HP 3000 SERIES II
COMPUTER SYSTEM
MANUAL OF STAND-ALONE DIAGNOSTICS

STAND-ALONE HP 30102A (2888A)
DISC FILE DIAGNOSTIC

Diagnostic No. D423

30102-90015
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10/76

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STAND-ALONE HP 30102A DISC FILE DIAGNOSTIC
HP PRODUCT NO: D423A
DESIGNED: MAY 9, 1975
UPDATED:
FIXED:

I. INTRODUCTION

THE STAND-ALONE HP 30102A DISC FILE DIAGNOSTIC VERIFIES THE INPUT, OUTPUT AND CONTROL FUNCTIONS OF THE HP 30102A DISC FILE. THE DIAGNOSTIC IS USED BY FIELD SERVICE, MANUFACTURING AND SYSTEM TEST PERSONNEL TO DETECT AND ISOLATE (AT THE FUNCTIONAL LEVEL) CONTROLLER, DISC PACK OR DISC DRIVE FAILURES.

II. M I N I - O P E R A T I N G I N S T R U C T I O N S

1. COLD LOAD DIAG FILE # FROM NON-CPU COLD LOAD TAPE
2. D99 01 DISC FILE (30102A) DIAG CONFG (D423A,UU,F)
   Q99 02 DECIMAL DEVICE NUMBER? (DRT #)
3. Q99 03 INTERRUPTS ON OR OFF? (ON OR OFF)
4. P99 61 PAUSE AFTER CONFIGURATION
   *SET SWITCH OPTIONS FOLLOWED BY CR TO START DIAGNOSTIC

BIT	SWITCH REGISTER OPTIONS:
0	SELECT EXTERNAL REGISTER
1	SET TO CHANGE SECTION REGISTER
2	NOT USED
3	NOT USED
4	NOT USED
5	NOT USED
6	D,E-CLASS MESSAGES TO LINE PRINTER
7	NOT USED
8	NOT USED
9	SUPPRESS E-CLASS MESSAGES
10	SUPPRESS D-CLASS MESSAGES
11	LOOP ON CURRENT STEP
12	PAUSE ON ERROR
13	PAUSE AT END OF CURRENT STEP
14	PAUSE AFTER CURRENT SECTION
15	PAUSE AFTER PASS THROUGH DIAGNOSTIC, USE ALL OF S1

BIT	SECTION REGISTER OPTIONS:
0	NOT USED
1	NOT USED
2	NOT USED
3	NOT USED
4	NOT USED
5	NOT USED
6	SET UP AND IGNORE DEFECTIVE TRACK
7	CHANGE UNIT, CYLINDER, HEAD OR PATTERN TABLE
8	NOT USED
9	NOT USED
10	NOT USED
11	LOOP ON CURRENT SECTION
12	SHORT PRINT
13	SHORTEN TEST SOMEWHAT
14	SHORTEN TEST SEVERELY
15	RESTRICT CYLINDERS ARE NOT USED

III. REQUIREMENTS

A. HARDWARE

1. MINIMUM SYSTEM HP 3000 SERIES II CPU
2. HP 30102A DISC FILE SUBSYSTEM (2888A)

B. SOFTWARE

1. NON CPU COLD LOAD TAPE # 30000-10017/11017

IV. DETAILED OPERATING INSTRUCTION

A. OPERATING INSTRUCTIONS

1. LOADING

TO LOAD THE DIAGNOSTIC REFER TO LOADING PROCEDURE IN THE SDUP MOD 03000-90125

2. RUNNING

A. UPON COMPLETION OF A SUCCESSFUL LOAD, THE FOLLOWING MESSAGES ARE PRINTED AT THE CONTROL TERMINAL:

D99 01 DISC FILE (HP 30102A) DIAGNOSTIC CONFIGURATION
(D423A.XX.Y)

Q99 02 DECIMAL DEVICE NUMBER?

B. THE TEST OPERATOR NOW INPUTS THE DECIMAL NUMBER OF THE CONTROLLER TO BE TESTED AND TERMINATES BY A CARRIAGE RETURN THE FOLLOWING MESSAGE IS PRINTED:

Q99 03 INTERRUPTS ON OR OFF?

C. THE TEST CAN BE RUN WITH INTERRUPTS ON OR OFF. IT OFTEN HELPS IF THE DISC FUNCTIONS CAN BE ISOLATED FROM THE INTERRUPT SYSTEM. THE OPERATOR RESPONDS BY KEYING IN ON OR OFF, FOLLOWED BY A CARRIAGE RETURN.

P99 61 PAUSE AFTER CONFIGURATION

CONFIGURATION IS NOW COMPLETED. PRESS 'CR' TO CONTINUE.

NOTE: S0, AND THEN THE REST OF THE TEST, ARE EXECUTED IMMEDIATELY FOLLOWING THIS LAST CARRIAGE RETURN. CONSEQUENTLY, ALL PROGRAM OPTION SWITCHES MUST BE SET BEFORE COMPLETION OF THIS INPUT.

PROGRAM WILL NOT IGNORE INITIAL INTERRUPTS WHEN PACKS ARE LOADED. THESE INTERRUPTS ARE IN GENERAL TREATED AS UNEXPECTED.

D. THE PROGRAM TITLE IS PRINTED AND THE PROGRAM IS INITIALIZED:

D99 07 DISC FILE (HP 30102A) DIAGNOSTIC OFF LINE
(D423A.XX.Y)

E. IF A DISC FILE NEEDS TO BE FORMATTED, THE OPERATOR USES SECTION S1 (WITH SWITCH REGISTER BIT 15 SET)

NOTE: ANY NEW DISC PACK OR ONE THAT WAS FORMATTED ON A SYSTEM OTHER THAN THE HP 3000 MUST BE FORMATED BEFORE TEST CAN BE RUN

F. THE OPERATOR IS ASKED THE FOLLOWING MESSAGE:

D99 68 RESTART?(YES/NO)

THE OPERATOR CAN RESTART THE PROGRAM CONFIGURATION BY YES AND CARRIAGE RETURN RESPOND. NO AND CARRIAGE RETURN IS FOR RESUME.

NOTE: THE QUESTION D99 68 RESTART?(YES/NO) IS ISSUED ANYTIME A CHANGE (SWITCH REGISTER BIT 1 SET) IS REQUESTED.

G. FOLLOWING EACH SECTION, BITS OF SWITCH REGISTER AND SECTION REGISTER ARE CHECKED IN THE FOLLOWING ORDER: BITS 14,13 OF SECTION REGISTER, SWITCH 14 OF SWITCH REGISTER AND BIT 11 OF SECTION REGISTER.

H. THE PROGRAM EXECUTES S1 THROUGH S5 ACCORDING TO THE PROGRAM OPTION BITS SELECTED. IF MULTIPLE DRIVE UNITS HAVE BEEN SELECTED (SEE PROGRAM OPTION BIT 1 OF SWITCH REGISTER), S1 THROUGH S4 IS EXECUTED FOR EACH DRIVE UNIT; THEN S5 IS EXECUTED.

I. FOLLOWING SECTION S5,(FOR MULTIPLE UNITS SELECTED) OR SECTION S4 (FOR ONLY ONE UNIT SELECTED), THE PASS NUMBER IS INCREMENTED. THE PASS NUMBER IS REPORTED ON THE CONTROL TERMINAL BY MESSAGES 56,57,58, DEPENDING ON BITS 13,14 AND 15 OF THE SECTION REGISTER.

J. THE TEST REPEATS (FROM S1) UNTIL MANUALLY HALTED BY THE OPERATOR.

B. O P T I O N S

THE INTERNAL SWITCH REGISTER IS USED TO SPECIFY PROGRAM OPTIONS DURING EXECUTION OF THE TEST. THE INTERNAL SWITCH REGISTER IS LOADED FROM THE EXTERNAL SWITCH REGISTER WHENEVER SWITCH ZERO OF THE EXTERNAL SWITCH REGISTER IS SET. THIS MEANS THAT THE EXTERNAL REGISTER IS FREE FOR OTHER USES DURING THE TEST, E.G., BREAKPOINT HALTS.

ANOTHER SWITCH SETTING THAT REQUIRES EXPLANATION IS SWITCH 1. IF THIS SWITCH IS SET, THE PROGRAM INITIATES A DIALOGUE WITH THE OPERATOR (MESSAGES 68,8 THROUGH 16). THE OBJECT OF THIS DIALOGUE IS TO ASK THE OPERATOR TO RESTART THE PROGRAM (IF HE WISHES IT FOR ANY REASON), THEN TO MAKE THE CHANGE OF THE SECTION REGISTER AND TO INFORM THE OPERATOR OF THE CURRENT SET OF TEST PARAMETERS FOR DRIVES, DISC CYLINDERS, TEST PATTERNS AND HEAD SECTION IF IT IS REQUIRED UPON SECTION REGISTER. THE USER CAN THEN ALTER THE SET AS HE WISHES. TABLE 2 LISTS SWITCH REGISTER AND TABLE 3 SECTION REGISTER SETTINGS.

TABLE 2 SWITCH REGISTER SETTING

BIT	FUNCTION IF SET
0	SELECT EXTERNAL REGISTER
1	SET TO CHANGE SECTION REGISTER
2	NOT USED
3	NOT USED
4	NOT USED
5	NOT USED
6	NOT USED
7	D,E-CLASS MESSAGES TO LINE PRINTER
8	NOT USED
9	SUPPRESS E-CLASS MESSAGES
10	SUPPRESS D-CLASS MESSAGES
11	LOOP ON CURRENT STEP
12	PAUSE ON ERROR
13	PAUSE AT END OF CURRENT STEP
14	PAUSE AFTER CURRENT SECTION
15	PAUSE AFTER PASS THROUGH DIAGNOSTIC, USE ALL OF S1

TABLE 3 SECTION REGISTER SETTING

BIT	FUNCTION IF SET
0	NOT USED
1	NOT USED
2	NOT USED
3	NOT USED
4	NOT USED
5	NOT USED
6	SET UP AND IGNORE DEFECTIVE TRACK
7	CHANGE UNIT, CYLINDER, HEAD OR PATTERN TABLE
8	NOT USED
9	NOT USED
10	NOT USED
11	LOOP ON CURRENT SECTION
12	SHORT PRINT
13	SHORTEN TEST SOMEWHAT
14	SHORTEN TEST SEVERELY
15	RESTRICT CYLINDERS ARE NOT USED

C. HALT AND MESSAGE TABLES

THE GENERAL FORMAT OF A DIAGNOSTIC MESSAGE TO THE OPERATOR IS THE FOLLOWING: A LETTER PREFIX; DECIMAL STEP NUMBER; DECIMAL MESSAGE NUMBER; TEXT. TABLE 4 LISTS MESSAGES.

THE LETTER PREFIX IDENTIFIES THE CLASS OF THE MESSAGE. THERE ARE FOUR MESSAGE CLASSES:

MESSAGE CLASS	CONTENT
D	DATA INFORMATION WHICH REQUIRES NO OPERATOR RESPONSE.
E	ERROR MESSAGE WHICH INDICATE THAT DISC FILE FAILED SOME PORTION OF THE DIAGNOSTIC TEST.
P	DIAGNOSTIC PROGRAM HAS PAUSED, WAITING FOR OPERATOR ACTION IS PERFORMED ENTER CARRIAGE RETURN AT TERMINAL TO CONTINUE TEST. IF MESSAGE HAVE BEEN SUPRESSED, PRESS RUN ON SYSTEM CONTROL PANEL TO CONTINUE.
Q	INPUT FROM OPERATOR AT CONTROL TERMINAL IS REQUIRED. CARRIAGE RETURN FOLLOWING INPUT CONTINUES TEST.

EXAMPLE:

EXAMPLE OF PRINTOUT FROM STEP 1 WITH PACK NOT LOADED AND PROGRAM PAUSED AFTER ERROR ON UNIT ZERO:

```
D01 23 RC
E01 24 STATUS IS    0 001 011 010 011 000
       SHOULD BE    D 0D1 000 000 000 000
P01 25 CYL 0000 HEAD 00 SECTOR 00 WORD COUNT 0000 UNIT 00
```

NOTE: STATUS CHECKING IS PROVIDED BY COMPARING THE HARDWARE STATUS BIT BY BIT AGAINST THE EXPECTED STATUS. ANY BIT OF THE EXPECTED STATUS MAY BE IN A DON'T CARE STATE (EXPRESSED AS D).

TABLE 4. MESSAGES

CLASS	MESSAGE NUMBER	MESSAGE	COMMENTS
D	01	DISC FILE (30102A) DIAGNOSTIC CONFIGURATION (D423A.UU.F)	CONFIGURATION SECTION PREAMBLE.
Q	02	DECIMAL DEVICE NUMBER?	INPUT DECIMAL DEVICE NUMBER.
Q	03	INTERRUPTS ON OR OFF?	INPUT ON OR OFF.
D	04	ST	CURRENT OPERATION IS HARDWARE STATUS COMMAND.
P	05	PAUSE XXXX	TYPE RETURN TO CONTINUE.
D	06	RF	CURRENT OPERATION IS READ FULL SECTOR.
D	07	DISC FILE (30102A) DIAGNOSTIC OFF-LINE (D423A.UU.F)	SECTION ZERO PREAMBLE.
D	08	UNIT NUMBER TABLE X DRIVE(S):A,B...	X=NUMBER OF DRIVES. A,B=DRIVE NUMBERS.
Q	09	WISH TO ALTER TABLE?	ANSWER Y OR N.
Q	10	ENTER UNIT NUMBERS SEPARATED BY COMMAS	ALL ON ONE LINE.
D	11	CYLINDER TABLE XXXX,XXXX,XXXX,XXXX, XXXX,XXXX,XXXX,XXXX, XXXX,XXXX,XXXX,XXXX	CONTENTS OF CYLINDER TABLE.
Q	12	ENTER CYLINDERS SEPARATED BY COMMAS	ALL ON ONE LINE.
D	13	PATTERN TABLE XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX	CONTENTS OF PATTERN TABLE. (XXXXXX=PATTERN IN OCTAL).
Q	14	ENTER PATTERNS SEPARATED BY COMMAS	ALL ON ONE LINE.

TABLE 4. MESSAGES
(CONT.)

CLASS	MESSAGE NUMBER	MESSAGE	COMMENTS
E	15	ADDRESS READ WAS XXXXXX AND YYYYYY	A READ ADDRESS OPERATION DID NOT RETURN THE EXPECTED ADDR. VALUES ARE IN OCTAL. XXXXXX SHOULD MATCH THE CYLINDER NUMBER. LEFT BYTE OF YYYYYY SHOULD MATCH THE HEAD NUMBER.
D	16	WA	CURRENT OPERATION IS WRITE ADDRESS.
P	17	UNLOAD HEADS ON UNIT XX	REMOVE HEADS FROM PACK. INPUT RETURN.
P	18	LOAD HEADS ON UNIT XX AFTER PACK STOPS	RELOAD HEADS. WHEN SPINNING STOPS! INPUT RETURN.
D	19	RA	CURRENT OPERATION IS READ ADDRESS.
D	20	SA	CURRENT OPERATION IS SKIP ADDRESS.
	21	NOT USED	
E	22	SIO BUSY (>)	CONDITION CODE IS CCG ON SIO.
D	23	RC	CURRENT OPERATION IS RECALIBRATE.
E	24	STATUS IS X XXX XXX XXX XXX XXX SHOULD BE X XXX XXX XXX XXX XXX	HARDWARE STATUS DOES NOT EQUAL EXPECTED STATUS. VALUES ARE IN TERNARY (D=DON'T CARE)
D OR P	25	CYL XXX HEAD XX SECTOR XX WORD COUNT XXXX UNIT XX	CONTENTS OF CURRENT SOFTWARE VARIABLES.
	26	NOT USED	
D	27	INPUT ERROR	BAD INPUT FROM OPERATOR I/O DEVICE.
E	29	XXXX WORDS TRANSFERRED YYYY EXPECTED	TRANSFER DID NOT COMPLETE.

TABLE 4. MESSAGES
(CONT.)

CLASS	MESSAGE NUMBER	MESSAGE	COMMENTS
	30	NOT USED	
E	31	NO RESPONSE (<) TO SIO	CONDITION CODE IS CCL ON SIO.
D	32	CD	CURRENT OPERATION IS CYCLE CHECK.
D	33	CB	CURRENT OPERATION IS SOFTWARE VERIFICATION OF DATA READ PREVIOUSLY.
D	34	FT	CURRENT OPERATION IS FLAG TRACK.
E	35	NO RESPONSE(<) TO CIO	CONDITION CODE IS CCL ON CIO.
E	36	ILLEGAL RESPONSE TO CIO	CONDITION CODE IS CCG OR NONE ON CIO.
D	37	SK	CURRENT OPERATION IS SEEK.
D	38	WD	CURRENT OPERATION IS WRITE DATA.
D	39	RD	CURRENT OPERATION IS READ DATA.
E	40	DATA WORD XXXX IS YYYYYY SHOULD BE ZZZZZZ	THE DATA RETURNED ON A READ DID NOT MATCH THE EXPECTED DATA. ONLY GIVEN FOR FIRST ERROR AND WHEN VERIFYING ADDRESS.
E	41	BUFFER CHECKSUM XXXXXX CYL XXXXXX(YYYY)HD/S XXXXXX (H=YY S=YY)	THE CHECKSUM SHOULD BE ZERO AND THE ADDRESS IN PARENTHESES (DECIMAL) SHOULD MATCH THE ONE TYPED OUT IN THE NEXT MESSAGE 25.(XXXXXX=VALUE IN OCTAL.) EITHER THE WRONG SECTOR WAS READ OR A DATA ERROR OCCURRED.

TABLE 4. MESSAGES
(CONT.)

CLASS	MESSAGE NUMBER	MESSAGE	COMMENTS
NOTE:		EACH SECTOR IS CHECKSUMMED SEPARATELY. THE ENTIRE SECTOR SUMS TO ZERO. THIS SIX-DIGIT OCTAL SUM IS REPORTED AS THE BUFFER CHECKSUM. THE FIRST TWO WORDS SUM TO THE CYLINDER NUMBER AND THE SIX-DIGIT OCTAL SUM IS REPORTED AS THE CYL. THE FOUR-DIGIT DECIMAL EQUIVALENT IS SHOWN IN PARENTHESES. THIS EQUIVALENT MAY BE MEANINGLESS IF THE SUM IS AN INVALID CYLINDER NUMBER. WORDS TWO AND THREE SUM TO THE HEAD/SECTOR NUMBER;THE HEAD IS IN THE LEFT HALF OF THE WORD AND THE SECTOR IS IN THE RIGHT HALF. THE SIX-DIGIT OCTAL SUM IS REPORTED AS THE HD/S. THE TWO-DIGIT DECIMAL EQUIVALENT MAY BE MEANINGLESS FOR AN INVALID HEAD OR SECTOR.	
	42	NOT USED	
E	43	NO RESPONSE(<) TO TIO	CONDITION CODE IS CCL ON TIO.
E	44	ILLEGAL RESPONSE TO TIO	CONDITION CODE IS CCG OR NONE ON TIO.
P	45	END OF SECTION X	PAUSE AFTER SECTION X.
P	46	END OF STEP	PAUSE AFTER STEP.
P	47	END OF PASS	PAUSE AFTER PASS.
E	48	MISSING INTERRUPT	NO INTERRUPT FOLLOWING CURRENT OPERATION.
E	49	LATE INTERRUPT	MISSING INTERRUPT OCCURRED DURING REPORT OF THIS ERROR.
E	50	NO RESIDUE RETURNED	UNABLE TO CHECK WORD COUNT.
P	51	RESET SWITCH 1(FLAG 16)	PROGRAM WILL CONTINUE WHEN CLEAR.
D	52	WF	CURRENT OPERATION IS WRITE FULL SECTOR.
D	53	CA	CURRENT OPERATION IS COMPARE ADDRESS.

TABLE 4. MESSAGES
(CONT.)

CLASS	MESSAGE NUMBER	MESSAGE	COMMENTS
D	54	MC	CURRENT OPERATION IS MASTER CLEAR (DIRECT COMMAND WITH BIT 0 SET).
D	55	PC	CURRENT OPERATION IS PACK CERTIFICATION TEST.
D	56	LONG PASS XXXX	XXXX=NUMBER OF CYCLES COMPLETED. LONG IMPLIES BITS 13,14 AND 15 OF SECTION REGISTER WERE CLEAR FOR ENTIRE PASS.
D	57	MEDIUM PASS XXXX	XXXX=NUMBER OF CYCLES COMPLETED. MEDIUM IMPLIES BITS 14 AND 15 OF SECTION REGISTER WERE CLEAR FOR ENTIRE PASS AND BIT 13 OF SECTION REGISTER WAS SET DURING PASS.
D	58	SHORT PASS XXXX	XXXX=NUMBER OF CYCLES COMPLETED. SHORT IMPLIES BITS 14 AND 15 OF SECTION REGISTER WERE SET DURING PASS.
E	59	ILLEGAL RESPONSE TO SIO	NO CONDITION CODE.
	60	NOT USED	
P	61	PAUSE AFTER CONFIGURATION	SET PROGRAM OPTIONS, INPUT RETURN.
E	62	NO RESPONSE (<) TO SIN	CONDITION CODE IS CCL TO SIN.
E	63	ILLEGAL RESPONSE TO SIN	CONDITION CODE IS CCG OR NONE TO SIN.
	64	NOT USED	
E	65	MISSING ATTENTION STATUS	ATTENTION STATUS (%37) DID NOT FOLLOW A SEEK OR RECALIBRATE.

TABLE 4. MESSAGES
(CONT.)

CLASS	MESSAGE NUMBER	MESSAGE	COMMENTS
E	66	INTERRUPT STATUS XXXXXX...	USED AT STEP 61 TO DUMP THE TABLE OF ALL INTERRUPT STATUS WORDS OBTAINED SINCE THE MULTIPLE SEEKS (STEP60) BEGAN. UP TO EIGHT VALUES APPEAR, DEPENDING ON THE NUMBER OF INTERRUPTS (NOT THE NUMBER OF UNITS).
D	67	PRESENT OCTAL SECTION REGISTER IS %XXXXXX	INFORMATION ABOUT PRESENT SECTION REGISTER.
D	68	RESTART?(YES/NO)	ENTER YES FOR RESTART, NO FOR RESUME.

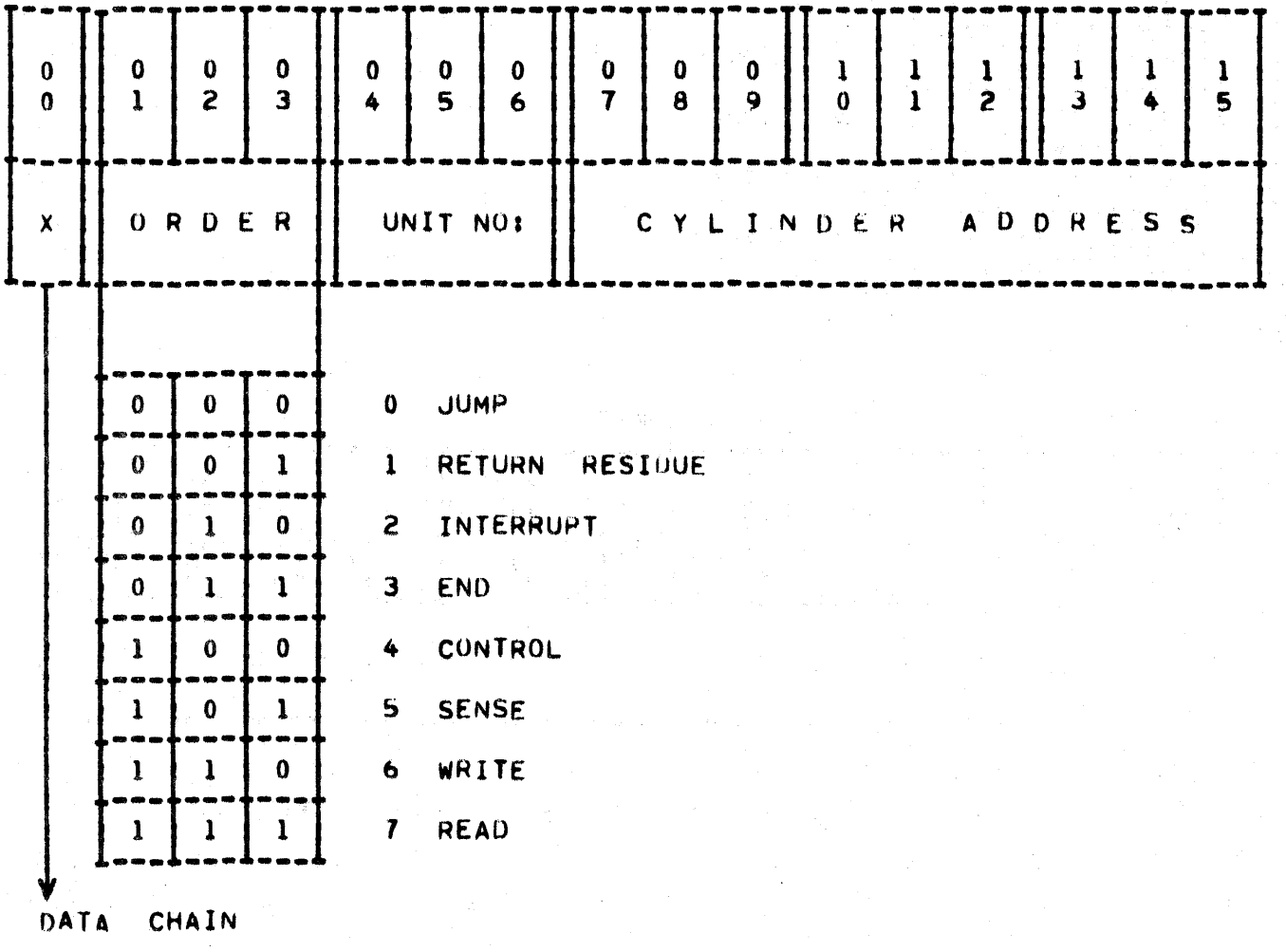
D. PRE-CONFIGURATION OPTIONS

THE DIAGNOSTIC PROGRAM HAS BEEN PRECONFIGURED IN THE BEST LOAD AND GO CONFIGURATION USING THE OPTIONS AVAILABLE FROM THE SWITCH AND SECTION REGISTER (CHAPTER III B). THE SWITCH REGISTER=%100000 AND SECTION REGISTER=0 MEANS THE RUN OF THE LONG CYCLE WITH ALL CYLINDERS. THE EXECUTION OF ONE CYCLE WITHOUT THE INTERACTIVE SEGMENT IN SECTION 1 TAKES APROX. 3.5 HOURS.

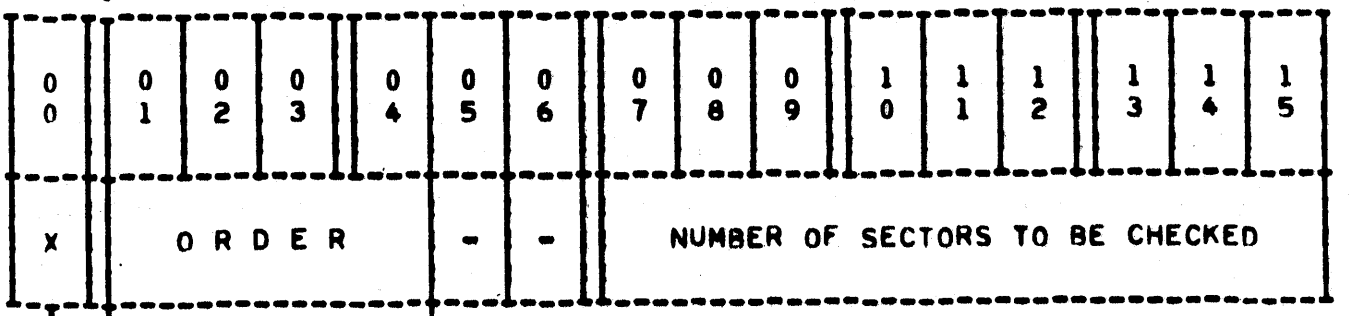
THE PROGRAMMED PRE-CONFIGURATION (DRT OF CONSOLE AND LINE PRINTER) CAN BE ALTERED WHEN THE DIAGNOSTIC COLD LOAD TAPE IS BEING CREATED UNDER SDUP (SYSTEM DIAGNOSTIC UTILITY PROGRAM FOR HP 3000 SYSTEMS II).

E. CONTROL AND STATUS WORD FORMATS

1. IOCW1 - FORMAT



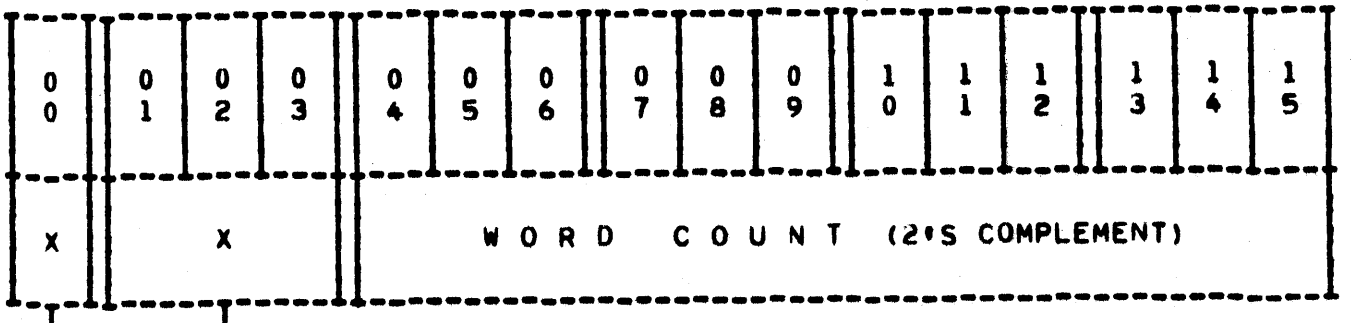
2. I O C W 2 - FORMAT



0 0 0 0	0 JUMP
0 0 0 1	1 RETURN RESIDUE
0 0 1 0	2 INTERRUPT
0 0 1 1	3 END
0 1 0 0	4 CONTROL
0 1 0 1	5 SENSE
0 1 1 0	6 WRITE
0 1 1 1	7 READ

DATA CHAIN

3. D A T A B L O C K - FORMAT



SPECIFIES EITHER W R I T E OR R E A D OPERATION CODE

W O R D C O U N T (2'S COMPLEMENT)

4. I O A W 1 - FORMAT

* * * * * * * *

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
OPERATION CODE				-	H E A D ADDRESS					-	SECTOR ADDRESS				

IOCW2

0	0	0	0	00	COLD LOAD READ
0	0	0	1	01	RECALIBRATE
0	0	1	0	02	SEEK
0	0	1	1	03	STATUS CHECK
0	1	0	0	04	READ ADDRESS
0	1	0	1	05	READ DATAED
0	1	1	0	06	READ FULL SECTOR
0	1	1	1	07	CYCLIC CHECK
1	0	0	0	10	WRITE DATA
1	0	0	1	11	WRITE FULL SECTOR
1	0	1	0	12	SKIP ADDRESS READ DATA
1	0	1	1	13	WRITE ADDRESS
1	1	0	0	14	PACK CERTIFICATION TEST
1	1	0	1	15	NOT USED
1	1	1	0	16	NOT USED
1	1	1	1	17	NOT USED

IOCW2

*) EIGHT BITS SELECTED BY CPU CONSOLE SWITCHES FOR A'COLD LOAD' OPERATION (IODW).

5. STATUS WORD - FORMAT

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
SO	2TPI	IR	OL	DU	SI	DB	PC	CONTROLLER STATUS					UNIT NO:		

- SIO OK
- 200 TPI
- INTERRUPT REQUEST
- ON - LINE
- DRIVE UNSAFE
- SEEK INCOMPLETE
- DRIVE BUSY
- PACK CHANGE

08	09	10	11	12	
0	0	0	0	0	NO ERROR
0	0	0	0	1	ILLEG.OP-CODE
0	0	0	1	1	CYL.# TOO BIG
0	0	1	0	0	HEAD# TOO BIG
0	0	1	0	1	TIME OUT
0	0	1	1	0	DEFECTIVE T
0	0	1	1	1	HEADS MIS-POS
0	1	0	0	0	CYCLIC ERR.IN ADDR.FIELD
0	1	0	0	1	CYCLIC ERR.IN DATA FIELD
0	1	0	1	0	I/O PROG.ERR
0	1	0	1	1	SEQ.ERROR
0	1	1	0	0	CYL.OVERRUN
0	1	1	0	1	SEC.COUNT=0
0	1	1	1	0	DATA OVERRUN
1	0	0	0	0	ILL.TERMINAT.
1	0	1	0	0	TRANSF.ERROR
1	0	0	1	1	DRIVE ERROR
1	1	1	1	1	DRIVE ATTENT.

V. DETAILED DESCRIPTION OF TESTS

SECTION NAME	STEP NUMBER	FUNCTION
S1	1	RECALIBRATES AND CHECKS THE STATUS WORD. CONTROLLER STATUS (BITS 8-15) SHOULD BE = 0.
	2	FORMATS FIRST CYLINDER IN CYLINDER TABLE AT HEAD 0 AND READS BACK ADDRESSES TO VERIFY THEY WERE WRITTEN PROPERLY.
	3	WRITES ON FIRST CYLINDER IN CYLINDER TABLE AT HEAD ZERO. THE CONTROLLER STATUS SHOULD BE ZERO.
	4	READS FIRST CYLINDER IN CYLINDER TABLE AT HEAD ZERO. CONTROLLER STATUS SHOULD BE ZERO.
	5	PLACES THE DEFECTIVE TRACK BIT ON FIRST CYLINDER TABLE AT HEAD ZERO. READS BACK THE ADDRESSES TO VERIFY THE ADDRESS WRITING CAPABILITY.
	6	WRITES ON FIRST CYLINDER IN CYLINDER TABLE AT HEAD ZERO. CONTROLLER STATUS SHOULD BE %06.
	7	READS FIRST CYLINDER IN CYLINDER TABLE AT HEAD ZERO. CONTROLLER STATUS SHOULD BE %06.
	8	DUPLICATES STEP 2.
NOTE: IF BIT 12 OF SWITCH REGISTER IS NOT SET, SKIP TO STEP 20. OTHERWISE, CONTINUE FROM STEP 9.		
	9	PERFORMS PACK CERTIFICATION AND FORMATS THE ENTIRE PACK. PACK IS CERTIFIED USING THE THREE PATTERNS: %52525,%125252 AND %177777. IF BIT 6 OF THE SECTION REGISTER IS SET, TRACKS WHICH ARE DEFECTIVE WILL BE FLAGGED WHEN FORMATTED.
NOTE: STEP 10 DOES NOT EXIST IN THIS DIAGNOSTIC.		
	11	UNLOADS THE HEADS ON THE DRIVE. THIS STEP NOTIFIES THE OPERATOR TO PERFORM THE MANUAL OPERATION OF PHYSICALLY REMOVING THE HEADS. SEE MESSAGE P17.
	12	VERIFIES STATUS FOR "PACK CHANGE".

SECTION NAME	STEP NUMBER	FUNCTION
NOTE:	STEPS 13 THROUGH 17 DO NOT EXIST IN THIS DIAGNOSTIC.	
S1 (CONT.)	18	LOADS THE HEADS ON THE DRIVE. THIS STEP NOTIFIES THE OPERATOR TO PERFORM THE MANUAL OPERATION OF PHYSICALLY REPLACING THE HEADS. SEE MESSAGE P18.
	19	VERIFIES STATUS FOR "PACK CHANGE".
	20	DUPLICATES STEP 1.
	21	READS SECTOR ADDRESS AND VERIFIES THAT THEY ARE ON THE PROPER CYLINDER AND HEAD.
	22	ACCORDING TO THE SETTING OF SECTION REGISTER BIT 15, SEEKS TO EACH CYLINDER AND READS ADDRESSES
	23	SENDS ILLEGAL OPERATION CODES TO THE CONTROLLER AND VERIFIES CONTROLLER STATUS FOR %01.
	24	SEEKS TO THE LAST CYLINDER + 1 AND VERIFIES STATUS FOR %03. ISSUES RECALIBRATE.
	25	SEEKS TO THE FIRST ENTRY IN THE CYLINDER TABLE.
	26	WRITES ONE SECTOR ON HEAD ZERO, SECTOR ZERO, USING RANDOM DATA;
	27	WRITES TWO SECTORS STARTING ON HEAD 0, SECTOR 7.
	28	READS, USING OPCODE ZERO, AND VERIFIES SECTOR ZERO.
	29	USING OPCODE 5, READS AND VERIFIES SECTOR 7 AND 8.
	30	WRITE FOUR SECTORS, STARTING AT HEAD ZERO, SECTOR 20. THE END ORDER INTERRUPTS.
	31	PERFORMS A CYCLIC CHECK OF TWO SECTORS, STARTING AT HEAD ZERO, SECTOR 7.
	32	READS AND VERIFIES FOUR SECTORS STARTING AT HEAD ZERO, SECTOR 20. CONTROLLER STATUS OF %07 OCCURS IF JUMP ORDER FAILS.
	33	WRITES TWO WORDS, STATRTING AT HEAD 19, SECTOR 10.

SECTION NAME	STEP NUMBER	FUNCTION
S1 (CONT.)	34	WRITES FOUR SECTORS AT LAST SECTOR MINUS 2. CHECKS CONTROLLER STATUS FOR %14.
	35	READS 30 WORDS, STARTING AT LAST HEAD, SECTOR 10. CHECKS WORD CONTENTS TO VERIFY FILL.
	36	READS FOUR SECTORS, STARTING AT LAST HEAD, LAST SECTOR MINUS 2. CHECKS CONTROLLER STATUS FOR %14.
	37	SEEKS TO CYLINDER ZERO. READS ONE SECTOR, STARTING AT CYLINDER 10. CHECKS CONTROLLER STATUS FOR %07.
	38	SEEKS TO THE LAST CYLINDER (OR SEEKS TO CYLINDER ZERO, IF THE FIRST CYLINDER IN THE CYLINDER TABLE IS THE LAST CYLINDER) AND THEN SEEKS TO THE FIRST CYLINDER LISTED IN THE CYLINDER TABLE. THE READS ONE SECTOR,STARTING AT THE LAST HEAD, LAST SECTOR MINUS 2.
NOTE: IN STEP 38 THE READ COMMAND IS ISSUED BEFORE THE SEEK IS COMPLETE. CONTROLLER STATUS %23 AND STATUS WORD BIT 6 ARE VERIFIED.		
	39	ISSUES "SKIP ADDRESS" COMMAND AND VERIFIES THAT DATA READ IS FROM SECTOR ZERO. "READ FULL SECTOR" COMMAND IS THEN ISSUED AND CYCLIC CHECK WORD IS VERIFIED.
	40	SEEKS TO HEAD 20 AND ATTEMPTS TO WRITE ON DISC. VERIFIES CONTROLLER STATUS FOR %04.
	41	SEEKS TO LAST SECTOR PLUS 1,ATTEMPTS TO READ FROM DISC AND CHECKS CONTROLLER STATUS FOR %05.
	42	SEEKS TO HEAD ZERO, SECTOR ZERO AND WRITES ONE FULL SECTOR WITH IMPROPER CYCLIC CHECK WORD. VERIFIES THE DATA WRITTEN WITH A FULL SECTOR READ OPERATION. PERFORMS A CYCLIC CHECK ON SECTOR ZERO AND THEN CHECKS CONTROLLER STATUS %11. READS SECTOR ZERO AND THEN CHECKS FOR CONTROLLER STATUS %11 AGAIN. READS SECTOR ZERO WITH SKIP ADDRESS READ, CHECKS CONTROLLER STATUS OF ZERO, AND AND VERIFIES DATA. REFORMATES TRACK.

SECTION NAME	STEP NUMBER	FUNCTION
S1 (CONT.)	43	ISSUES SIO PROGRAM TO WRITE WITH READ OPCODE. CHECKS CONTROLLER STATUS FOR %12. ALSO TRIES TO WRITE ADDRESS WITH READ OPCODE.
	44	ISSUES SIO PROGRAM TO READ WITH WRITE OPCODE. CHECKS CONTROLLER STATUS FOR %12.
	45	PERFORMS A CYCLIC CHECK ON GROUPS OF SECTORS STARTING AT HEAD ZERO, SECTOR ZERO. (ONE SECTOR, THEN 2 SECTORS, THEN 4,8,16,32,64,128 AND 256 SECTORS.) THEN PERFORMS A CYCLIC CHECK WITH SECTOR COUNT EQUAL TO ZERO. CONTROLLER STATUS RESULTING FROM LAST COMMAND SHOULD BE %15.
	46	WRITES ON SECTORS ZERO AND 1 USING DATA CHAINING. READS BACK DATA USING DATA CHAINING, THEN VERIFIES IT.
	47	TRIES TO PERFORM A SEEK WHILE ANOTHER SEEK IS IN PROGRESS. CHECKS STATUS FOR BIT 6 SET AND CONTROLLER STATUS = %23.
	48	WRITES ADDRESS WITH WORD COUNT OF 45; CHECKS CONTROLLER STATUS FOR %20. READS ADDRESS WITH WORD COUNT OF 45; CHECKS CONTROLLER STATUS FOR %20. WRITES ADDRESS WITH WORD COUNT OF 44; CHECKS CONTROLLER STATUS FOR %20.

NOTE: THE FOLLOWING SECTION 2 WRITES AND READS BACK DATA PATTERNS TO CHECK FOR FAULTY DISC PACKS AND HEADS. THE DEVICE IS ALTERNATELLY WRITTEN FORWARD,THEN BACKWORD. THE ROUTINE CONTINUES TO LOOP UNTIL ALL CYLINDERS HAVE BEEN SELECTED ACCORDING TO SECTION REG. BIT 15. NUMBER OF PATTERNS TO USE FOR EACH CYLINDER IS DETERMINED BY SEC. REGISTER BIT 7. SECTION 2 IS NOT EXECUTED WHEN BIT 14 OF SECTION REGISTER IS SET.

SECTION NAME	STEP NUMBER	FUNCTION
S2	49	SELECTS A CYLINDER ACCORDING TO THE SETTING OF SECTION REGISTER BIT 15 BY STARTING AT ONE END OF THOSE CYLINDERS AVAILABLE AND CHOOSING THEM ONE AT A TIME UNTIL THE OTHER END IS REACHED; THEN SEEKS TO THE SELECTED CYLINDER.

NOTE: EXECUTE THE FOLLOWING TWO STEPS TEN TIMES, IF BIT 13 OF THE SECTION REGISTER IS NOT SET,OR FIVE TIMES IT IS SET. A DIFFERENT ENTRY OF THE OCTAL DATA PATTERN TABLE IS USED FOR EACH TIME STEP IS EXECUTED.

	50	USING DATA CHAINING, WRITES THE ENTIRE CYLINDER.
	51	READS THE FIRST, LAST THEN MIDDLE THIRD OF EACH TRACK. VERIFIES THE DATA READ.

NOTE: THE FOLLOWING THREE STEPS ARE REPEATED AS A GROUP ACCORDING TO THE SECTION REGISTER SETTING OF BITS 14 AND 13.

BIT 14	13	REPETITIONS
SET	NOT USED	100
CLEAR	SET	512
CLEAR	CLEAR	1024

S3	52	GENERATES A RANDOM CYLINDER,HEAD,SECTOR AND WORD COUNT. REDUCES THE WORD COUNT (IF NECESSARY) TO PREVENT CYLINDER OVERFLOW. GENERATES A BUFFER OF RANDOM DATA, DUPLICATING THE LAST WORD IN THE FIRST UNUSED WORD OF THE BUFFER. SEEKS TO THE RANDOM ADDRESS.
	53	WRITES THE RANDOM DATA GENERATED IN STEP 52.
	54	READS BACK AND VERIFIES THE DATA WRITTEN IN STEP 53. (READS ONE EXTRA WORD, IF SECTOR FILL WAS NECESSARY IN STEP 53.)

NOTE: STEP 55 DOES NOT EXIST IN THIS DIAGNOSTIC.

SECTION NAME	STEP NUMBER	FUNCTION
S4	56	SAME AS STEP 49.
	57	FOR EACH HEAD, WRITES ON THE FIRST,LAST THEN MIDDLE THIRD OF THE TRACK.

NOTE: THE NEXT TWO STEPS ARE REPEATED AS A GROUP ACCORDING TO SECTION REGISTER SETTING OF BIT 13.

BIT 13	REPETITIONS
SET	4096
CLEAR	8192

	58	SEEKS TO NEXT RANDOM ADDRESS AND VERIFIES PREVIOUSLY READ DATA IF ANY.
	59	READS ONE SECTOR.
S5	60	SEEKS TO NEXT RANDOM ADDRESS ON ALL SELECTED UNITS AND VERIFIES DATA FROM LAST PREVIOUS READ IF ANY.
	61	READS ONE SECTOR FROM EACH SELECTED UNIT AFTER THEY BECOME AVAILABLE (ARE FINISHED SEEKING). THE DATA IS VERIFIED BEFORE THE NEXT READ IS PERFORMED.
S0	99	ALL STEPS IN SECTION S0 HAVE STEP NUMBER 99.