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

STAND-ALONE HP 30110A (7900A)
CARTRIDGE DISC DIAGNOSTIC

Diagnostic No. D424A

HEWLETT PACKARD

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TABLE OF CONTENTS

I. INTRODUCTION

THE STAND-ALONE HP 30110A CARTRIDGE DISC DIAGNOSTIC VERIFIES THE INPUT, OUTPUT AND CONTROL FUNCTIONS OF THE HP 30110A CARTRIDGE DISC. 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 F ILURES.

II. MINI-OPERATING INSTRUCTIONS

1. COLD LOAD DIAG FILE # FROM NON-CPU COLD LOAD TAPE
2. 099 01 CARTRIDGE DISC (30110A) DIAG CONFG (D424A.XX.Y)
   099 02 DECIMAL DEVICE NUMBER? (DRT #)
3. 099 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	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

BIT	SECTION REGISTER OPTIONS:
0	NOT USED
1	NOT USED
2	NOT USED
3	NOT USED
4	NOT USED
5	NOT USED
6	NOT USED
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 30110A CARTRIDGE DISC SUBSYSTEM (7900A)

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 THE 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 CARTRIDGE DISC (HP 30110A) DIAGNOSTIC CONFIGURATION
    D424A.XX.Y

Q99 02 DECIMAL DEVICE NUMBER?
```

B. THE TEST OPERATOR NOW INPUTS THE DECIMAL DEVICE 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 CARTRIDGE DISC (HP 30110A) DIAGNOSTIC OFF LINE
    (D424A.XX.Y)
```

E. IF A CARTRIDGE DISC 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 SERIES II MUST BE FORMATTED BEFORE THE TEST CAN BE RUN.

F. THE OPERATOR IS ASKED THE FOLLOWING QUESTION:

D99 68 RESTART? (YES/NO)

THE OPERATOR CAN RESTART THE PROGRAM CONFIGURATION BY ENTERING YES AND A CARRIAGE RETURN. NO AND A CARRIAGE RETURN WILL RESUME THE PROGRAM.

NOTE: THE OPERATOR IS ASKED THIS QUESTION WHENEVER A REQUEST FOR CHANGE IS NEEDED (SWITCH REGISTER BIT 1 SET).

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

H. THE PROGRAM EXECUTED 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 IT IS 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 TO FOR ANY REASON), TO MAKE THE CHANGE TO THE SECTION REGISTER, AND TO INFORM THE OPERATOR OF THE CURRENT SET OF TEST PARAMETERS FOR DRIVES, DISC CYLINDERS, TEST PATTERNS AND HEAD SECTIONS (IF IT IS REQUIRED BY THE SECTION REGISTER). THE USER CAN THEN ALTER THE SET AS HE WISHES. TABLE 2 LISTS THE SWITCH REGISTER SETTINGS AND TABLE 3 LISTS THE SECTION REGISTER SETTINGS.

TABLE 2 SWITCH REGISTER SETTING

BIT	FUNCTION IS 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 IS SET:
0	NOT USED
1	NOT USED
2	NOT USED
3	NOT USED
4	NOT USED
5	NOT USED
6	NOT USED
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; AND TEXT. TABLE 4 LISTS THE 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 INDICATES THAT THE CARTRIDGE DISC FAILED DURING SOME PORTION OF THE DIAGNOSTIC TEST.
P	DIAGNOSTIC PROGRAM HAS PAUSED AND IS WAITING FOR OPERATOR ACTION. ACTION IS PERFORMED WHEN A CARRIAGE RETURN IS ENTERED AT THE TERMINAL TO CONTINUE THE TEST. IF MESSAGES HAVE BEEN SUPPRESSED, PRESS RUN ON THE SOFTWARE CONTROL PANEL TO CONTINUE.
Q	INPUT FROM THE OPERATOR AT THE CONTROL TERMINAL IS REQUIRED. A CARRIAGE RETURN FOLLOWING THE INPUT CONTINUES THE TEST.

EXAMPLE:

THE FOLLOWING MESSAGE WAS PRINTED (FROM STEP 1) BECAUSE THE PACK WAS NOT LOADED AND THE PROGRAM PAUSED AFTER AN ERROR OCCURRED 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 EXPECTED STATUS MAY BE IN A DON'T CARE STATE (EXPRESSED AS D).

TABLE 4. MESSAGES

CLASS	MESSAGE NUMBER	MESSAGE	COMMENTS
D	01	CARTRIDGE DISC (HP 30110A) DIAGNOSTIC CONFIGURATION (D424A.XX.Y)	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	CARTRIDGE DISC (30110A) DIAGNOSTIC OFF-LINE (D424A.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	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 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
Q	15	TYPE A FOR HEADS 0,1; B FOR 2,3;C FOR ALTERNATELY 0,1 THEN 2,3	SELECT HEADS.(A=DISC PACK, B=FIXED PLATTER,C=BOTH).
Q	16	WISH TO SELECT HEADS?	ANSWER Y OR NO.
P	17	UNLOAD HEADS ON UNIT XX	REMOVE HEADS FROM PACK, INPUT RETURN.
P	18	LOAD HEADS ON UNIT XX	RELOAD HEADS,INPUT RETURN.
P	19	DATA PROTECT X/D	WHERE X=U FOR UPPER, X=L FOR LOWER.
P	20	CLEAR DATA PROTECT X/D	SEE 19 COMMENT.
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. THE VALUES ARE IN GROUPS OF THREE. (D=DON'T CARE)
D OR P	25	CYL XXX HEAD XX SECTOR XX WORD COUNT XXXX UNIT XX	CONTENTS OF CURRENT SOFTWARE VARIABLES.
D	27	INPUT ERROR	BAD INPUT FROM OPERATOR I/O DEVICE.
E	29	XXXX WORDS TRANSFERRED YYYY EXPECTED	TRANSFER DID NOT COMPLETE.
E	31	NO RESPONSE (<) TO SIO	CONDITION CODE IS CCL ON SIO.
D	32	CD	CURRENT OPERATION IS A CYCLE CHECK.
D	33	CB	CURRENT OPERATION IS A SOFTWARE VERIFICATION OF DATA READ PREVIOUSLY.

TABLE 4. MESSAGES
(CONT.)

CLASS	MESSAGE NUMBER	MESSAGE	COMMENTS
D	34	FT	CURRENT OPERATION IS A 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. IT WAS ONLY GIVEN FOR THE FIRST ERROR AND WHEN VERIFYING THE 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 MESSAGE 25.(XXXXXX=VALUE IN OCTAL.) EITHER THE WRONG SECTOR WAS READ OR A DATA ERROR OCCURRED.

NOTE: EACH SECTOR IS CHECKSUMMED SEPARATELY. THE ENTIRE SECTOR HAS A SUM OF 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.

TABLE 4. MESSAGES
(CONT.)

CLASS	MESSAGE NUMBER	MESSAGE	COMMENTS
	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	HALT OF SECTION X	PAUSE AFTER SECTION X.
P	46	HALT OF STEP	PAUSE AFTER STEP.
P	47	HALT OF PASS	PAUSE AFTER PASS.
E	48	MISSING INTERRUPT	NO INTERRUPT FOLLOWING CURRENT OPERATION.
E	49	LATE INTERRUPT	MISSING INTERRUPT OCCURED 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	ID	CURRENT OPERATION IS INITIALIZE DATA.
D	54	MC	CURRENT OPERATION IS MASTER CLEAR.
D	55	RN	CURRENT OPERATION IS READ NEXT FULL SECTOR.
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.

TABLE 4. MESSAGES
(CONT.)

CLASS	MESSAGE NUMBER	MESSAGE	COMMENTS
D	57	MEDIUM PASS XXXX	XXXX=NUMBER OF CYCLES COMPLETED. MEDIUM IMPLIES BITS 14 AND 15 OF SECTION REGISTER WERE CLEAR FOR THE ENTIRE PASS AND BIT 13 OF SECTION REGISTER WAS SET DURING THE 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.
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.
E	65	MISSING ATTENTION STATUS	ATTENTION STATUS (%37) DID NOT FOLLOW A SEEK OR RECALIBRATE.
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 FOUR 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.

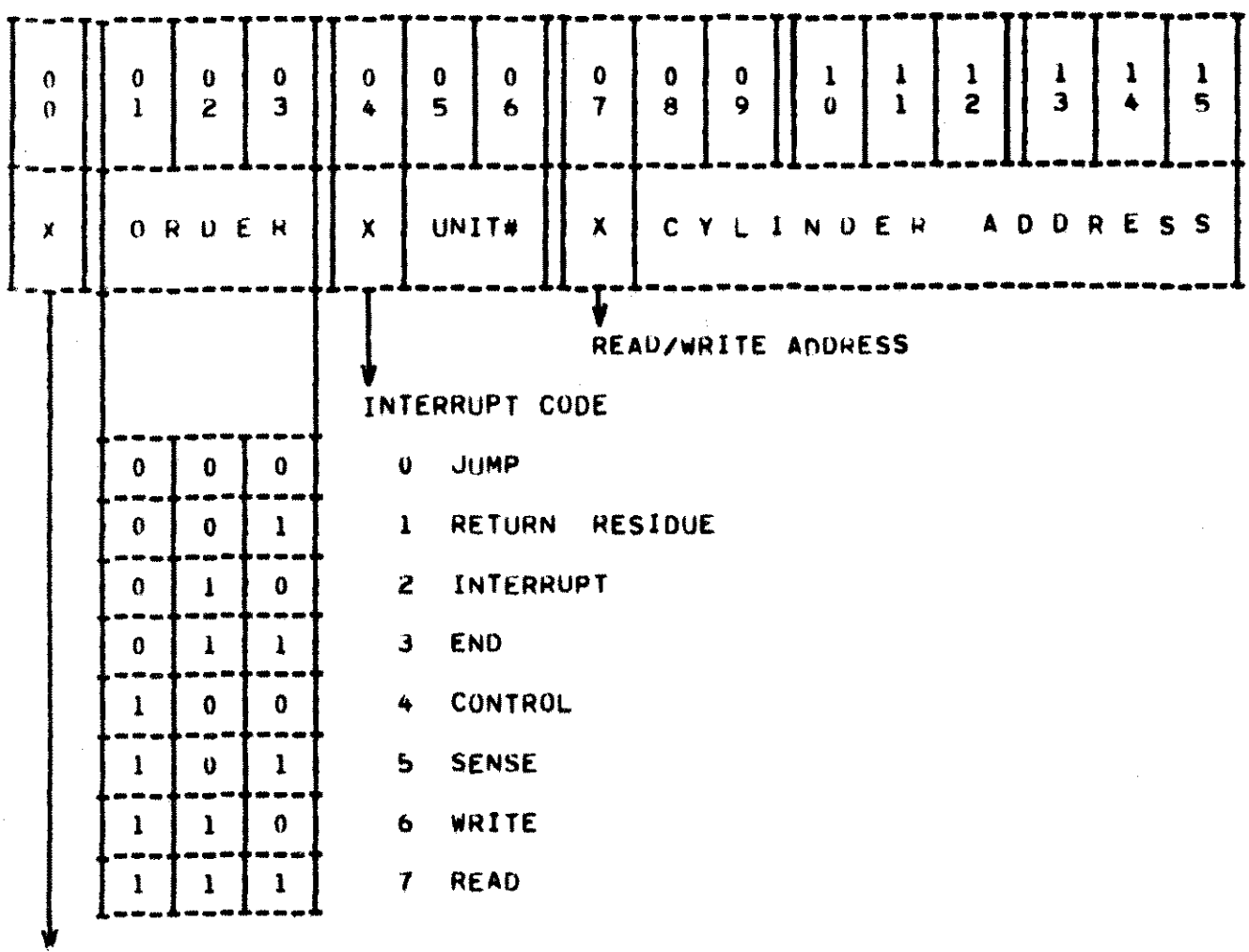
D. PRE-CONFIGURATION OPTIONS

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. 1 HOUR.

THE PROGRAMMED PRE-CONFIGURATION (DRT OF CONSOLE AND LINE PRINTER) CAN BE ALTERED WHEN THE DIAGNOSTIC COLD LOAD TAPE IS BEING CREATED UNDER SDUPII (SYSTEM DIAGNOSTIC UTILITY PROGRAM FOR THE HP3000 SERIES II).

E. CONTROL AND STATUS WORD FORMATS

1. IOCW - FORMAT

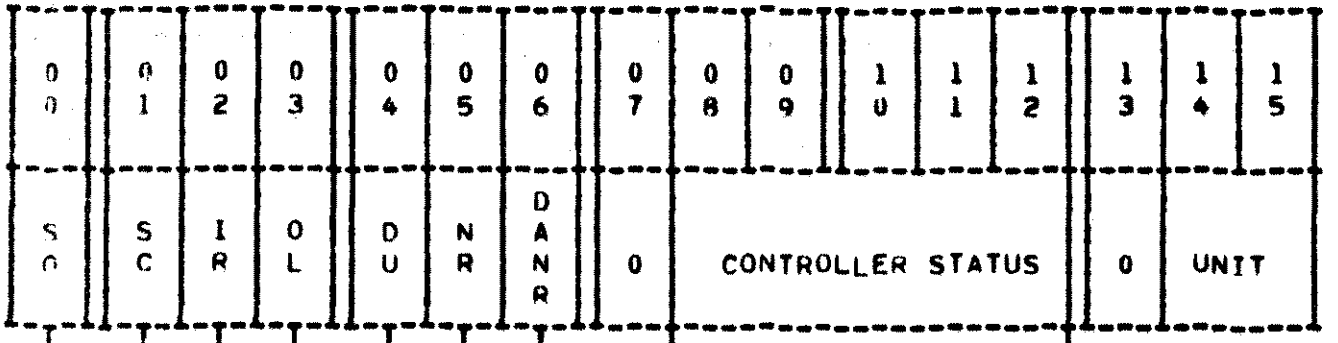


2. I O A W - FORMAT

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
OPERATION CODE				-	-	-	-	HEAD#		SECTOR CODE					

					NEXT IOCW
0	0	0	0	00 READ DATA	READ
0	0	0	1	01 RECALIBRATE	ANY
0	0	1	0	02 SEEK	ANY
0	0	1	1	03 STATUS CHECK	SENSE
0	1	0	0	04 FLAG TRACK DEFECTIVE	ANY
0	1	0	1	05 NOT USED	-
0	1	1	0	06 READ FULL SECTOR	READ
0	1	1	1	07 CYCLIC CHECK	CONTROL
1	0	0	0	10 WRITE DATA	WRITE
1	0	0	1	11 WRITE FULL SECTOR	WRITE
1	0	1	0	12 READ NEXT FULL SECTOR	READ
1	0	1	1	13 INITIALIZE DATA	WRITE
1	1	0	0	14 NOT USED	-
1	1	0	1	15 NOT USED	-
1	1	1	0	16 NOT USED	-
1	1	1	1	17 NOT USED	-

3. STATUS WORD - FORMAT



DRIVE ACCESS NOT READY	0	0	0	0	0	NO ERROR
	0	0	0	0	1	ILLEGITIMATE OP-CODE
	0	0	1	0	0	ILLEGITIMATE SECTOR #
	0	0	1	1	0	DEF. TRACK
NOT READY	0	0	1	1	1	HEAD MISSPOSITIONED
	0	1	0	0	1	CYCLICK ERROR
DRIVE UNSAFE	0	1	0	1	0	PROGRAM ERROR
	0	1	1	0	0	CYLINDER OVERRUN
ON - LINE	0	1	1	0	1	ZERO SECTOR COUNT
	0	1	1	1	0	DATA OVERRUN
INTTERRUPT REQUEST	1	0	0	1	0	ERRONEOUS H/S COMPARE
SEEK CHECK	1	0	0	1	1	ACCESS NOT READY
	1	0	1	0	0	TRANSFER ERROR
	1	0	1	1	0	DATA PROTECTION
SIO OK	1	1	1	1	1	DRIVE ATTENTION

V. DETAILED DESCRIPTION OF TESTS

SECTION NAME	STEP NUMBER	FUNCTION
S1	1	RECALIBRATES AND CHECKS THE STATUS WORD. CONTROLLER STATUS SHOULD BE ZERO.
	2	FORMATS FIRST CYLINDER IN CYLINDER TABLE AND READS BACK ADDRESSES TO VERIFY THAT THE ADDRESSES 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. READS BACK THE ADDRESSES TO VERIFY THE ADDRESSES WRITTING 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 THE SWITCH REGISTER IS NOT SET, SKIP TO STEP 20. OTHERWISE, CONTINUE FROM STEP 10.

NOTE: STEP 9 DOES NOT EXIST IN THIS DIAGNOSTIC.

	10	FORMATS THE ENTIRE DISC PACK AND READS BACK EACH ADDRESS WRITTEN FOR VERIFICATION.
	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 "ACCESS NOT READY" AND "DRIVE NOT READY".

SECTION NAME	STEP NUMBER	FUNCTION
S1 (CONT.)	13	THIS STEP NOTIFIES THE OPERATOR TO PERFORM THE MANUAL OPERATION OF SETTING THE DATA PROTECT SWITCH. SEE MESSAGE P19.
	14	THIS STEP NOTIFIES THE OPERATOR TO PERFORM THE MANUAL OPERATION OF LOADING HEADS ON THE DRIVE. SEE MESSAGE P18.
	15	ATTEMPTS TO WRITE DATA ON THE DISC AND THEN VERIFIES THAT NO DATA WAS WRITTEN. CHECKS CONTROLLER STATUS FOR %26.
	16	DUPLICATES STEP 11, ABOVE.
	17	THIS STEP NOTIFIES THE OPERATOR TO PERFORM THE MANUAL OPERATION OF CLEARING DATA PROTECT SWITCH. SEE MESSAGE P20.
	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.
NOTE: STEP 19 DOES NOT EXIST IN THIS DIAGNOSTIC.		
	20	DUPLICATES STEP 1.
	21	READS SECTOR ADDRESS AND VERIFIES THAT THEY ARE ON THE PROPER CYLINDER AND HEAD.
	22	SEEKS EACH CYLINDER ACCORDING TO THE SETTING OF THE SWITCH REGISTER BIT 5, AND READS ADDRESSES FROM EACH HEAD TO VERIFY THAT THE HEADS ARE POSITIONED CORRECTLY. A STATUS CHECK IS PERFORMED IMMEDIATELY FOLLOWING THE SEEK COMMAND AND STATUS SHOULD INDICATE "ACCESS NOT READY".
	23	SENDS ILLEGAL OPERATION CODES TO THE CONTROLLER AND VERIFIES CONTROLLER STATUS FOR %01.
	24	SEEKS THE LAST CYLINDER + 1 AND VERIFIES STATUS FOR "SEEK CHECK". ISSUES RECALIBRATE.

SECTION NAME	STEP NUMBER	FUNCTION
S1 (CONT.)	25	SEEKS THE FIRST ENTRY IN THE CYLINDER TABLE.
	26	WRITES ONE SECTOR ON HEAD ZERO, SECTOR ZERO, USING RANDOM DATA;
	27	WRITES TWO SECTORS ON HEAD ZERO, 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 21. 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 21. CONTROLLER STATUS OF %07 OCCURS IF JUMP ORDER FAILS.
	33	WRITES TWO WORDS, STARTING AT HEAD 1, SECTOR 10.
	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 FOR SECTOR FILL;
	36	READS FOUR SECTORS, STARTING AT LAST HEAD, LAST SECTOR MINUS 2. CHECKS CONTROLLER STATUS FOR %14.
	37	SEEKS CYLINDER ZERO. READS ONE SECTOR, AT CYLINDER 10. CHECKS CONTROLLER STATUS FOR %07.
	38	SEEKS THE LAST CYLINDER (OR SEEKS CYLINDER ZERO, IF THE FIRST CYLINDER IN THE CYLINDER TABLE IS THE LAST CYLINDER), THEN SEEKS THE FIRST CYLINDER LISTED IN THE CYLINDER TABLE. READS ONE SECTOR, STARTING AT THE LAST HEAD, LAST SECTOR.

NOTE: IN STEP 38 THE READ COMMAND IS ISSUED BEFORE THE SEEK IS COMPLETE. CONTROLLER STATUS %23 AND STATUS WORD BIT 6 ARE VERIFIED.

SECTION NAME	STEP NUMBER	FUNCTION
S1 (CONT.)	39	READS ONE SECTOR AT SECTOR 5, HEAD ZERO, THEN READS NEXT FULL SECTOR AND VERIFIES THAT IT IS SECTOR 8. CYCLIC CHECK WORD IS ALSO VERIFIED.
	40	WRITES A BAD ADDRESS WITH A FULL SECTOR WRITE OPERATION AT SECTOR 15, READS SECTOR 15 AND CHECKS THE CONTROLLER STATUS FOR %22,THEN REWRITES THE ADDRE
	41	SEEKS THE LAST SECTOR PLUS 1 AND CHECKS THE CONTROLLER STATUS FOR %04.
	42	SEEKS HEAD ZERO, SECTOR ZERO AND WRITES ONE FULL SECTOR WITH AN IMPROPER CYCLIC CHECK WORD. VERIFIES THE DATA WRITTEN WITH A FULL SECTOR READ OPERATION. PERFORMS A CYCLIC CHECK ON SECTOR ZERO AND CHECKS THE CONTROLLER STATUS %11. READS SECTOR ZERO AND THEN CHECKS FOR CONTROLLER STATUS %11 AGAIN. REWRITES SECTOR ZERO.
	43	ISSUES AN SIO PROGRAM TO WRITE WITH A READ OPCODE. CHECKS CONTROLLER STATUS FOR %12.
	44	ISSUES AN SIO PROGRAM TO READ WITH A 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, AND 32 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 OF %23.

NOTE: STEP 48 DOES NOT EXIST IN THIS DIAGNOSTIC.

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 THE CYLINDERS AVAILABLE AND CHOOSING THEM ONE AT A TIME UNTIL THE OTHER END IS REACHED; THEN SEEKS THE SELECTED CYLINDER.

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

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

NOTE: THE FOLLOWING THREE STEPS ARE REPEATED AS A GROUP ACCORDING TO THE SECTION 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 THE RANDOM ADDRESS AND READS THE NEXT FULL SECTOR, CHECKING FOR A SLOW HEAD SETTING.
	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, WRITE ON THE FIRST, LAST AND MIDDLE-THIRD OF THE TRACK.

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

BIT 13	REPETITIONS
SET	4096
CLEAR	8192

	58	SEEKS THE NEXT RANDOM ADDRESS AND VERIFIES PREVIOUSLY READ DATA IF ANY.
	59	READS ONE SECTOR.
S5	60	SEEKS THE NEXT RANDOM ADDRESS ON ALL SELECTED UNITS AND VERIFIES THE LAST PREVIOUSLY READ DATA, 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.