3	BEGW	Write	3.8 no reject
74.4	COPY	Copy Status	3.8
74.5	CLCH	Clear Channel	100
74.6	CCWD	Change Control Word	2.2 reject
63bv0006500m	LDCH	Load Character	3.8
63bv0006505m	STCH	Store Character	6.1
Illegal Codes			3.7 lower 4.5 upper
30	FAD	Floating Add	6.8*
31	FSB	Floating Subtract	6.8*
32	FMU	Floating Multiply	19.8**
33	FDV	Floating Divide	19.8**
	All other legal instructions		3.0

* For equal exponents and no normalizing

** No normalizing

For each shift to equalize exponents or to normalize, add 0.2 usec

**SYSTEM
CONFIGURATION**

Basic Configuration:

- Central Processor (3404)
- Control Console (3401)
- Standard Input/Output Channel (3406)

This configuration which lacks input/output devices is suitable as a control computer. The standard 3400 software cannot be used with the basic configuration.

Standard Configuration:

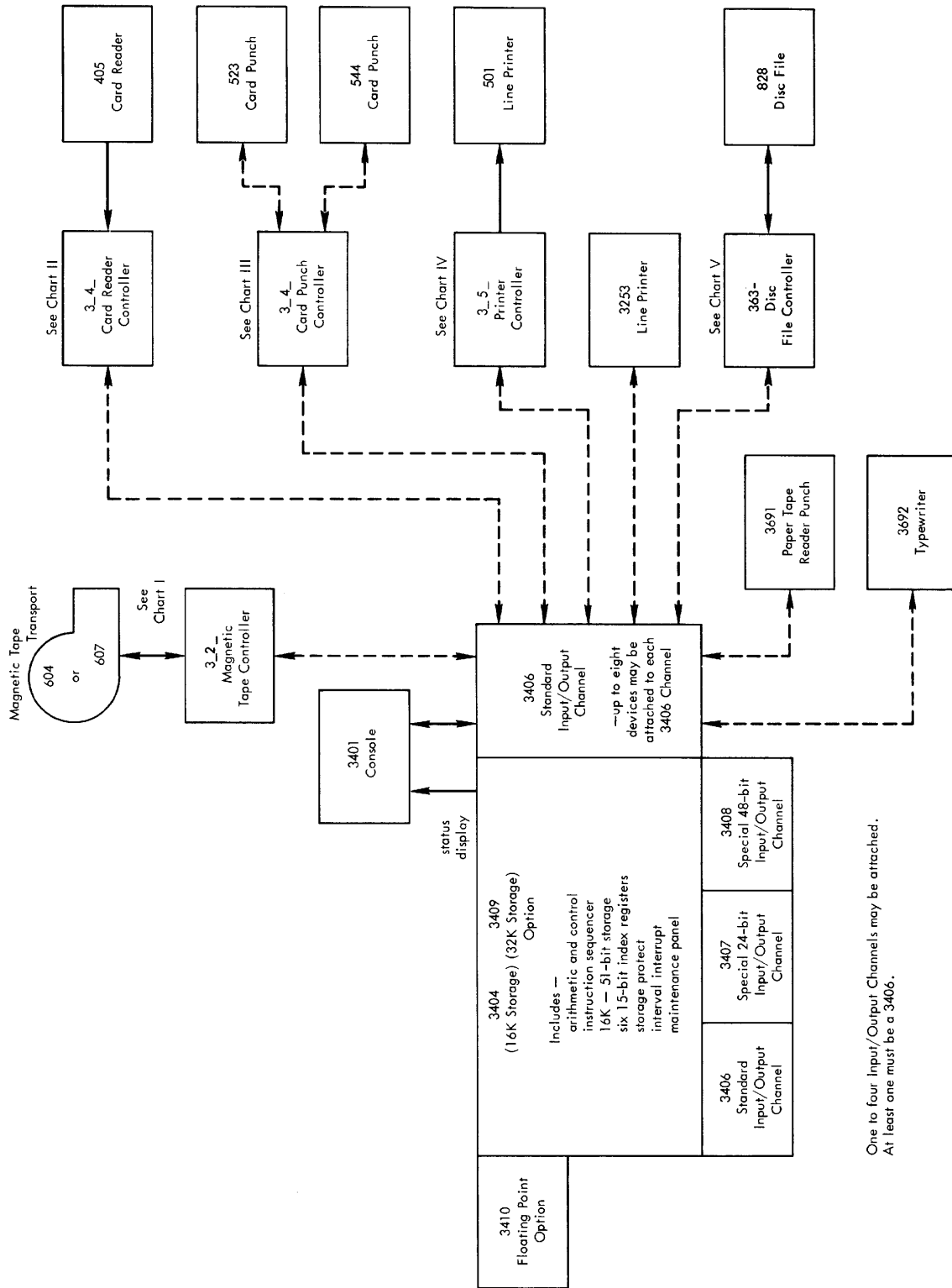
On-Line - - An on-line system which permits use of standard 3400 software consists of the equipment listed in table 4.

The recommended list of on-line equipment differs from the minimum list in three particulars: (1) another unit of the same model is added, (2) the model is changed, (3) the model and the number of units are changed.

Minimum Configuration	Recommended Configuration
One Central Processor (3404) with 32K Memory (3409)	
One Standard Input/Output Channel (3406)	Two Standard Input/Output Channels (3406)
One Floating Point Option (3410)	
One Control Console (3401)	
One Magnetic Tape Controller (3228)	One Magnetic Tape Controller (3422)
Four Magnetic Tape Transports (604)	Six Magnetic Tape Transports (607)
One Line Printer Controller (3256)	
One Line Printer (501)	
One Card Punch Controller (3245)	
One Card Punch (IBM 523)	
One Card Reader Controller (3248)	
One Card Reader (405)	

Table 4 - On-Line Standard Software Compatible Configuration

All equipment which may be used in the 3400 Computer System is shown in figure 2. It does not represent any recommended configuration.



One to four Input/Output Channels may be attached.
At least one must be a 3406.

Figure 2 - Block Diagram Relating all 3400 Equipment

Chart I - Magnetic Tape Controllers

Model No.	No. of Channels	Max. No. of Tapes
3228	1	4
3229	1	8
3421	2	4
3422	2	6
3423	2	8
3622	2	16
3625	3	8
3626	3	16
3623	4	8
3624	4	16

Chart II - Card Reader Controllers

Model No.	No. of Channels	Core Buffer
3248	1	No
3447	1	Yes
3649	2	Yes

Chart III-Card Punch Controllers

Model No.	No. of Channels	Core Buffer
3245	1	No
3446	1	Yes
3644	2	Yes

Chart IV-Line Printer Controllers

Model No.	No. of Channels	Checking
3256	1	No
3257	1	Yes
3659	2	No

Chart V-Disc File Controllers

Model No.	No. of Channels	No. of Discs
3632	2	1
3633	2	2
3634	2	3
3635	2	4

Off-Line - - An off-line system which permits use of standard 3400 software consists of the equipment listed in table 5. The recommended list of off-line equipment differs from the minimum list by addition of units and by changes in the unit model.

Minimum Configuration		Recommended Configuration	
One Central Processor	(3404)		
with 32K Memory	(3409)		
One Standard Input/Output Channel	(3406)	Two Standard Input/Output Channels	(3406)
One Floating Point Option	(3410)		
One Control Console	(3401)		
One Magnetic Tape Controller	(3228)	One Magnetic Tape Controller	(3625)
Six Magnetic Tape Transports	(604)	Eight Magnetic Tape Transports	(607)
One Computer	(160A)		
One Line Printer Controller	(3256)	One Line Printer Controller	(3659)
One Line Printer	(501)		
One Card Punch Controller	(3245)	One Card Punch Controller	(3644)
One Card Punch	(IBM 523)		
One Card Reader Controller	(3248)	One Card Reader Controller	(3649)
One Card Reader	(405)		
One Data Channel Converter	(3681)		

Table 5 - Off-Line Standard Software Compatible Configuration

**COMPONENT
DESCRIPTION**

Central Processor (3404, 3409) -- The central processor is a solid state computer which performs calculations and processes data in parallel binary mode through the step-by-step execution of individual instructions. More than 250,000 commands are executed per second. The standard 3400 magnetic core storage section provides high speed, random-access storage for 32,768 words. The basic 3400 magnetic core storage section provides storage for 16,384 words (the 3409 is removed in this case).

Control Console (3401) - - The console provides the communication link between computer system, stored program, and operator. It consists of a system status display panel, speaker, electric typewriter, and various control switches. A chair is included.

Standard Input/Output Channel (3406) - - One input/output channel may control a maximum of eight external equipments.

Special Input/Output Channels - - Two special input/output channel units are available. The 3407 is used with peripheral equipment handling 24 bits or less. The 3408 is used with peripheral equipment handling 48 bits or less.

Floating Point Option (3410) - - This option adds four single-precision floating point instructions to the machine language.

Magnetic Tape Controller - - The ten available magnetic tape controllers are listed below. Each controller unit permits independent reading and writing on the tape it controls.

Model No.	No. of Channels	Max. No. of Tapes
3228	1	4
3229	1	8
3421	2	4
3422	2	6
3423	2	8
3622	2	16
3625	3	8
3626	3	16
3623	4	8
3624	4	16

Magnetic Tape Transport - - Two magnetic tape transport units are available. The 604 which moves tape 75 inches per second is available in densities of 200 and 556 characters per inch at rates of 66 and 24 microseconds per frame, respectively. The 607 which moves tape 150 inches per second is available in densities of 200, 556, and 800 characters per inch at rates of 33, 12, and 8 microseconds per frame, respectively.

Card Reader Controller - - Three card reader controller units are available. The 3248 connects a 405 card reader to an input/output channel or data channel converter without buffering. The 3447 performs the same

function with buffering. The 3649 connects a 405 card reader to an input/output channel with buffering.

Card Punch Controller - - Three card punch controller units are available. The 3245 connects an IBM 523 or 544 card punch to an input/output channel or to a data channel converter without buffering. The 3446 performs the same function with buffering. The 3644 connects a card punch to two input/output channels or data channel converters with buffering.

Line Printer Controller - - Three line printer controller units are available. The 3256 connects a 501 high speed line printer to an input/output channel or data channel converter without checking. The 3257 performs the same function with checking. The 3659 connects a 501 to two input/output channels or data channel converters.

High Speed Line Printer (501) - - The capacity of this printer is 136 columns at 1000 lines per minute with a character set of 64 symbols.

Line Printer (3253) - - The capacity of this printer is 120 columns at 300 lines per minute with a character set of 64 symbols.

Disc File Controller - - Each of the four disc file controllers permits two independent reading, writing or positioning functions. The difference is in the number of disc files which may be controlled as shown below:

Model No.	Max. No. of Disc Files
3632	1
3633	2
3634	3
3635	4

Disc File (828) - - This file allows simultaneous operation of any two functions - - reading, writing, and positioning. It has a 200 million bit capacity, 80 kc average character transfer rate, and 225 millisecond average access time.

Paper Tape Reader/Punch (3691) - - This unit reads 350 characters per second and punches 110 characters per second.

Program Controlled Input/Output Typewriter (3692) - - This unit operates from a single input/output channel.

STANDARD CONTROL DATA 3400 SOFTWARE

The standard 3400 software is compatible with the standard CONTROL DATA 3600 software. Programs written for the 3400 FORTRAN and COBOL compilers and the COMPASS assembler may be compiled or assembled on the corresponding 3600 compiler or assembly system.

3400 SCOPE

The 3400 SCOPE (Supervisory Control of Program Execution) is a monitor system, complete with library. By controlling the input and output operations, execution of programs, and use of libraries, 3400 SCOPE simplifies coding. It minimizes operating responsibilities, makes maximum use of computer time, and provides a maximum amount of available storage area for job execution. 3400 SCOPE is compatible with 3600 SCOPE.

3400 SCOPE provides the following functions:

Job processing

- maintains accounting information
- initiates compilations and assemblies
- assigns equipment
- loads and links subprograms
- allocates memory
- provides overlay processing

Debugging aids

- SNAP dump
- error dumps (recovery dumps)
- octal corrections
- memory map
- diagnostics

Program requests

- input/output control
- external interrupt control
- tape handling

internal interrupt control

sampling of time, date, equipment status, and available memory

Library preparations and maintenance

listing the table of contents

directory

preparing and editing library tape

3400 SCOPE library contains:

3400 COMPASS

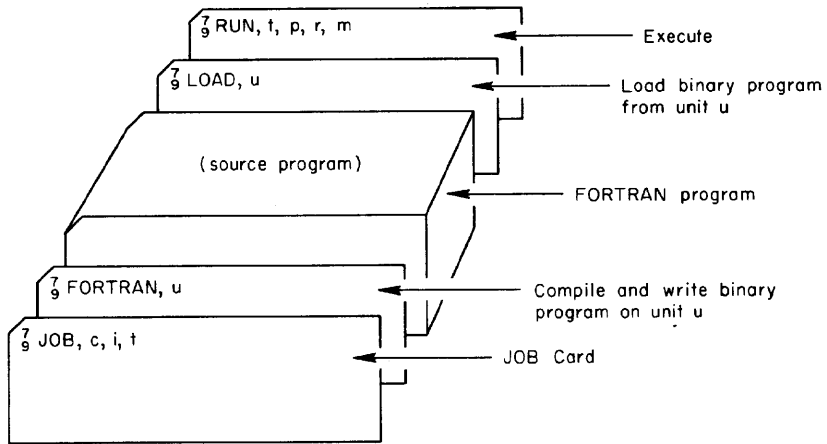
3400 FORTRAN

3400 COBOL

MACRO Library

SUBROUTINE Library

Compile a FORTRAN source program on unit u. Load and execute the program.



Assemble a COMPASS subprogram on unit u. Load with a binary subprogram and execute.

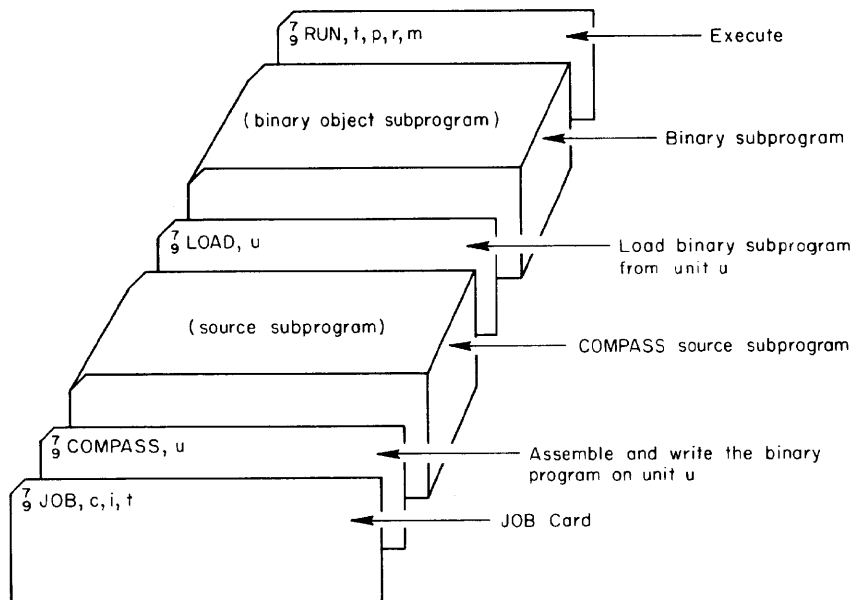


Figure 3 - 3400 SCOPE Use

3400 COMPASS

3400 COMPASS is a comprehensive assembly system. The instructions loaded in the central processor storage are in binary. Writing a machine language program requires considerable attention to detail. To simplify coding, 3400 COMPASS provides the programmer with a symbolic coding language which is converted by COMPASS into a form acceptable to the central processor. Source programs may consist of punched cards or binary-coded decimal card images on magnetic tape. Several forms of output are available from the assembler, including an assembly listing, a relocatable binary object program on punched cards or magnetic tape, and a Compressed Symbolic (COSY) source card deck.

3400 COMPASS contains many features of 3600 COMPASS and is compatible with it. The language includes:

Address Arithmetic	Constants, symbolic address, and arithmetic expressions may be used for addresses.
Preloaded Data	Data areas may be specified and loaded with data in the source program.
Common Assignments	Common areas may be designated to facilitate communication between sub-programs.
Data Definitions	Integer, floating point, binary-coded decimal, and typewriter constants may be designated.
Library Routine Calls	Library routines, input/output routines, and macros may be called.
Listing Control	The vertical format of the assembly listing may be controlled with COMPASS pseudo instructions.
Diagnostics	Diagnostics for source program errors are included with the output listing.
Macro Instructions	Sequences of instructions from the macro library or previously defined by a macro statement will be inserted by the assembler when the macro name appears in an operation field.

COMPASS CODING FORM

PROGRAM AREA COMPUTATION

ROUTINE

CONTROL DATA
CORPORATION

NAME
PAGE
DATE

LOCATION	OPERATION, MODIFIERS	ADDRESS FIELD	COMMENTS	IDENT
1.2	IDENT	AREA		
1.3	SPACE	1		NDB 01
1.4	REM		THIS SUBPROGRAM COMPUTES THE AREA OF A CIRCLE	NDB 02
1.5	REM		GIVEN THE VALUE OF THE RADIUS, IN FLOATING POINT	NDB 03
1.6	REM		FORM, IN THE ACCUMULATOR, AND EXITS WITH THE AREA	NDB 04
1.7	REM		IN THE ACCUMULATOR	NDB 05
1.8	SPACE	1		NDB 06
1.9	SLJ	**		NDB 07
2.0	STQ	TEMP+1	SAVE Q REGISTER	NDB 08
2.1	STA	TEMP		NDB 09
2.2	FMU	TEMP	AREA = PI * R * R	NDB 10
2.3	FMU	= D3 14 1 5 9 2 6 5		NDB 11
2.4	LDQ	TEMP+1	RESTORE Q REGISTER	NDB 12
2.5	SLJ	AREA	EXIT	NDB 13
2.6	SPACE	1		NDB 14
2.7	BSS	2	WORKING STORAGE	NDB 15
2.8	SPACE	1		NDB 16
2.9	ENTRY	AREA		NDB 17
3.0	SPACE	1		NDB 18
3.1	END			NDB 19
3.2				
3.3				
3.4				
3.5				
3.6				
3.7				
3.8				
3.9				
4.0				
4.1				
4.2				
4.3				
4.4				
4.5				
4.6				
4.7				
4.8				
4.9				
5.0				
5.1				
5.2				
5.3				
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6.0				
6.1				
6.2				
6.3				
6.4				
6.5				
6.6				
6.7				
6.8				
6.9				
7.0				
7.1				
7.2				
7.3				
7.4				
7.5				
7.6				
7.7				
7.8				
7.9				
8.0				

3400 FORTRAN

In the 3400 FORTRAN programming language, mathematical or scientific problems may be expressed in algebraic notation. 3400 FORTRAN incorporates elements present in other FORTRAN systems as well as features unique to this system.

The 3400 FORTRAN language includes:

Constants and variables of the following types:

Integer	Single precision floating point
Octal	Double precision floating point
Hollerith	Complex floating point
Logical	

Programmer-defined variable types

Mixed mode arithmetic

Multiple arithmetic replacement statements

Masking logical (Boolean) and relational operators

Library functions

Independently compilable subprograms

Multiple entry points to functions and subroutines

Variable dimension specification

Variable format for input/output control

Conversion formats: double precision, complex, right justifying
binary-coded decimal, and logical.

Buffering of all input/output operations

Memory-to-memory data transmission operations

Multi-branch status statement

FORTRAN CODING FORM										
PROGRAM		CONTROL DATA		NAME		PAGE		OF		
ROUTINE		CORPORATION		DATE		PAGE		OF		
TYPE	STATE- MENT NO.	FORTRAN STATEMENT								SERIAL NUMBER
		O = ZERO Ø = ALPHA O				I = ONE I = ALPHA I				2 = TWO Z = ALPHA Z
1	2, 3, 4, 5, 6	<pre> FUNCTION CNCTØC1(Z1,W1) TYPE CØMPLEX Z1,W1,I1,CTØC1 TYPE REAL LØGR DATA (PI)=1.57079632668, (I=(0.1,1.1)) A=Z1, \$ B=-I*Z1, \$ C=W1, \$ D=-I*Z1 IF(A) 20,1,0 P=B, \$ THETA=PI, \$ GØ TØ 30 THETA=ATAN(B/A) R=SQRTF(A* A+B* B) LØGR=LØGF(R) CTØC1=EXPF(C*LØGR, I, D*THETA),*(CØS F(D*LØGR, I) + C1*THETA) *SINF(D*LØGR, I) + C*THETA)*I) RETURN END </pre>								
1	2, 3, 4, 5, 6	<pre> 1. 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 </pre>								

3400 COBOL

3400 COBOL is a programming language specifically designed to permit business and data processing problems to be defined and solved using English language notation. In processing data, two elements are involved: a set of procedures which specifies how data is to be manipulated, and a description of the data involved.

3400 COBOL consists of four divisions. The Identification Division identifies the source program and the outputs of a compilation. The Environment Division specifies the particulars of the 3400 Computer System. The Data Division describes the files of data the object program is to manipulate or create and the individual logical records which comprise these files. The Procedure Division specifies the steps the computer is to follow. These steps are expressed in English words, statements, sentences, and paragraphs. Verbs denote actions, sentences describe procedures, and conditional statements provide alternative paths of action.

3400 COBOL, which includes all required COBOL, and many desirable elements of elective COBOL, contains the following features:

- Operates under 3400 SCOPE

- Upward compatible with 3600 COBOL

- Label checking

- Alphanumeric handling

- Fixed and variable length records

COBOL CODING FORM		NAME:	PAGE	OF
CONTROL DATA CORPORATION		DATE:	IDENT:	
SEQ. NO.	STATEMENTS			
0001	IDENTIFICATION DIVISION.			
0002	PROGRAM-ID. EXAMPLE-PROGRAM.			
0003	ENVIRONMENT DIVISION.			
0004	CONFIGURATION SECTION.			
0005	SOURCE-COMPUTER. 3400.			
0006	OBJECT-COMPUTER. 3400.			
0007	SPECIAL-NAMES. PRINTER IS PRINT.			
0008	DATA DIVISION.			
0009	WORKING-STORAGE SECTION.			
0010	7 7 A. PICTURE IS X(50).			
0011	0 1 PARAMETERS.			
0012	0 2 NUMBERS.			
0013	0 3 B. PICTURE IS S9(5)V9(5).			
0014	PROCEDURE DIVISION.			
0015	START-RUN. DISPLAY #1 START TESTS ON CONDITIONAL STATEMENTS. #			
0016	UPON PRINT.			
0017	PERFORM PROCEDURE-BLOCKS.			
0018	STOP RUN.			
0019	PROCEDURE-BLOCKS SECTION.			
0020	MOVE #TEST SIMPLE RELATIONAL CONDITIONS. # TO #.			
0021	SECOND.			
0022	MOVE 1 TO B.			

SORT/MERGE

The 3400 SORT/MERGE program organizes data on magnetic tape into one continuous predetermined order. SORT/MERGE is included in the 3400 SCOPE library and operates under the SCOPE monitor system. It may be used as a subroutine in an assembly program or as a single program using control cards.

SORT/MERGE includes the following features:

- Operates under SCOPE
- Binary coded decimal and binary files
- Varied collating sequences
- Fixed and variable length records
- Merge presorted input files with sorted output
- Merge only presorted input files
- Exits for user routines
- Label checking
- Recovery protection

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