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NOTES:
3410/3411 (1: FOR 3410/3411 MAGNETIC TAPE USER'S GUIDE, REFER TO 3410/3411 INTEGRATED MAINTENANCE MANUAL.

PROGRAM ID	DECK PN	LISTING PN	USER GUIDE BLOCK	COMMENT	
001	2589651	N/A	17	MFCU MOD I TAP MODULE	
002	2589652	N/A	17	.	
003	2589653	N/A	17	.	
004	2589654	N/A	17	.	
005	2589655	N/A	17	.	
006	2589656	N/A	17	.	
007	2589657	N/A	17	.	
008	2589658	N/A	17	.	
009	2589659	N/A	17	.	
00A	2589660	N/A	17	.	
00B	2589661	N/A	17	.	
00C	2589662	N/A	17	.	
00D	2589663	N/A	17	.	
00E	5558335	N/A	17	.	
00F	5558336	N/A	17	.	
010	5558337	N/A	17	.	
011	5558338	N/A	17	.	
013	5558339	N/A	17	.	
014	5558340	N/A	17	.	
015	5558068	N/A	21	1403	TAP MODULE
016	5558069	N/A	21	.	
017	5558070	N/A	21	.	
018	2444626	N/A	21A	2ND 1403 TAP MODULE	
019	2444627	N/A	21A	2ND 1403 TAP MODULE	
020	2444628	N/A	21A	2ND 1403 TAP MODULE	
021	2589671	N/A	17	MFCU MOD II TAP MODULE	
022	2589672	N/A	17	.	
023	2589673	N/A	17	.	
024	2589674	N/A	17	.	
025	2589675	N/A	17	.	
026	2589676	N/A	17	.	
027	2589677	N/A	17	.	
028	2589678	N/A	17	.	
029	2589679	N/A	17	.	
02A	2589680	N/A	17	.	
02B	2589681	N/A	17	.	
02C	2589682	N/A	17	.	
02D	2589683	N/A	17	.	
02E	5558341	N/A	17	.	
02F	5558342	N/A	17	.	
030	5558343	N/A	17	.	
031	5558344	N/A	17	.	
033	5558345	N/A	17	.	
034	5558346	N/A	17	.	
040	5558053	N/A	23	2560 MOD A02 TAP MODULE	
041	5558054	N/A	23	.	
042	5558055	N/A	23	.	
045	5558056	N/A	23	.	
046	5558057	N/A	23	.	
047	5558058	N/A	23	.	
048	5558059	N/A	23	.	
049	5558060	N/A	23	.	
04A	5558061	N/A	23	.	
04B	5558062	N/A	23	.	
04C	5558072	N/A	23	.	
088	2775693	N/A	51	1442	TAP MODULE
089	2775694	N/A	51	.	
08A	2775695	N/A	51	.	
08B	2775696	N/A	51	.	
08C	2725697	N/A	51	.	
08D	2775698	N/A	51	.	
08E	2795699	N/A	51	.	
093	5554746	N/A	25	2501	TAP MODULE
094	5554747	N/A	25	.	
0A0	5555590	N/A	23	2560 MOD A01 TAP MODULE	
0A1	5555591	N/A	23	.	
0A2	5555592	N/A	23	.	
0A3	5555593	N/A	23	.	
0A4	5555594	N/A	23	.	
0A5	5555595	N/A	23	.	
0A6	5555596	N/A	23	.	
0A7	5555697	N/A	23	.	
0A8	5555598	N/A	23	.	
0A9	5555599	N/A	23	.	
0AA	5555588	N/A	23	.	
0AB	5555589	N/A	23	.	
0AC	5558071	N/A	23	.	
0CF	5558036	N/A	04		DATA DECK FOR ERAP (FF7)
0CF	2444622	N/A	04/21A	DATA DECK	FOR ERAP (FF7) ONLY IF 2ND 1403 INSTALLED
0D0	5555511	5555512	05	5415A	CPU AND MEMORY - 5444
0D0	5558786	5558787	95	5415B/C	CPU TESTS 2560****(80 COLUMN ONLY-NEVER ON DISK)****
0D0	5558788	5558789	95	5415B/C	CPU TESTS 1442****(80 COLUMN ONLY-NEVER ON DISK)****
0D0	5558790	5558791	95	5415B/C	CPU TESTS 5424****(96 COLUMN ONLY-NEVER ON DISK)****
0D0	5558792	5558793	95	5415B/C	CPU AND MEMORY - 3340
0D0	1607742	1607743	95	5415B/C	CPU TESTS 3741****(DISKETTE ONLY - NEVER ON DISK)****
0D0	4238718	4238719	95	5415D	CPU TESTS 5424****(96 COLUMN ONLY - NEVER ON DISK)****
0D0	4238720	4238721	95	5415D	CPU TESTS 2560****(80 COLUMN ONLY-NEVER ON DISK)****
0D0	4238722	4238723	95	5415D	CPU TESTS 1442****(80 COLUMN ONLY-NEVER ON DISK)****
0D0	4238724	4238725	95	5415D	CPU TESTS 3340
0D0	4238726	4238727	95	5415D	CPU TESTS 3741****(DISKETTE ONLY-NEVER ON DISK)****
141	5555524	5555525	26	3277/3284	BASIC CHECKOUT
143	5555526	5555527	26	.	MICRO-CODE LOADER
144	5555528	5555529	26	.	FUNCTION TEST
14F	5558028	5558029	26	.	SYSTEM TEST MODULE
201	N/A	N/A	22	MLTA	CONFIGURE DATA (CREATED BY FE7)
202	2588525	2588526	22	.	ERAP FOR MLTA
203	2588527	2588528	22	.	BASIC CHECKOUT
204	5555550	5555551	22	.	FUNCTIONAL CHECKOUT
205	5555552	5555553	22	.	MICRO-CODE LOADER
206	5555554	5555555	22	.	LOOP/WRAP TEST
207	5555556	5555557	22	.	LINE TEST
20F	2588537	2588538	11	.	SYSTEM TEST
281	4835401	4835400	29	BSCC	ATTACHMENT TEST
284	4835403	4835402	29	.	AUTOPOLL PROGRAM
289	4835405	4835404	29	.	ON-LINE REQUEST PGM.
28A	4835407	4835406	29	.	ON-LINE RESPOND PGM.
28C	4835409	4835408	29	.	FUNCTIONAL MICROCODE LOADER
28E	4835413	4835412	29	.	TERMINAL STATISTICS DUMP
28F	4835415	4835414	11/29	.	SYSTEM TEST
301	2588794	2588791	18	SIOC	FUNCTION TEST WITHOUT CONNECTION
302	2588795	2588792	18	.	FUNCTION TEST WITH CONNECTION
303	2588796	2588793	18	.	DATA TRANSFER FUNCTION TEST
311	5558044	5558045	25	2501	FUNCTION TEST
312	2441556	2441552	25	.	READ TEST
313	2441557	2441553	25	.	READ EVALUATION AND ADJUSTMENT TEST
31F	5558046	5558047	25	.	SYSTEM TEST

PROGRAM ID	DECK PN	LISTING PN	USER GUIDE BLOCK	COMMENT	
351	2552542	2552541	SEE NOTE 2	1255	FUNCTION TEST
352	2552545	2552544	SEE NOTE 2	.	READ SELECT TEST
353	2552548	2552547	SEE NOTE 2	.	DOCUMENT SPACING AND LENGTH TEST
35F	2495154	2495153	11	.	SYSTEM TEST
3A1	2450161	2450162	30	3881	FUNCTION TEST
3AF	2450163	2450164	11	.	SYSTEM TEST MODULE
401	5558420	5558421	40	3741	ATTACH TEST WITHOUT WRAP TOOL
402	5558422	5558423	40	.	ATTACH TEST WITH WRAP TOOL
403	5558780	5558781	40	.	ATTACH DATA TRANSFER TEST
404	5558775	5558776	40	.	FUNCTION TEST
40F	5558777	5558778	40	.	SYSTEM TEST MODULE
511	5558005	5558006	51	1442	COMMAND RESPONSE TEST
512	5558418	5558419	51	.	FUNCTION TESTS
515	2775689	2775690	51	.	READ EVALUATION AND ADJUSTMENT TEST
51A	5555519	5555520	51	.	IPL TEST****(80 COLUMN ONLY--NEVER ON DISK)****
51F	5558007	5558008	11	.	SYSTEM TEST
701	2521877	2521876	SEE NOTE 1	3411	FUNCTION TEST SECTION 1
702	2521879	2521878	SEE NOTE 1	.	FUNCTION TEST SECTION 2
706	2522118	2522117	SEE NOTE 1	.	WRITE RELIABILITY
707	2522120	2522119	SEE NOTE 1	.	READ TEST
708	2521883	2521882	SEE NOTE 1	.	CAPSTAN FAULT LOCATER
70A	2521885	2521884	SEE NOTE 1	.	SKEW ADJUST
70B	2521875	2521874	SEE NOTE 1	.	TACH TEST
70E	2521887	2521886	SEE NOTE 1	.	PTE(PROGRAMMABLE TAPE EXERCISER)
70F	2521889	2521888	11	.	SYSTEM TEST MODULE
710	2521891	2521890	SEE NOTE 1	.	LOGANAL FORMAT
711	2521893	2521892	SEE NOTE 1	.	LOGANAL SECTION 1
712	2521895	2521894	SEE NOTE 1	.	LOGANAL SECTION 2
713	2521897	2521896	SEE NOTE 1	.	EREP (ERROR RECORDING & EDITING PROGRAM)
714	2521899	2521898	SEE NOTE 1	.	LOGANAL
715	2521873	2521872	SEE NOTE 1	.	LOG ANALYSIS
716	5558914	5558915	SEE NOTE 1	.	3340 LOG ANALYSIS
801	2589701	2589702	19	BSCA-1	FUNCTION TEST
802	2589703	2589704	19	.	FUNCTION TEST
803	2589705	2589706	19	.	FUNCTION TEST
804	2589707	2589708	19	.	FUNCTION TEST
805	2589709	2589710	19	.	FUNCTION TEST
806	2589711	2589712	19	.	FUNCTION TEST
809	2589715	2589716	19	.	ON-LINE REQUESTOR
80A	2589717	2589718	19	.	ON-LINE RESPONSE
80E	2589992	2589993	19	BSCA-1 & 2	TERMINAL STATISTICS
80F	2589996	2589997	11	BSCA-1	SYSTEM TEST
821	7369833	7369834	82	2972	FUNCTION TEST
822	7369835	7369836	82	.	FUNCTION TEST
823	7369837	7369838	82	.	FUNCTION TEST
824	7369839	7369840	82	.	FUNCTION TEST
825	7369841	7369842	82	.	FUNCTION TEST
826	7369843	7369844	82	.	FUNCTION TEST
827	7369845	7369846	82	.	EXERCISER
871	2588493	2588494	87	3270	PATTERN TEST
872	2588495	2588496	87	3270	PATTERN TEST
881	7369821	7369822	19	BSCA-2	FUNCTION TEST
882	7369823	7369824	19	.	FUNCTION TEST
883	7369825	7369826	19	.	FUNCTION TEST
884	7369827	7369828	19	.	FUNCTION TEST
885	7369829	7369830	19	.	FUNCTION TEST
886	7369831	7369832	19	.	FUNCTION TEST
88F	2589994	2589995	11	.	SYSTEM TEST
891	4234254	4234255	89	INTEGRATED DISPLAY ADAPTER	BASIC CHECKOUT DIAGNOSTIC
893	4234256	4234257	89	.	MICRO-CODE LOADER
894	4234258	4234259	89	.	FUNCTION TEST
89F	4234260	4234261	11	.	SYSTEM TEST MODULE
A02	5554659	5554660	13	5444	FCU LOGIC DIAGNOSTIC-SECTION 1
A03	5554663	5554664	13	.	SEEK TEST
A05	5129629	5129628	13	.	WRITE DATA
A06	5129631	5129630	13	.	VERIFY DATA
A07	5129633	5129632	13	.	READ DIAGNOSTIC
A08	5129635	5129634	13	.	READ DATA TEST
A09	5129637	5129636	13	.	WRITE ID AND DISK SELECT
A0A	5129639	5129638	13	.	SCAN EQUAL
A0B	5129641	5129640	13	.	SCAN LOW OR EQUAL
A0C	5129643	5129642	13	.	SCAN HI OR EQUAL
A0D	5129645	5129644	13	.	SPEED TEST
A0E	5129627	5129626	13	.	SEEK TEST
A0F	5558050	5558051	11	.	SYSTEM TEST
B02	5554661	5554662	13	.	FCU LOGIC DIAGNOSTIC-SECTION 2
B03	5558348	5558347	13	.	IPL FORMAT CHECK
B04	5129649	5129648	13	.	FRIEND TEST
B0B	5134156	5134155	13	.	5444 ADJUSTMENT UTILITY
C0F	5555547	5555548	11	5445	SYSTEM TEST MODULE
C11	1607700	1607701	28	3340/3344	CONTROL STORE TESTS
C12	1607702	1607703	28	3340	FUNCTION TESTS
C12	4238694	4238695	28	3340/3344	FUNCTION TESTS
C14	1607704	1607705	28	3340/3344	ATTACHMENT TESTS-PART 1
C15	1607706	1607707	28	3340/3344	ATTACHMENT TESTS-PART 2
C16	4238696	4238697	28	3340/3344	MICRO DIAGNOSTIC CONTROL PROGRAM
C17	1607710	1607711	28	3340	MICROCODE LOADER
C18	1607712	1607713	28	3340	FRIENDS TEST
C18	4238698	4238699	28	3340/3344	FRIENDS TEST
C19	1607714	1607715	28	3340	AMOP
C1A	1607716	1607717	28	3340	SCOPE LOOP- CONTROLLER INTERFACE
C1A	4238700	4238701	28	3340/3344	SCOPE LOOP- CONTROLLER INTERFACE
C1B	1607718	1607719	28	3340	DATA MODULE SCAN
C1B	4238702	4238703	28	3340/3344	SCAN PROGRAM
C1C	4238728	4238729	28	3340/3344	INITIALIZER
C1F	1607720	1607721	28	3340	SYSTEM TEST
C1F	4238704	4238705	28	3340/3344	SYSTEM TEST
C81	5555543	5555544	24	5445	FRIENDS TEST
CCC	5558403	5558404	97		INSTALLATION AID PROGRAM
D01	5555535	5555536	24	5445	FCU LOGIC DIAGNOSTIC
D02	5555537	5555538	24	.	FCU LOGIC DIAGNOSTIC
D04	5555539	5555540	24	.	SEEK AND READ TEST
D05	5555541	5555542	24	.	WRITE & DUAL ACCESS TEST
D44	5558796	5558797	96	3340	FREELANCE/UTILITY PROGRAM
D82	5555545	5555546	24	5445	SPECIAL TESTS
DD6	5558794	5558795	94	3340	EDITOR
DD9	5558798	5558799	94	.	INITIALIZER
E0A	5558022	5558023	21	1403	RIPPLE PRINTCHAIN CLEANER ****(NEVER ON DISK)****
DUP	5558037	5558038	09		CARD DUPLICATE PROGRAM****(96 COLUMN ONLY--NEVER ON DISK)****

PROGRAM ID	DECK PN	LISTING PN	USER GUIDE BLOCK	COMMENT
E11	5558010	5558011	21	1403 ATTACHMENT TEST
E12	5558012	5558013	21	. FUNCTION TEST
E13	5558014	5558015	21	. CHARACTER COUNT TEST
E14	5558016	5558017	21	. CHAIN EMITTER TIMING
E15	5558063	5558064	21	. CARRIAGE TIMING & ADJUSTMENT
E16	2588486	2588487	21	. HAMMER ADDRESSING AND SENSE
E17	2588488	2588489	21	. SPECIAL ATTACHMENT
E18	5558018	5558019	21	. CARRIAGE DIAGNOSTIC II
E1F	5558024	5558025	11	. SYSTEM TEST
E21	2444600	2444601	21A	2ND 1403 ATTACHMENT TEST
E22	2444602	2444603	21A	2ND 1403 FUNCTION TEST
E23	2444604	2444605	21A	2ND 1403 CHARACTER COUNT TEST
E24	2444606	2444607	21A	2ND 1403 CHAIN EMITTER TIMING
E25	2444608	2444609	21A	2ND 1403 CARRIAGE TIMING AND ADJUSTMENT
E26	2444610	2444611	21A	2ND 1403 HAMMER ADDRESSING AND SENSE
E27	2444612	2444613	21A	2ND 1403 SPECIAL ATTACHMENT
E28	2444614	2444615	21A	2ND 1403 CARRIAGE DIAGNOSTIC II
E2A	2444616	2444617	21A	2ND 1403 RIPPLE PRINT CHAIN CLEANER -- (NEVER ON DISK) --
E2F	2444618	2444619	21A	2ND 1403 SYSTEM TEST
E44	5558400	5558401	98	5444 SYSTEM UTILITY/FREELANCE PROGRAM
F01	5558000	5558001	17	MFCU FUNCTION TEST
F02	5558002	5558003	17	. READ/PUNCH/PRINT TEST
F03	2589735	2589736	17	. READ EVAL & ADJ TEST
F05	2589741	2589742	17	. KATAKANA RIPPLE PRINT
F0A	2589727	2589725	17	. ONE CARD READ CHECK
F0B	2589728	2589726	17	. ONE CARD READ ANALYSIS
001	5558033	5558034	17	MFCU MAP ENTRY PROGRAMS****(96COL. CARDS ONLY--NEVER ON DISK)****
F0F	5558026	5558027	11	. SYSTEM TEST
F21	5555505	5555506	23	2560 FUNCTION TEST
F22	5555507	5555508	23	. FUNCTION TEST
F23	5555503	5555504	23	. READ EVALUATION & ADJUSTMENT
F24	5555500	5555501	27	. MTAP-2
F25	5555521	5555522	23	. IPL TEST****(80 COLUMN ONLY--NEVER ON DISK)****
F2F	5555509	5555510	23	. SYSTEM TEST
N/A	N/A	5558052		. MICRO-CODE LISTING
FA0	5558920	5558921	28	3340 ATTACHMENT FUNTIONAL MICROCODE
FA0	4238706	4238707	28	3340/3344 ATTACHMENT FUNTIONAL MICROCODE
FA1	4238712	N/A	28	3340/3344 DIAGNOSTIC MICROCODE-PART 1
FA2	5558927	N/A	28	3340 DIAGNOSTIC MICROCODE-PART 2
FA3	5558928	N/A	28	3340 DIAGNOSTIC MICROCODE-PART 3
FA4	5558929	N/A	28	3340 DIAGNOSTIC MICROCODE-PART 4
FA5	5558930	N/A	28	3340 DIAGNOSTIC MICROCODE-PART 5
FA6	5558922	5558923	28	3340/3344 IPL MICROCODE
FA7	5558924	5558925	28	3340 IPL LOADER
FA7	4238708	4238709	28	3340/3344 IPL LOADER
FA8	4238713	N/A	28	3344 DIAGNOSTIC MICROCODE-PART2M
FA9	4238714	N/A	28	3344 DIAGNOSTIC MICROCODE-PART3M
FAA	4238715	N/A	28	3344 DIAGNOSTIC MICROCODE-PART4M
FB0	4835417	N/A	29	BSCC FUNCTIONAL MICROCODE
FC0	5555530	5555531	26	3277 MICRO DATA DECK
FC1	5555532	5555533	26	. CUSTOMER PACK UPDATE
FC2	5558916	5558917	94	3340 IPL FORMAT PROGRAM
FC4	4238710	4238711	94	3340/3344 IPL FORMAT PROGRAM
FC5	5558021	N/A	23	2560 INVALID CHAR. LAST CARD TEST DECK***(80 COLUMN ONLY--NEVER ON DISK)**
FC6	5558406	N/A	23	2560 RIPPLE READ DATA DECK****(80 COLUMN ONLY--NEVER ON DISK)****
FC7	4234262	4234263	89	INTEGRATED DISPLAY ADAPTER MICRO DATA DECK
FC8	4234264	4234265	89	. CUSTOMER PACK UPDATE
FD0	5555583	5555584	10	. DCP IPL LOADER****(80 COLUMN ONLY--NEVER ON DISK)****
FD1	4835419	N/A	29	BSCC MICRO-DIAGNOSTICS
FD5	4835421	4835420	29	. SYSTEM PACK UPDATE
FD6	5555514	5555515	05/95	5415 I/O LSR TEST
FD7	5555517	5555518	05/95	. FET MEMORY PRINT TEST
FE0	5555581	5555582	10	1442 DCP IPL LOADER****(80 COLUMN ONLY--NEVER ON DISK)****
FE1	5558030	5558031	11	5415 CPU SYSTEM TEST
FE5	5555558	5555559	22	MLTA CUSTOMER PACK MICRO-CODE UPDATE
FE7	5558048	5558049	22	MLTA CONFIGURATOR
FE9	2588464	2588465	07	CASSETTE DCP LOADER ****(CASSETTE ONLY - NEVER ON DISK)****
FF0	5554852	N/A	.22	MLTA MICRO-CODE W/O AUTO-POLL(5554853 W/AUTO-POLL)
FF1	5555571	5555572	11	SYSTEM TEST LOADER
FF2	5555573	5555574	11	SYSTEM TEST SUPERVISOR
FF4	2589722	2589923	12	MASTER TAP
FF5	5129659	5129658	20	5444 DISK INITIALIZER
FF6	5555565	5555566	20	5444 DISK EDITOR
FF7	5555578	5555579	04	DISK ERAP
FF7	2444620	2444621	04/21A	DISK ERAP - ONLY IF 2ND 1403 INSTALLED
FF8	5558041	5558042	08	USAGE METER TEST
FF8	2444624	2444625	08/21A	USAGE METER TEST - ONLY IF 2ND 1403 INSTALLED
FF9	5555586	5555587	24	5445 DISK INITIALIZER
FFA	5555567	5555568	10	DISK IPL LOADER
FFA	5558910	5558911	10	3340 IPL LOADER
FFB	5555569	5555570	10	DISK DCF LOADER
FFB	5558912	5558913	10	3340 DCP LOADER
FFB	1607736	1607737	10	3741 DCP LOADER ****(DISKETTE ONLY - NEVER ON DISK)****
FFF	5555562	5555563	10	DCP CONTROL PROGRAM
LDR	5558065	5558066	06	3277/3284 STAND ALONE MICRO-CODE LOADER (80 OR 96 COLUMN CARD NEVER ON DISK)***
LDS	5558918	5558919	93	3340 STAND ALONE MICRO-CODE LOADER (80 OR 96 COLUMN CARD-NEVER ON DISK)***
LDR	1607732	1607733	06	3277/3284 STAND ALONE MICRO-CODE LOADER (DISKETTE ONLY - NEVER ON DISK)***
LDS	1607734	1607735	93	3340 STAND ALONE MICRO-CODE LOADER (DISKETTE ONLY - NEVER ON DISK)***

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USER'S GUIDE TO THE
INTEGRATED MAINTENANCE PACKAGE

1.0 PURPOSE: THE PURPOSE OF THIS SECTION IS TO GIVE DETAILED INFORMATION CONCERNING THE SYSTEM/3 INTEGRATED MAINTENANCE PACKAGE (IMP).

2.0 INTRODUCTION: THE INTEGRATED MAINTENANCE PACKAGE CONSISTS OF:

A. MAINTENANCE ANALYSIS PROCEDURE (MAP) CHARTS
B. DIAGNOSTIC PROGRAMS
C. FE EDUCATION COURSES
D. CE AIDS DESIGNED ESPECIALLY FOR THIS SYSTEM AND THE TECHNOLOGIES USED IN SYSTEM/3
E. FE PUBLICATIONS

THIS PACKAGE IS UNIQUE IN THE FACT THAT IT EFFECTIVELY TIES ALL MAINTENANCE EQUIPMENT AND INFORMATION TOGETHER. THIS PACKAGE, WHEN USED CORRECTLY, MAKES DIAGNOSING SYSTEM PROBLEMS SIMPLER, AND REQUIRES A MINIMUM OF RECALL ON THE PART OF THE CE WHICH GREATLY REDUCES DIAGNOSTIC TIME.

THE IMP IS PRIMARILY ORIENTED TOWARD FIRST LINE MAINTENANCE PERSONNEL. HOWEVER, SUPPORT PERSONNEL AT ALL ECHELONS WILL ALSO FIND THE IMP USEFUL IN SOLVING DIFFICULT SYSTEM PROBLEMS. THE SYSTEMATIC APPROACH OF THE MAP CHARTS TO PROBLEMS, THE VERSATILITY OF THE MASTER TAP PROGRAM, THE DETAILED TESTING DONE BY THE DIAGNOSTIC PROGRAMS AND THE ADVANCED CE AIDS WILL ASSIST THE SPECIALIST IN RECALLING SYSTEM OPERATION AND IN DIAGNOSING THE PROBLEM.

3.0 INTEGRATED MAINTENANCE PACKAGE:

3.1.0 FE EDUCATION - THE IMP HAS BEEN DESIGNED FOR SIMPLICITY OF USE. HOWEVER, SOME TRAINING IS REQUIRED TO USE IT EFFECTIVELY. THIS TRAINING, PLUS THE TRAINING REQUIRED TO UNDERSTAND SYSTEM OPERATION, AND THE OPERATION AND REPAIR OF VARIOUS I/O DEVICES, HAS BEEN COVERED IN FE TRAINING CLASS. THIS GUIDE, PLUS THE INTRODUCTION OR COMMENTS AT THE BEGINNING OF EACH SET OF MAP CHARTS WILL ASSIST IN RECALLING SOME OF THE DETAILS PERTINENT TO THE SYSTEM AND THE EFFECTIVE USE OF EACH SET OF MAPS.

3.2.0 MAP CHARTS - THE MAP CHARTS HAVE BEEN DESIGNED TO ISOLATE FAILURES WITH THE MINIMUM AMOUNT OF TIME AND TEST EQUIPMENT. THESE CHARTS SHOULD BE USED PRIOR TO TRYING FREE-LANCE METHODS ON A PROBLEM.

THE MAP CHARTS HAVE BEEN STANDARDIZED WHEREVER POSSIBLE. HOWEVER, CLARITY, SIMPLICITY, AND EASE OF USE HAVE BEEN THE OVERRIDING FACTORS IN MAP CHART DESIGN. FOR THESE REASONS THERE WILL BE DIFFERENCES BETWEEN THE MAP CHARTS FOR VARIOUS SYSTEM DEVICES. AN EXPLANATION OF THESE VARIATIONS AND OTHER INFORMATION PERTINENT TO THE CHARTS FOR EACH I/O DEVICE ARE CONTAINED IN THE BRIEF INTRODUCTION AT THE BEGINNING OF EACH SET OF MAP CHARTS. THE INDIVIDUAL INTRODUCTIONS ALSO CONTAIN A SUMMARY OF DIAGNOSTIC PROGRAMS AVAILABLE FOR THE DEVICE AND A SUMMARY OF ALL DIAGNOSTIC HALT ID'S. THIS SUMMARIZED INFORMATION WILL BE BENEFICIAL TO YOU IN YOUR DIAGNOSTIC EFFORTS. MORE DETAILED DESCRIPTIONS OF ALL DIAGNOSTIC PROGRAMS CAN BE FOUND IN THIS GUIDE.

THE FOLLOWING ITEMS MUST BE OBSERVED WHEN USING THE MAP CHARTS:

SELECT THE APPROPRIATE PROBE FOR THE TECHNOLOGY.

1. CHECK THE PROBE FOR CORRECT OPERATION.
2. IF THERE IS ANY DOUBT AS TO WHETHER A PROBLEM IS A CPU OR I/O DEVICE PROBLEM ALWAYS GO THROUGH THE SYSTEM STRATEGY CHART. THIS CHART WILL EVENTUALLY DIRECT YOU TO THE FAILING I/O DEVICE. ONCE YOU EXIT TO THE I/O DEVICE, HOWEVER, IT IS ASSUMED THE CPU IS FUNCTIONING PROPERLY.

```
************************************************************
* ALWAYS START AT THE SYSTEM STRATEGY CHART UNLESS YOU     *
* ARE CERTAIN IT IS AN I/O DEVICE PROBLEM.  FAILURE TO     *
* FOLLOW THIS ADVICE CAN RENDER THE MAPS INEFFECTIVE.      *
************************************************************
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3. ALWAYS ENTER DEVICE MAP CHARTS AT THE ENTRY CHART.
4. WORK DILIGENTLY AND DOUBLE CHECK YOUR WORK AS YOU GO. IF YOU MAKE A MISTAKE GO BACK TO THE ENTRY CHART TO RESTART. REMEMBER, THE MAPS USE A VERY SYSTEMATIC APPROACH TO ALL PROBLEMS. IF YOU ALTER THIS APPROACH OR BACK UP IN THE MAPS, THEIR ACCURACY CANNOT BE GUARANTEED. IF YOU SUSPECT A HUMAN ERROR WAS MADE IN PROCEEDING THROUGH A CHART (PROBED WRONG PIN, MISREAD DECISION BLOCK, MISINTERPRETED ACTION STATEMENT), NOTE THE PART THE MAP SAYS IS FAILING ON THE FIRST PASS AND GO THRU THE CHARTS A SECOND TIME TO VERIFY THAT YOU HAVE NOT MADE A MISTAKE.
5. ALWAYS INVESTIGATE AUDIBLE NOISES AND OBVIOUS ERRORS BEFORE USING THE MAP CHARTS.
6. IF YOU HAVENT ISOLATED THE PROBLEM WITHIN TWO HOURS, IT IS RECOMMENDED THAT YOU CALL FOR ASSISTANCE.
7. A GLOSSARY OF ABBREVIATIONS AND THEIR MEANINGS IS CONTAINED IN SECTION 4.0. THESE ABBREVIATIONS ARE USED BECAUSE THE SYSTEM DECALS USE THEM, THEY ARE IBM "STANDARDS", OR BECAUSE THEY ARE USED FREQUENTLY THROUGHOUT OTHER SYSTEM DOCUMENTS.
8. IF THE MAP CHART EVER FAILS YOU, YOU MAY WISH TO CONSIDER THE FOLLOWING ITEMS DURING YOUR FREE-LANCE EFFORT:
   A. CHECK FOR SHORTED NETS ON THE BOARDS. PARTICULARLY CHECK FOR LOOSE OBJECTS (E.G. PAPER CLIPS, BITS OF WIRE, DROPS OF SOLDER, ETC.) ON THE BOARD.
   B. CHECK FOR OPEN LAND PATTERNS ON THE BOARD.
   C. IF ERRORS ARE HIGHLY INTERMITTENT - CHECK THE POWER SUPPLY ADJUSTMENTS. THIS REQUIRES A METER WITH 1/4% ACCURACY SUCH AS THE WESTON 901 (PN 460879). THESE ARE AVAILABLE AT THE BRANCH OFFICES.
   D. CHECK POWER CROSS-OVERS COMING FROM THE LAMINAR BUSS TO THE ELECTRONICS BOARDS.
   E. CHECK FOR LOOSE AND SHORTED SIGNAL AND POWER CABLES.

9. ALL "PROBE" INSTRUCTIONS ARE FOR THE MST PROBE UNLESS ANOTHER LOGIC LEVEL IS SPECIFIED.
10. WHEN CARDS ARE CALLED OUT AS THE FAILING UNIT, INSURE THE CARD IS SEATED PROPERLY PRIOR TO REPLACING CARD.

THE ABOVE ITEMS SHOULD BE REVIEWED PERIODICALLY SINCE THEY ARE IMPORTANT TO SUCCESSFUL COMPLETION OF A CALL USING THE MAP CHARTS.

3.3.0 CE AIDS: THE FOLLOWING CE AIDS HAVE BEEN DEVELOPED FOR THIS SYSTEM: (SEE THE 5415 CPU FEMM FOR PICTURES).

3.3.1 CE DIAGNOSTIC PROBE - THIS PROBE IS DESIGNED AS A SUBSTITUTE FOR THE SCOPE IN NORMAL SYSTEM DIAGNOSTIC TECHNIQUES.

WHEN INFORMATION BECOMES AVAILABLE, THE NEW PROBE WILL BE DESCRIBED HERE.

THE DIAGNOSTIC PROBE HAS TWO PROBE TIPS, ONE IS FOR PROBING MST-1 SIGNALS AND THE OTHER FOR SLD (SLT) 100/700 SIGNALS. ONLY ONE TIP AT A TIME IS USED. THIS TIP SLIPS OVER THE SIGNAL PIN OF INTEREST AND SUPPORTS THE PROBE.

TWO LAMPS ARE PROVIDED TO INDICATE THE STATUS OF THE LINE BEING PROBED. IF THE LINE HAS AN UP LEVEL THE "UP" INDICATOR WILL BE ON. A DOWN LEVEL WILL CAUSE THE "DOWN" INDICATOR TO LIGHT. A PULSE WILL BE SHOWN AS A FLASH OF ONE OF THE LIGHTS (DEPENDING ON THE POLARITY). A SERIES OF PULSES IS INDICATED BY BOTH LAMPS ON, OR ON ALTERNATELY, DEPENDING ON THE FREQUENCY OF THE PULSES.

EACH INDICATOR LAMP HAS ITS OWN SAMPLING CIRCUITS AND OPERATES INDEPENDENTLY OF THE OTHER LAMP. THUS PULSES WILL BE DETECTED AND DISPLAYED BY THE PROBE. IF A LINE IS ACTIVE, WHEN PROBED, THE APPROPRIATE INDICATOR WILL BE TURNED ON FOR APPROXIMATELY 75 MS. AFTER THIS TIME THE INDICATOR WILL GO OFF AND THE LINE WILL IMMEDIATELY BE SAMPLED AGAIN. IF IT IS STILL ACTIVE THE LAMP WILL BE TURNED ON FOR ANOTHER 75 MS, OTHERWISE IT WILL STAY OFF UNTIL THE LINE AGAIN BECOMES ACTIVE.

THE PROBE IS POWERED BY -4VDC AND GROUND, THROUGH A 42-INCH POWER CABLE. THE END OF THE CABLE HAS A 4-PIN SOCKET WHICH PLUGS ONTO THE POWER CROSS-OVER CONNECTORS ON THE MST BOARDS, OR AT OTHER SIMILAR LOCATIONS WHERE -4V AND GROUND HAVE BEEN PROVIDED IN THE PROPER PIN CONFIGURATION. ALWAYS KEEP THE SIDE OF THE POWER PLUG LABELED "UP" IN THE UP DIRECTION.

ADDITIONALLY, THE PROBE HAS TWO MST INPUT TERMINALS FOR 'GATING' PURPOSES. WHEN A JUMPER WIRE IS CONNECTED FROM ONE OF THESE GATES TO AN MST SIGNAL PIN, OPERATION OF THE INDICATOR LAMPS IS INHIBITED (BOTH LIGHTS OFF) UNTIL THE CORRECT POLARITY SIGNAL IS RECEIVED BY THE GATE. THE "+" GATE REQUIRES AN UP MST LEVEL TO START SAMPLING AND THE "-" GATE IS CONTINGENT UPON AN MST DOWN LEVEL. THESE GATES WORK FOR MST ONLY. HOWEVER, AN SLD SIGNAL AT THE SLD PROBE TIP MAY BE GATED WITH AN MST SIGNAL AT THE GATE. ALWAYS USE THE SHORTEST LEAD POSSIBLE WHEN JUMPERING A SIGNAL TO THE PROBE GATES.

- NOISE REJECTION -

THE PROBE INPUT SENSITIVITY IS COMPATIBLE WITH EITHER MST OR SLD CIRCUIT FAMILIES. THE PROBE CIRCUITRY CAN, HOWEVER, BE EFFECTED BY STRAY ELECTRICAL NOISE EMANATING FROM THE SWITCHING OF APPLIANCES SUCH AS DRILLS, FLUORESCENT LIGHTS OR FROM ELECTROSTATIC TYPE DISCHARGES. THE PROBE POWER CORD WHEN HANGING IN CLOSE PROXIMITY TO THE MEMORY, UNDER CERTAIN OPERATING CONDITIONS CAN GIVE ERRONEOUS INDICATIONS.

DETAILED FIELD TESTING OF CE PROBE - IF YOU SUSPECT THE PROBE IS NOT FUNCTIONING PROPERLY, PERFORM THE FOLLOWING TESTS TO VERIFY ITS ACCURACY (NC = NOT CONNECTED):

TEST NO.	CONNECT SLD TIP TO:	MST TIP	+ GATE	- GATE	INDICATOR RESPONSE
1.	+6V LAMINAR BUS	NC	NC	NC	UP LIGHT ON
2.	GROUND	NC	NC	NC	DOWN LIGHT ON
3.	NC	TIE-UP	NC	NC	UP LIGHT ON
4.	NC	TIE-DOWN	NC	NC	DOWN LIGHT ON
5.	NC	-4VDC	NC	NC	BOTH LIGHTS OFF
6.	NC	+6VDC LAMINAR BUS	NC	NC	BOTH LIGHTS OFF
7.	NC	CPU CLOCK	NC	NC	BOTH LIGHTS ON
8.	NC	CPU CLOCK	TIE-DOWN	NC	BOTH LIGHTS OFF
9.	NC	CPU CLOCK	NC	TIE-UP	BOTH LIGHTS OFF
10.	NC	(1)	NC	NC	PULSE ON LIGHT

NOTES: (1) CONNECT THE MST PROBE TO +PHASE 'B' CHANNEL LINE. SET THE CE MODE SWITCH TO CLOCK STEP. SEE IF THE PROBE WILL RESPOND (UP LIGHT FLASH ON) FOR EACH CLOCK. REPEAT TEST WITH PROBE CONNECTED TO A - PHASE 'B' SIGNAL AND SEE IF DOWN LIGHT WILL PULSE ON WITH EACH CLOCK ADVANCE.

THE FOLLOWING ARE TYPICAL SPECIFICATIONS PERTINENT TO THE PROBE. 'IN BETWEEN LEVELS' ARE NOT DEFINED AND WILL VARY FROM PROBE TO PROBE.

A. MST SPECIFICATIONS FOR MST PROBE TIP -
   - UP LEVEL: -0.55V TO -0.98V
   - DOWN LEVEL: -1.52V TO -2.18V
   - PROTECTION: +24VDC TO -30VDC
   - RESPONSE: 30 NANOSECOND PULSE WIDTH
   - INHIBIT RANGE: -0.5VDC TO +24VDC, -3.98VDC TO -30VDC, AND ON OPEN PINS.

B. SLD SPECIFICATIONS FOR SLD PROBE TIP -
   - UP LEVEL: +2.7VDC TO +60VDC
   - DOWN LEVEL: -.01VDC TO +0.45VDC
   - PROTECTION: -12VDC TO +60VDC
   - RESPONSE: 200 NS (WORSE CASE) PULSE WIDTH
   - INHIBIT RANGE: -3.0V TO -12.0V AND ON OPEN PINS.

C. SPECIFICATIONS FOR MST GATES -
   1) "+" GATE:
      ACTIVE RANGE: -1.01V TO -0.613V
      INHIBIT RANGE: -1.55V TO -4.48V
   2) "-" GATE:
      ACTIVE RANGE: -1.55V TO -4.48V
      INHIBIT RANGE: -0.613V TO -1.01V
   3) PROTECTION: -4VDC TO +6VDC
   4) RESPONSE: SAME AS MST

D. POWER REQUIREMENTS: -4VDC +/- 12% AT 265 MA (MAX).

E. POWER DISSIPATION: 1.95 WATTS (WORSE CASE)

F. LAMPS: 2 EACH - PN 454612 (FIELD REPLACEABLE).

G. TIPS: 2 EACH - PN 453163 (FIELD REPLACEABLE).

3.3.2 THIS SECTION WAS INTENTIONALLY LEFT BLANK

3.3.3 CE SNS BITS - SPARE BITS IN EACH ATTACHMENT HAVE BEEN PROVIDED FOR CE USE. THESE BITS ALLOW THE CE TO INPUT SIGNALS WHICH ARE NOT NORMALLY AVAILABLE FOR SENSING INTO THE CPU. THESE SIGNALS ARE EXTREMELY USEFUL FOR DIAGNOSTIC MEASUREMENTS.

3.3.4 SINGLE PIN EXTENDERS -
THE SINGLE PIN EXTENDERS (PN 2594238) SHIPPED WITH EACH SYSTEM ALLOW THE CE TO USE THE CE METER ON BOARD PINS WITHOUT SHORTING TO ADJACENT PINS. THIS EXTENDER SLIPS OVER THE PIN AND ALLOWS THE CE TO PLACE THE ALLIGATOR CLIPS OF HIS METER ON THE STUB END. THIS EXTENDER CAN ALSO BE USED TO MEASURE THE POWER TEST JACKS BY PLACING THE ALLIGATOR CLIP ON THE SLIP OVER END AND USING THE STUB END AS A METER PROBE.

3.3.5 MST CARD EXTENDERS - MST CARD EXTENDERS ARE AVAILABLE IN 1 WIDE (PN 2360067) AND 2 WIDE (PN 2360068) SIZES. SIZES. THEY ALLOW YOU TO EXTEND MST CARDS ABOVE THE TOP OF ADJACENT CARDS IN THE GATES. THESE AIDS ARE USED FOR SCOPING MODULE PINS ON THE CARD AND FOR OTHER GENERAL SERVICE NEEDS. THEY ARE AVAILABLE AS BRANCH OFFICE TOOLS.

3.3.6 JUMPER WIRES - SIX JUMPER WIRES (2 EACH OF 6 INCH (PN 829117) 12 INCH (PN 2588263) AND 18 INCH (PN 829118) ARE PROVIDED WITH EACH SYSTEM. THESE ARE USED IN CONJUNCTION WITH THE MAP CHARTS AND DIAGNOSTIC PROGRAMS. THEY ARE ALSO USED TO INPUT SIGNALS INTO THE CE DIAGNOSTIC PROBE GATES AND INTO THE CE SENSE BITS.

```
*****************************************************************
*  1. ALWAYS USE THE SHORTEST JUMPER POSSIBLE WHEN JUMPERING    *
*     SIGNAL PINS.                                              *
*  2. NEVER PLACE ONE END OF A JUMPER ON A PIN AND TOUCH THE    *
*     OPPOSITE END TO OTHER PINS AS YOU COUNT THEM.             *
*****************************************************************
```

3.4.0 FE PUBLICATIONS:

THE FOLLOWING TYPES OF PUBLICATIONS WILL ALSO BE AVAILABLE FOR THE SYSTEM. EACH DEVICE HAS DETERMINED ITS OWN REQUIREMENTS FOR THE DOCUMENTS PRECEDED BY AN ASTERISK AND THESE MAY OR MAY NOT BE PROVIDED:

*A. FE THEORY MAINTENANCE DIAGRAM MANUAL
B. FE AUTOMATED LOGIC DIAGRAMS (FEALD'S)
C. INSTALLATION MANUAL
D. ILLUSTRATED PARTS CATALOG
E. CE HANDBOOK FOR THE SYSTEM.
F. PROGRAM LISTINGS.

4.0 STANDARD ABBREVIATIONS, SYMBOLS AND MEANINGS:

4.1 ABBREVIATIONS:

ACC	ACCESS
ADDR	ADDRESS
ADV	ADVANCE
ALT	ALTER
ALU	ARITHMETIC LOGIC UNIT
AMP	AMPLIFIER
APL	ALTERNATE PROGRAM LOADER
ARM	ARMATURE
ARR	ADDRESS RECALL REGISTER
ASM	ASSEMBLY
ASNMT	ASSIGNMENT
ATT	ADDRESS TRANSLATE TABLE
ATTN	ATTENTION
BIN	BINARY
BK	BANK
BSCA	BINARY SYNCHRONOUS COMMUNICATION ADAPTER
CAR	CARRY
CARR	CARRIAGE
CHAN	CHANNEL
CHK	CHECK
CLK	CLOCK
COND	CONDITION
CPU	CENTRAL PROCESSING UNIT
CR	CONDITION REGISTER
CS	CYCLE STEAL
CTRL	CONTROL
CURR	CURRENT
CYC	CYCLE
D.	DEPRESS AND RELEASE
DBI	DATA BUSS IN
DBO	DATA BUSS OUT
DCP	DIAGNOSTIC CONTROL PROGRAM
DEC	DECIMAL
DEV	DEVICE
D.H.	DEPRESS AND HOLD UNTIL NEXT NON-DECISION BLOCK
DIAG	DIAGNOSTIC
DIG	DIGIT
DISP	DISPLAY
DPF	DUAL PROGRAM FEATURE
EM	EMITTER
EQ	EQUAL
FCU	FILE CONTROL UNIT
FD	FEED
FEMM	FIELD ENGINEERING MAINTENANCE MANUAL
FWD	FOWARD
GATE(+/-)	PLACE '+' OR '-' GATE OF CE DIAGNOSTIC PROBE TO THE POINT INDICATED
HDB	HIGH DENSITY BUFFER
HOP	HOPPER
IAR	INSTRUCTION ADDRESS REGISTER
IND	INDICATOR/INDICATION
INH	INHIBIT
INJ	INJECT
INV	INVALID
INCR	INCREMENTER
INST	INSTRUCTIONS

INT	INTERRUPT
INTF	INTERFACE
I/O	INPUT-OUTPUT
IPL	INITIAL PROGRAM LOAD / PROGRAM LOAD KEY
L.	LEFT
LCA	LOCAL COMMUNICATIONS ADAPTER
LD	LOAD
LEV	LEVEL
LVL	LEVEL
LPM	LINES PER MINUTE
LSR	LOCAL STORAGE REGISTER
M.	METER
MAG	MAGNET
MACH	MACHINE
MFCM	MULTI FUNCTION CARD MACHINE
MFCU	MULTI-FUNCTION CARD UNIT
MLTA	MULTIPLE LINE TERMINAL ADAPTER
MR	MANUAL ROUTINE
MS	MAIN STORAGE
MSAR	MEMORY STORAGE ADDRESS REGISTER
NPRO	NON PROCESS RUN OUT
OP	OPERATION
OVFL	OVERFLOW REGISTER
P.	PROBE
PCB	PRINTER POWER CONTROL BOX
PCH	PUNCH
PEB	PRINTER ELECTRONICS BOARD
PMR	PROGRAM MODE REGISTER
POS	POSITION
PR	PRESSURE ROLL
PROC	PROCESS OR PROCESSOR
PROG/PGM	PROGRAM
PROT	PROTECT
PRT	PRINTER/PRINT
PS	POWER SUPPLY
PSR	PROGRAM STATUS REGISTER
PTY	PARITY
PTX	PHOTO VARISTOR OR PHOTO TRANSISTOR
PWR	POWER
R./RGHT	RIGHT
RECOMP	RECOMPLEMENT
REG	REGISTER/REGISTRATION/REGULATOR
REQ	REQUEST
REV	REVERSE
RD	READ
RTN	ROUTINE
SAR	STORAGE ADDRESS REGISTER
SDBI	STORAGE DATA BUS IN
SDBO	STORAGE DATA BUS OUT
SDR	STORAGE DATA REGISTER
SECT	SECTION
SEL	SELECT
SIOC	SERIAL INPUT/OUTPUT CHANNEL
SR	SYSTEM RESET
SSW	SENSE SWITCH
STOR	STORAGE
SUB	SUBTRACT
SVC	SUPERVISOR CALL
SW	SWITCH
SYS	SYSTEM
TB	TERMINAL BLOCK
TEMP	TEMPORARY
TF	TEST FALSE
TP	TEST POINT
TRK	TRACK
UCS	UNIVERSAL CHARACTER SET
UDT	UNIT DEFINITION TABLE
VDC	VOLTS DIRECT CURRENT
XR1	INDEX REGISTER 1
XR2	INDEX REGISTER 2

4.2 SYMBOLS:

THE FOLLOWING SYMBOLS HAVE BEEN ADOPTED AS MAP CHART STANDARDS FOR THE SYSTEM /3. INFORMATION AND REPAIR ACTION WHICH WILL NOT FIT IN ONE OF THE FOLLOWING STANDARD BLOCKS NORMALLY WILL BE PLACED IN A 'DRAW' BLOCK.

SYMBOL

```
                                                        ****
                                                       *    *
                                                       * D4 *
                                                       *    *
A. ON PAGE CONNECTOR---------------------->             ****
                                                         |
                                                         |
                                                         |
                                                         V
                                                 -----D4---------           ****
                                                |ENTRY TO CHART |          *    *
B. TERMINAL (T) BLOCK-------------------->      | OR EXIT TO A  |----->*  D4 *
                                                |    MANUAL     |          *    *
                                                 ---------------            ****
                                                         |
                                                         |   ****
C. OFF PAGE CONNECTOR-------------------->               |  *    *
                                                         .->*    *
                                                            *    *
                                                             ****
                                              ******E4************
D. INPUT/OUTPUT (I) BLOCK---------------->    *    FAILING      *
                                               COMPONENT OR
                                              *REPAIR ACTION*
                                               *************

                                              .----F4---------.
                                              |PROBE INFO,LINE|
E. PROCESS (P) BLOCK--------------------->    |NAMES,ACTIONS, |
                                              | INSTRUCTIONS  |
                                              |   AND SOME    |
                                              |   QUESTIONS   |
                                              .---------------.

                                                     .*.
                                                G4 .*   *.
                                                .*        *.
F. DECISION (D) BLOCK-------------------->     *.  DECISION  .*
                                                *.        .*
                                                  *.    .*
                                                     *

                                                **H4*******
                                               * NOTES AND *
G. LIBRARY (L) BLOCK--------------------->    * INFORMATION *
                                              * FOR ADJACENT *
                                               *  BLOCKS    *
                                                ***********

                                                 **A1***
H. BACK CROSS REFERENCE BLOCK------------>       *031A3*
                                                 *045B2*
                                                 *061C3*
                                                  *****
                                                    |
                                                    V
```

4.3.0 STANDARD CALLOUTS

4.3.1 PROBE OPERATIONS - PROBE OPERATIONS ARE SPECIFIED IN THE FOLLOWING MANNER. ALL OPERATIONS REFER TO THE MST PROBE UNLESS SPECIFIED OTHERWISE:

P.A-B1K2S04	- MST CALLOUT
SLD PROBE ON PEB P.A-A1A3B02 SLD P.A-B2D2D04	- SLD CALLOUT - SLD CALLOUT
P.A-B1K2S07 P.A-B1K2S09 P.A-B1K2S11	- MULTI-POINT PROBE OPERATION.
P.A-B1K2M08 P.A-B1K2M06 P.A-B1K2D04 >D. CHECK RESET.	- A MULTI-POINT PROBE OPERATION WITH ANOTHER ACTION SPECIFIED. (PRESS CHECK RESET WHEN PROBING EACH POINT).

4.3.2 DIAGNOSTIC PROBE INDICATIONS:

LINE UP - RED LIGHT IS ON AND STAYS ON AFTER AN ACTION IS TAKEN. NO REFERENCE IS MADE AS TO WHAT THE LEVEL IS AT THE TIME THE PROBE IS PLACED ON THE PIN.

LINE DOWN - GREEN LIGHT IS ON AND STAYS ON EVEN AFTER AN ACTION IS TAKEN. NO REFERENCE IS MADE AS TO WHAT THE LEVEL IS AT THE TIME THE PROBE IS PLACED ON THE PIN.

LINE PULSING - BOTH THE RED AND THE GREEN LIGHTS WILL BE ON--OR ON ALTERNATELY.

PULSE ON LINE - RED AND GREEN LIGHTS WILL MAKE ONE OF THE FOLLOWING TRANSITIONS: A) RED TO GREEN TO RED B) GREEN TO RED TO GREEN OR, C) EITHER THE RED OR GREEN LIGHT WILL BE ON AND THE OTHER WILL FLASH ON MOMENTARILY.

LEVEL CHANGE UP/DOWN - LIGHTS WILL CHANGE FROM GREEN TO RED(UP) OR RED TO GREEN(DOWN) WHEN THE REQUESTED ACTION IS TAKEN.

PULSE ON UP/DOWN LINE - BOTH LIGHTS ARE OFF INITIALLY AND EITHER THE THE RED (UP) OR GREEN (DOWN) LIGHT WILL PULSE ON. (NOTE: WHEN PULSE ON UP LINE IS CALLED OUT THE RED AND GREEN LIGHT MAY PULSE. THIS IS IN-HERITENT IN THE PROBE DESIGN AND THE GREEN LIGHT SHOULD BE IGNORED).

4.3.3 CARD CALLOUTS (ALL CARDS ARE IN CPU MAIN FRAME UNLESS OTHERWISE SPECIFIED):

A-A3K2	(SINGLE CARD IN CPU)
PEB A-A1C3	(SINGLE CARD IN PEB GATE)
A-B2H2, A-B2K2	(MULTICARD CALLOUT)
PEB A-A1F5, CPU A-B1S4	(MULTICARD CALLOUT WITH CARDS ON DIFFERENT GATES)

4.3.4 CABLE CALLOUTS:

BAD CABLE MFCU TB3-1 TO CPU A-A3V4 (NORMAL INTERFACE CABLE CALLOUT):

BAD CABLE PEB TB3-2 TO PCB TB4-1 (NORMAL BOX CABLE CALLOUT)

CABLE PEB A-A1A5 TO CPU A-B1V4, CARD A-B1T4 (CABLE OR CARD MULTIPLE CALLOUT).

4.3.5 DIAGNOSTIC PROGRAMS(SEE USER'S GUIDE FOR DETAILED INFORMATION):

PROGRAM IDENTIFICATION - ALL SYSTEM 3 DIAGNOSTIC PROGRAMS ARE IDENTIFIED WITH A FOUR DIGIT ALPHA NUMERIC CODE. (E.G. F020, E120, ETC.) THE FIRST TWO DIGITS REPRESENT THE DEVICE ADDRESS THE THIRD DIGIT THE SECTION NUMBER AND THE LAST DIGIT THE VERSION LEVEL. SECTION CALLOUTS IN THE MAP ARE ONLY REFERRED TO BY THE FIRST THREE DIGITS (E.G. E12).

PROGRAM HALT ID'S - ALL HALTS WITHIN THE DIAGNOSTIC PROGRAMS EXCEPT FOR THE CPU AND MEMORY PROGRAMS HAVE A HALT ID. THE HALT ID CONSISTS OF FOUR ALPHA-NUMERIC CHARACTERS (E.G. E11C). THE FIRST TWO DIGITS ARE THE DEVICE ADDRESS ID AND THE LAST TWO ARE THE HALT ID. HALT ID'S FROM 01 TO 9F ARE ALWAYS ERROR HALTS. HALT ID'S FROM A0 TO FF ARE INFORMATION OR INTERVENTION HALTS.

PROGRAM CALLOUT:
RUN SECTION E12 - THIS MEANS TO GET SECTION E12. DCP MUST PREVIOUSLY BE IN MEMORY. THEN, ACCORDING TO SECTION LOADING ISTRUCTIONS, PLACE 'DE12' IN THE SWITCHES, PRESS START, CHANGE LEFTMOST SWITCH TO 0, AND PRESS START FOR E12 TO BE LOADED. RESET THE NON-ERROR HALTS AND EXECUTE THE PROGRAM. ALL INSTRUCTIONS IN THE PRINTED OUTPUT MUST BE OBSERVED. IF ADDITIONAL ACTIONS ARE SPECIFIED IN THE MAP CHARTS, THEY TOO MUST BE PERFORMED PRIOR TO EXECUTING THE PROGRAM.

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1. SUMMARY OF DISK ERAP

1.1 GENERAL DESCRIPTION

DISK ERAP (ERROR RECORDING ANALYSIS PROGRAM) RUNS UNDER DCP ON SYSTEM/3 .

DISK ERAP CONSISTS OF SECTION FF7 & DATA MODULE OCF. THE DATA MODULE IS AUTOMATICALLY LOADED BY SECTION FF7 AFTER THE 'HA' HALT FROM FF7 IS RESET. THERE ARE 4 ROUTINES WHICH AUTOMATICALLY EXECUTE AND PERFORM ALL THE ERAP FUNCTIONS.

1.2 ROUTINE DESCRIPTION

ROUTINE	DESCRIPTION	SENSE SWITCH
1	PRINTS AND CLEARS (UNDER SETTING OF SSW20) HISTORY TABLE AND THE MEANING OF THE ENTRIES IN THE HISTORY TABLE.	20
2	PRINTS AND CLEARS (UNDER SETTING OF SSW20) STATISTICAL DATA RECORDING (SDR) ENTRIES THAT ARE DEFINED IN THE UNIT DEFINITION TABLE (UDT).	20
3	PRINTS AND CLEARS (UNDER SETTING OF SSW20)	
	A. MASTER SIO TABLE (5444)	20
	B. INDIVIDUAL VOLUME STATISTICS (UNDER SETTING OF SSW21-SSW24) FOR 5444.	20,21,22, 23,24
4	PRINTS AND CLEARS (UNDER SETTING OF SSW20)	20
	A. INDIVIDUAL VOLUME STATISTICS (UNDER SETTING OF SSW25-SSW28) FOR 5445.	25,26 27,28
5	PRINTS A SUMMARY OF 3340 ERROR RECORDS AND USAGE INFORMATION. (UNDER SETTING OF SWS 11-14).	11,12 13,14
6	PRINTS AND CLEARS (UNDER SETTING OF SW 20) THE 3340 ERROR HISTORY (UNDER SETTING OF SWS 11-14).	11,12 13,14,20

1.3 SENSE SWITCH DESCRIPTION

SENSE SWITCH	MEANING
11	PRINT AND CLEAR (UNDER SETTING OF SW 20) 3340 ERROR AND USAGE RECORDS FROM VOLUME MOUNTED ON 3340 DRIVE 1.
12	PRINT AND CLEAR (UNDER SETTING OF SW 20) 3340 ERROR AND USAGE RECORDS FROM VOLUME MOUNTED ON DRIVE 2. NOTE-- THIS SW IS SET ON BY PROGRAM DEFAULT SELECTION IF EITHER ROUTINE 5 OR 6 IS RUN WITH SWS 11 THRU 14 OFF. UNLESS ON MOD 15D WITH 3344, THEN SEE SSW2A, 2B, 2C OR 2D.
13	SAME AS SW 11 EXCEPT THAT DRIVE 3 IS USED.
14	SAME AS SW 11 EXCEPT THAT DRIVE 4 IS USED.
20	RE-INITIALIZE AREA IN ERROR RECORDING AREA ON DISK THAT IS BEING PRINTED OUT SSW20 OFF = CLEAR AREA SSW20 ON = DON'T CLEAR AREA
21	PRINT AND CLEAR (UNDER SETTING OF SSW20) THE INDIVIDUAL VOLUME STATISTICS OF FIXED DRIVE 1 OF 5444. F1
22	PRINT AND CLEAR (UNDER SETTING OF SSW20) THE INDIVIDUAL VOLUME STATISTICS OF REMOVABLE DRIVE 1 OF 5444. R1
23	PRINT AND CLEAR (UNDER SETTING OF SSW20) THE INDIVIDUAL VOLUME STATISTICS OF FIXED DRIVE 2 OF 5444. F2
24	PRINT AND CLEAR (UNDER SETTING OF SSW20) THE INDIVIDUAL VOLUME STATISTICS OF REMOVABLE DRIVE 2 OF 5444. R2
25	PRINT AND CLEAR (UNDER SETTING OF SSW20) THE INDIVIDUAL VOLUME STATISTICS OF DRIVE 1 OF 5445. DRV 1
26	PRINT AND CLEAR (UNDER SETTING OF SSW20) THE INDIVIDUAL VOLUME STATISTICS OF DRIVE 2 OF 5445. DRV 2
27	PRINT AND CLEAR (UNDER SETTING OF SSW20) THE INDIVIDUAL VOLUME STATISTICS OF DRIVE 3 OF 5445. DRV 3
28	PRINT AND CLEAR (UNDER SETTING OF SSW20) THE INDIVIDUAL VOLUME STATISTICS OF DRIVE 4 OF 5445. DRV 4
2A	PRINT AND CLEAR (UNDER SETTING OF SW 20) HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-F1 SETTING AND TURN ON SSW 12 FOR 3340 ERROR LOGGING.
2B	PRINT AND CLEAR (UNDER SETTING OF SW 20) HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-R1 SETTING AND TURN ON SSW 12 FOR 3340 ERROR LOGGING.
2C	PRINT AND CLEAR (UNDER SETTING OF SW 20) HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-F1 SETTING AND TURN ON SSW 13 FOR 3340 ERROR LOGGING.
2D	PRINT AND CLEAR (UNDER SETTING OF SW 20) HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-R1 SETTING AND TURN ON SSW 13 FOR 3340 ERROR LOGGING.
2E	ERAP DATA LOCATED ON 5444 F1. THIS SWITCH IS SET ONLY IF AN 'FF' HALT IS RECEIVED.
2F	ERAP DATA LOCATED ON 3340 SIMULATED F1. (THIS SWITCH IS SET ONLY IF AN 'FF' HALT IS RECEIVED).

1.4 HALT DESCRIPTION

HALT	MEANING	CE ACTION
0F	ERROR PRINTOUT.	SEE PRINTOUT.
E0	MODEL 15 ERROR RECORDING FLAG NOT ON.	THIS SITUATION IS SERIOUS. READ DESCRIPTION AT THE END OF THIS TABLE.
E1	SET DRIVE SSW 2A = DRV1-F1,2B = DRV1-R1, 2C = DRV3-F1, 2D = DRV3-R1	SET SSW DESIRED. RESET HALT.
EC	DATA CARDS ARE NOT IN ORDER.	MAKE SURE DATA CARDS ARE IN ORDER AND RE-ADD TO THE CE DISK PACK USING DISK EDITOR (ID = FF6).
EE	DATA DECK (PROG ID = 0CF) IS NOT THE RIGHT LEVEL. (FF7 & 0CF MUST BE SAME LEVEL.)	DISK ERAP WILL NOT RUN UNLESS THE LEVEL NUMBER OF 0CF IS THE NUMBER PRINTED ON THE PRINTER. OBTAIN THE CORRECT LEVEL AND ADD TO THE CE DISK PACK USING THE DISK EDITOR (ID = FF6).
F0	SELECT VOLUMES(S) ON 5444 TO PRINT INDIVIDUAL VOLUME STATISTICS.	SET SSW 21-24 AS DESIRED. RESET THE HALT. SEE SECTION 3.3 FOR MORE INFORMATION.
F1	VOLUME 1 IS NOT READY ON FIXED DRIVE 1 OR A NON-RECOVERABLE ERROR HAS OCCURRED.	MAKE SURE DRIVE 1 IS READY AND EITHER: 1. RESET HALT AND TRY AGAIN OR 2. RUN 5444 DISK FUNCTION TEST.
F2	VOLUME 2 IS NOT READY ON REMOVABLE DRIVE 1 OR A NON-RECOVERABLE ERROR HAS OCCURRED.	
F3	VOLUME 3 IS NOT READY ON FIXED DRIVE 2 OR A NON-RECOVERABLE ERROR HAS OCCURRED.	MAKE SURE DRIVE 2 IS READY AND EITHER: 1. RESET HALT AND TRY AGAIN OR 2. RUN 5444 DISK FUNCTION TEST.
F4	VOLUME 4 IS NOT READY ON REMOVABLE DRIVE 2 OR A NON-RECOVERABLE ERROR HAS OCCURRED.	
F5	5445 DISK ERROR. CHECK PRINTOUT ON PRINTER TO DETERMINE WHICH DRIVE.	MAKE SURE DRIVE IS READY. RESET THE HALT. IF HALT PERSISTS RUN 5445 DIAGNOSTICS.
F6	3340 NOT READY, OR ERROR CONDITION. SEE PRINTOUT TO DETERMINE WHICH DRIVE.	MAKE SURE THAT A SYSTEM (ERROR LOG) DATA MODULE IS MOUNTED, THAT THE DRIVE IS READY, THAT SW 20 IS OFF, THAT THE DRIVE IS NOT IN 'READ ONLY' MODE.
FC	SELECT DRIVE(S) ON 5445 FOR INDIVIDUAL VOLUME STATISTICS.	SET SSW 25-28 AS DESIRED. RESET THE HALT. SEE SECTION 3.4 FOR MORE INFORMATION.
FF	MANUAL INPUT NEEDED.	SEE PRINTOUT FOR ANY ACTION REQUIRED.

HALT -- E0 --

MODEL 15 ERAP EXPECTS TO FIND X'15' IN A PARTICULAR LOCATION ON FIXED DISK. IT INDICATES THAT THE CUSTOMER SOFTWARE IS PROPERLY SET UP FOR MODEL 15.

INFORMATION:

1. ERRORS FROM THIS ERAP DUMP ARE NOT RELIABLE.
2. SOFTWARE OR HARDWARE INSTALLATION PROCEDURES MAY NOT HAVE BEEN FOLLOWED PERFECTLY.
3. MODEL 10 SOFTWARE WHICH IS RUN ON MODEL 15 MUST BE AT LEAST RELEASE 10 OR EQUIVALENT.
4. WHEN ERAP IS RUN (WITH SSW 20 OFF), IT WRITES THE X'15' FLAG. HOWEVER, FURTHER CORRECTIVE ACTION IS NECESSARY. FOLLOW THE RECOVERY PROCEDURE BELOW.

THE RECOVERY PROCEDURE IS AS FOLLOWS:

1. REMOVE C.E. PACK. MOUNT SCRATCH PACK ON F1. USE CUSTOMER COPY UTILITY TO COPY F1 TO R1.
2. REMOVE R1, MOUNT C.E. PACK, RUN C.E. INITIALIZER (ID=FF5) TO INITIALIZE F1.
3. REMOVE C.E. PACK. MOUNT R1 FROM STEP 1 ABOVE. COPY R1 BACK TO F1 USING CUSTOMER COPY UTILITY. THIS PROCEDURE WILL CLEAR THE ERROR TABLES.
4. MOUNT C.E. PACK AND RUN ERAP (NO SSW 20). ERAP WILL GIVE 'E0' HALT AGAIN BUT X'15' FLAG WILL BE WRITTEN. RECOVERY IS NOW COMPLETE.
5. THIS PROCEDURE IS DESIGNED TO COVER ALL HALT 'E0' TYPE PROBLEMS. IF COMPLICATIONS ARISE, YOU WILL HAVE TO OBTAIN OUTSIDE ASSISTANCE.

3. DETAIL ROUTINE DESCRIPTION

3.1 ROUTINE 1

THIS ROUTINE PRINTS ALL RECORDED ENTRIES IN THE ERROR HISTORY TABLE IN CHRONOLOGICAL ORDER, OLDEST FIRST.

THEN THE HISTORY TABLE MEANING IS PRINTED FOR THOSE DEVICES PRINTED IN THE ERROR HISTORY TABLE.

HERE IS A LIST OF DEVICES THAT CAN BE IN THE ERROR HISTORY TABLE.

1. 1442
2. BSCA
3. 5444
4. 5424 MFCU
5. 1403 PRINTER
6. 5203 LINE PRINTER (WT RPQ)
7. 2501 CARD READER
8. 2560
9. 3277 CRT/KEYBOARD
10. 5445 DISK
11. 3284 MATRIX PRINTER
12. DISPLAY ADAPTER

3.2 ROUTINE 2

THIS ROUTINE PRINTS ALL SDR (STATISTICAL DATA RECORDING) TABLES FOR DEVICES THAT ARE DEFINED IN THE UDT TABLE.

HERE IS A LIST OF DEVICES THAT HAVE A SDR TABLE WITH THEIR UDT CODE.

DEVICE	UDT CODE	
5444	X'A0'	
1442	X'51'	
5203	X'E0'	(W.T. RPQ)
1403	X'E1'	
5424	X'F0'	
BSCA 1	X'80'	
BSCA 2	X'88'	
DA	X'89'	
2501	X'31'	
2560	X'F2'	
3277	X'14'	
3284	X'15'	
5445	X'C0'	
3741	X'40'	

ALL VALUES IN THE SDR TABLE ARE PRINTED IN DECIMAL.

3.3 ROUTINE 3

THIS ROUTINE PRINTS THE MASTER SIO TABLE AND THE INDIVIDUAL VOLUME STATISTICS (IVS). AFTER THE MASTER SIO TABLE IS PRINTED A -F0- HALT WILL OCCUR TO LET THE CE SET SSW21-24 FOR SELECTION OF VOLUMES. AFTER ALL SELECTED INDIVIDUAL VOLUME STATISTICS HAVE BEEN PRINTED THE -F0- HALT WILL OCCUR AGAIN. AT THIS TIME THE CE CAN:

1. REMOUNT NEW VOLUMES AND RESET SSW21-24 TO OBTAIN MORE INDIVIDUAL VOLUME STATISTICS. THIS LOOP WILL OCCUR UNTIL THERE ARE NO PRINTOUTS.

   OR
2. CLEAR SSW21-24 AND RESET HALT. THIS WILL TERMINIATE ROUTINE 3.

'B0' MUST BE DEFINED IN THE UDT TABLE TO OBTAIN INDIVIDUAL VOLUME STATISTICS FROM VOLUME 3 AND 4.

INDIVIDUAL VOLUME STATISTICS FOR VOLUMES WHICH HAVE A NON-STANDARD FORMAT FOR SYSTEM 3 DISK OPERATING SYSTEM WILL NOT BE PRINTED. A MESSAGE 'VOL X IS A NON-STANDARD PACK' WILL BE PRINTED (X=1,4) IN THE IVS TABLE.

VOL #	DRIVE
1	1 FIXED
2	1 REMOV
3	2 FIXED
4	2 REMOV

ALL VALUES IN THE MASTER SIO TABLE AND INDIVIDUAL VOLUME STATISTICS ARE PRINTED IN DECIMAL.

THE CE CAN REMOVE THE CE DISK PACK --(ONLY AFTER THE -F0- HALT)-- TO MOUNT OTHER VOLUMES ON THAT DRIVE TO OBTAIN MORE INDIVIDUAL VOLUME STATISTICS. THE CE DISK PACK WILL NEED TO BE REMOUNTED AFTER TERMINATION OF ERAP OR RERUN OF ERAP.

3.4 ROUTINE 4

THIS ROUTINE PRINTS THE 5445 INDIVIDUAL VOLUME STATISTICS. WHEN THE -FC- HALT OCCURS YOU CAN:

1. REMOUNT NEW VOLUMES AND RESET SSW25-28 (FOR DRIVES 1-4) TO OBTAIN MORE INDIVIDUAL VOLUME STATISTICS. THIS LOOP WILL OCCUR UNTIL THERE ARE NO PRINTOUTS.

   OR
2. CLEAR SSW25-28 AND RESET HALT. THIS WILL TERMINIATE ROUTINE 4.

'C8', 'D0' AND 'D8' MUST APPEAR IN THE UDT TABLE TO ALLOW THOSE VOLUME STATISTICS TO BE DUMPED.

3.5 ROUTINE 5

THIS ROUTINE PRINTS A SUMMARY, BY DRIVE NUMBER AND VOLUME ID, OF ALL 3340 ERROR RECORDS AND USAGE INFORMATION RECORDED ON THE DATA MODULE(S) MOUNTED ON THE DRIVE(S) SELECTED BY SWS 11 THRU 14. IF SWS 11 THRU 14 ARE ALL OFF WHEN ROUTINE 5 IS STARTED, THE PROGRAM WILL DEFAULT TO DRIVE 2 BY TURNING ON SW 12. UNLESS ON MOD 15D WITH 3344, THEN SEE SSW 2A, 2B, 2C OR 2D.

THE DATA MODULE(S) MOUNTED ON THE SELECTED DRIVE(S) MUST BE THE SYSTEM RESIDENT (ERROR LOG) VOLUME(S). IF MORE THAN 1 DATA MODULE IS MOUNTED (AND SELECTED), A SEPARATE SUMMARY TABLE WILL BE PRINTED FOR EACH MODULE.

ALL NUMERICAL VALUES PRINTED IN THE SUMMARY TABLE ARE IN DECIMAL.

3.6 ROUTINE 6

THIS ROUTINE PRINTS A HISTORY OF RECORDED 3340 ERRORS IN CHRONOLOGICAL ORDER (OLDEST FIRST). ERROR RECORDS ARE RETRIEVED FROM THE DATA MODULE(S) MOUNTED ON THE DRIVE(S) SELECTED BY SWS 11 THRU 14. IF THESE SWS ARE ALL OFF WHEN ROUTINE 6 IS STARTED, THE PROGRAM WILL DEFAULT TO DRIVE 2 BY TURNING ON SW 12. UNLESS ON MOD 15D WITH 3344, THEN SEE SSW 2A, 2B, 2C OR 2D.

THE DATA MODULE(S) MOUNTED ON THE SELECTED DRIVE(S) MUST BE THE SYSTEM RESIDENT (ERROR LOG) VOLUME(S). IF MORE THAN 1 DATA MODULE IS MOUNTED (AND SELECTED), A SEPARATE HISTORY TABLE WILL BE PRINTED FOR EACH MODULE.

EACH PRINTED ERROR RECORD IDENTIFIES THE DRIVE AND VOLUME ON WHICH THE ERROR OCCURRED AND PROVIDES THE 'READ DIAGNOSTIC SENSE' DATA RETRIEVED AT THE TIME THE ERROR WAS DETECTED. THE TIME AND DATE THAT EACH ERROR OCCURRED WILL ALSO BE PRINTED IF THIS INFORMATION WAS RECORDED IN THE ERROR LOG.

IF SW 20 IS OFF, THE ERROR HISTORY AND USAGE INFORMATION WILL BE CLEARED FROM EACH DATA MODULE AFTER BOTH THE SUMMARY TABLE (ROUTINE 5) AND THE ERROR HISTORY TABLE FOR THAT DATA MODULE HAS BEEN SUCCESSFULLY PRINTED.

4. TABLE DESCRIPTION

4.1 ERROR HISTORY TABLE

THE HISTORY TABLE PROVIDES FOR 63 ENTRIES AND IS RECURSIVE WITH NO OVERFLOW OR STOP LOGIC PROVIDED ON RECORDING. THE 64TH TIME AN ENTRY IS MADE IT WILL OVERLAY THE FIRST ENTRY, THE 65TH ENTRY WILL OVERLAY THE SECOND, ETC. THEREFORE THE HISTORY CAN OBTAIN AT MOST 63 ENTRIES. 5444(DISK) ENTRIES ARE DOUBLE ENTRIES. ERRORS ARE PRINTED IN CHRONOLOGICAL ORDER, OLDEST FIRST.

THE HISTORY TABLE WILL CONTAIN PERMANENT AND TEMPORARY ERRORS. TEMPORARY ERRORS ON DISK WILL CONTAIN A RETRY COUNT WHICH TELLS THE NUMBER OF RETRIES. PERM WILL BE PRINTED FOR PERMANENT ERRORS ON DISK. A PERMANENT ERROR IS DEFINED AS ONE THAT PERSISTS THROUGHOUT THE NUMBER OF RETRIES SPECIFIED IN THE ERROR RECOVERY PROCEDURES. FOR DISK, THERE ARE 16 RETRIES THEN A RECALIBRATE. THIS IS REPEATED 16 TIMES. (16X16=256 RETRIES) A TEMPORARY ERROR IS DEFINED AS ONE WHERE RECOVERY OCCURS BEFORE THE MAXIMUM NUMBER OF RETRIES.

IN GENERAL, EACH ENTRY IN THE ERROR HISTORY TABLE CONTAINS:

1. Q AND R BYTES OF THE SIO INSTRUCTION ISSUED AT THE TIME OF THE ERROR.
2. ERROR BYTE W AND X OF THE ERROR CONDITION.

NOTE- THE R BYTE IS NOT RECORDED FOR BSCA ERRORS AND TEMP BSCA ERRORS ARE NOT RECORDED.
THE Q AND R BYTE ARE NOT APPLICABLE FOR A 3277 UNIT INTERRUPT ERROR.
ERROR BYTES X-Z ARE USED ONLY FOR ERAP PRINTOUT AND SHOULD NOT BE REFERENCED TO SENSE BYTES FROM A SENSE COMMAND.

FOR SOME DEVICES, MORE DATA IS RECORDED IN THE ERROR HISTORY TABLE THAN THE Q, R, AND ERROR BYTES W-X. THIS ADDITIONAL DATA WILL BE PRINTED OUT AND EXPLAINED FOR EACH DEVICE.

4.2 MASTER DISK SIO TABLE FOR 5444.

THE MASTER SIO TABLE HAS COUNTERS FOR WRITES & VERIFIES AND READS & SCANS FOR EACH DRIVE.

ALL NUMBERS ARE PRINTED IN DECIMAL.

4.3 INDIVIDUAL VOLUME STATISTICS (IVS) DISK TABLE ON 5444.

THE IVS TABLE CONTAINS THE VOLUME ID, A COUNTER FOR TEMPORARY ERROR ON THE VOLUME, A COUNTER FOR THE NUMBER OF WRITES & VERIFIES ON THE VOLUME, A COUNTER FOR THE NUMBER OF READS & SCANS ON THE VOLUME, AND THE LOCATION OF UP TO THE LAST 12 PERMANENT DISK ERRORS.

THE TEMPORARY ERROR COUNTER CONTAINS THE COUNT OF MISSING ADDRESS MARKERS, DATA CHECKS ON READS, DATA CHECKS ON WRITES, AND DATA CHECKS IN IDENTIFIER.

A WRITE & VERIFY AND READ & SCAN WILL EACH BE RECORDED AS A SINGLE OPERATION.

THE NUMBER OF SEEKS ARE NOT COUNTED.

ALL NUMBERS ARE PRINTED IN DECIMAL.

A MESSAGE 'VOL X IS A NON-STANDARD PACK' WILL BE PRINTED IN THE IVS TABLE IF THE PACK HAS A NON-STANDARD FORMAT FOR SYSTEM 3 DISK OPERATING SYSTEM.

VOL #	DRIVE
1	1 FIXED
2	1 REMOV
3	2 FIXED
4	2 REMOV

4.4 STATISTICAL DATA RECORDING (SDR) TABLES

EACH DEVICE SDR TABLE WILL CONSIST OF COUNTERS TO RECORD DISTINGUISHABLE ERRORS FOR THAT DEVICE. THE 5444 AND 5445 DEVICES HAVE TEMPORARY AND PERMANENT COUNTERS. A PERMANENT ERROR IS DEFINED AS ONE WHICH PERSISTS THROUGHOUT THE NUMBER OF RETRIES OUTLINED IN THE ERROR RECOVERY PROCEDURES. A TEMPORARY ERROR IS DEFINED AS ONE WHERE RECOVERY OCCURS BEFORE THE MAXIMUM NUMBER OF RETRIES.

ALL NUMBERS ARE PRINTED IN DECIMAL.

4.5 INDIVIDUAL VOLUME STATISTICS (IVS) DISK TABLE ON 5445.

THE IVS TABLE CONTAINS THE VOLUME ID, A COUNTER FOR TEMPORARY ERROR ON THE VOLUME, A COUNTER FOR THE NUMBER OF WRITES & VERIFIES ON THE VOLUME, A COUNTER FOR THE NUMBER OF READS & SCANS ON THE VOLUME, AND THE LOCATION OF UP TO THE LAST 122 PERMANENT DISK ERRORS.

THE TEMPORARY ERROR COUNTER CONTAINS THE COUNT OF MISSING ADDRESS MARKERS, DATA CHECKS ON READS, DATA CHECKS ON WRITES, AND DATA CHECKS IN IDENTIFIER.

A WRITE & VERIFY AND READ & SCAN WILL EACH BE RECORDED AS A SINGLE OPERATION.

THE NUMBER OF SEEKS ARE NOT COUNTED.

ALL NUMBERS ARE PRINTED IN DECIMAL, EXECPT THE PERMANENT ERRORS WHICH ARE PRINTED IN HEX AS -CCHH- WHERE CC IS CYLINDER AND HH IS HEAD.

A MESSAGE 'VOL X IS A NON-STANDARD PACK' WILL BE PRINTED IN THE IVS TABLE IF THE PACK HAS A NON-STANDARD FORMAT FOR SYSTEM 3 DISK OPERATING SYSTEM.

----------- LAST PAGE -----------

1. PROGRAM DESCRIPTION

PROGRAM 'LDR' (PN 5558065 OR PN 1607732) IS A STANDALONE LOADER WHICH IS USED ONLY FOR LOADING THE 3277/3284 CONTROL STORE. FOR CARD READERS, THE DATA LOADED INTO CONTROL STORE IS OBTAINED FROM THE 3277/3284 DATA DECK (ID = FCO), PN 5555530. PROGRAM 'LDR' IS RUN ONLY FROM CARDS OR DISKETTE - NEVER FROM DISK.

2. PROGRAM OPERATION

2.1 LOADING FROM 96 COLUMN CARDS

```
****************************************************************
*                                                              *
*                   LOADING  FROM  MFCU                        *
*                  -----------------------                     *
*                  -----------------------                     *
*                                                              *
*                   1.                                         *
*  DECK                   PLACE 'LDR' FOLLOWED BY 'FCO' IN     *
*                         PRIMARY HOPPER OF MFCU. MAKE READY.  *
*                                                              *
*  -----------                                                 *
*  | PROGRAM |      2.                                         *
*  |  LOAD   |            SET IPL SELECTOR SWITCH TO           *
*  -----------            'ALTERNATE' POSTION.  DEPRESS        *
*                         PROGRAM LOAD KEY.                    *
*                                                              *
*                   3.                                         *
*  $$$$      $            'EJ' HALT MEANS THAT CONTROL         *
*  $         $            STORE IS LOADED AND THE 3277/3284    *
*  $$$$   $  $            IS READY FOR USE.                    *
*  $      $  $                                                 *
*  $$$$   $$$$                                                 *
*                                                              *
****************************************************************
```

2.2 LOADING FROM 80 COLUMN CARDS--1442

```
****************************************************************
*                                                              *
*                   LOADING  FROM  1442                        *
*                  ------------------------------------        *
*                  ------------------------------------        *
*                                                              *
*  DECK(S)                'LDR' FOR 80 COLUMN CARD READERS     *
*                         CONSISTS OF 'LDR' DECK IN 80 COLUMN  *
*                         FORM AND A SPECIAL LOADER DECK.      *
*                            1442 LOADER DECK ID IS 'FEO'.     *
*                                                              *
*                   1.                                         *
*                         PLACE THESE DECKS IN HOPPER:         *
*                           - 'FEO'                            *
*                           - 'LDR'                            *
*                           - 'FCO'                            *
*                                                              *
*     NOTE:  1 BLANK CARD AFTER FCO WILL ELIMINATE H5 HALT     *
*            WHEN HOPPER EMPTIES.                              *
*  -----------                                                 *
*  | PROGRAM |      2.                                         *
*  |  LOAD   |            SET IPL SELECTOR SWITCH TO           *
*  -----------            'ALTERNATE' POSTION.                 *
*                         DEPRESS PROGRAM LOAD KEY.            *
*                                                              *
*                   3.                                         *
*  $$$$      $            'EJ' HALT MEANS THAT CONTROL         *
*  $         $            STORE IS LOADED AND THE 3277/3284    *
*  $$$$   $  $            IS READY FOR USE.                    *
*  $      $  $                                                 *
*  $$$$   $$$$                                                 *
*                                                              *
****************************************************************
```

2.3 LOADING FROM 80 COLUMN CARDS--2560

```
****************************************************************
*                                                              *
*                   LOADING  FROM  2560                        *
*                  ------------------------------------        *
*                  ------------------------------------        *
*                                                              *
*  DECK(S)                'LDR' FOR 80 COLUMN CARD READERS     *
*                         CONSISTS OF 'LDR' DECK IN 80 COLUMN  *
*                         FORM AND A SPECIAL LOADER DECK.      *
*                            2560 LOADER DECK ID IS 'FDO'.     *
*                                                              *
*                   1.                                         *
*                         PLACE THESE DECKS IN HOPPER:         *
*                           - 'FDO'                            *
*                           - 'LDR'                            *
*                           - 'FCO'                            *
*                                                              *
*     NOTE:  2 BLANK CARDS AFTER FCO WILL ELIMINATE H5 HALT    *
*            WHEN HOPPER EMPTIES.                              *
*  -----------                                                 *
*  | PROGRAM |      2.                                         *
*  |  LOAD   |            SET IPL SELECTOR SWITCH TO           *
*  -----------            'ALTERNATE' POSTION.                 *
*                         DEPRESS PROGRAM LOAD KEY.            *
*                                                              *
*                   3.                                         *
*  $$$$      $            'EJ' HALT MEANS THAT CONTROL         *
*  $         $            STORE IS LOADED AND THE 3277/3284    *
*  $$$$   $  $            IS READY FOR USE.                    *
*  $      $  $                                                 *
*  $$$$   $$$$                                                 *
*                                                              *
****************************************************************
```

2.4 LOADING FROM DISKETTE--3741

LOADING FROM 3741

1. INSERT DISKETTE #2 (P/N 1607739) INTO 3741. (LDR HEADER SHOULD APPEAR.)

2. PLACE 3741 ON-LINE, OUTPUT MODE. (TYPE '41' IN COL 1 & 2. PRESS UPPER 'FUNCT SEL' AND 'OUTPUT FROM 3741')

3. SET IPL SELECTOR SWITCH TO 'ALTERNATE' POSITION. DEPRESS PROGRAM LOAD KEY.

4. 'EJ' HALT MEANS THAT CONTROL STORE IS LOADED AND THE 3277/3284 IS READY FOR USE.

```
$$$$      $
$         $
$$$$   $  $
$      $  $
$$$$   $$$$
```

3. LOADER HALTS AND RECOVERY

HALT ID	CONDITION	EXPLANATION AND RECOVERY
EJ	CONTROL STORE LOADED CORRECTLY.	PROGRAM 'LDR' HAS EXECUTED AND TERMINATED WITH NO ERRORS.
HS	ALTERNATE LOADER NOT READY OR ERROR.	1.IF THIS HALT OCCURS ON 80 COLUMN CARD READER WHEN HOPPER EMPTIES, MAKE READER READY AND RESET HALT. (2 BLANK CARDS AFTER FCO SHOULD ELIMINATE THIS HALT AT LAST CARD) 2.OTHERWISE, CLEAR LOADER AND RE-LOAD PROGRAM.
LS	SEQUENCE ERROR (NOTE 1)	DECK 'FCO' IS OUT OF SEQUENTIAL ORDER. CORRECT THE DECK AND RELOAD 'LDR' AND 'FCO' SEQUENCING FOR 80 COL CARDS CONTAINED IN COL 17-20 OF EVERY OTHER CARD. SEQUENCING FOR 96 COL CARDS CONTAINED IN COL 93-96 OF EACH CARD.
L6	CODE LENGTH CHECK	DATA DECK 'FCO' CONTAINS MORE DATA THAN THE LOADER CAN HANDLE.
L7	DECK ID CHECK (NOTE 1)	'FCO' WAS NOT FOUND IN COLUMNS 89-91 OF THE DECK. MAY BE AN INCORRECT CARD IN THE DECK. CORRECT THE DATA DECK AND RELOAD 'LDR' AND 'FCO'. FOR 80 COL CARDS 'FCO' CONTAINED IN COLUMNS 13-15 OF EVERY OTHER CARD. FOR 96 COL CARDS 'FCO' CONTAINED IN COLUMNS 89-91 OF EACH CARD.
L8	ATTACHMENT CHECK	ATTACHMENT CHECK DETECTED WHILE CLEARING THE HDB'S OR WHILE LOADING CONTROL STORE. PROBABLE HARDWARE ERROR. RELOAD AND IF ERROR PERSISTS, CONSULT THE 3277/3284 MAINTENANCE PACKAGE.
Ld	CONTROL STORE LOAD ERROR	DATA LOADED INTO CONTROL STORE IS INCORRECT. PROBABLE HARDWARE ERROR. RELOAD AND IF ERROR PERSISTS, CONSULT THE 3277/3284 MAINTENANCE PACKAGE.
UU	DATA DECK 'FCO' WAS IPLED. (NOTE 1)	DATA DECK WAS IPLED RATHER THAN THE LOADER. 'LDR' MUST PRECEED 'FCO'. CORRECT THE DECKS AND RELOAD.

NOTE 1: IF THIS HALT OCCURS WHILE LOADING FROM 3741, TRY RE-LOADING PROGRAM.
IF HALT RE-OCCURS, RUN 3741 DIAGNOSTICS, REPLACE DISKETTE.

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3. DETAILED DESCRIPTION OF TEST 5

1. GENERAL PROGRAM SUMMARY OF -FF8-

1.1 INTENT

TO PROVIDE A DIAGNOSTIC PROGRAM WHICH WILL PROVIDE A SIX MINUTE RUN OF THE CPU USAGE METER AND THE USAGE METER OF EACH I/O DEVICE ATTACHED WHICH IS DEFINED IN THE UNIT DEFINITION TABLE (UDT) CARD.

2. OPERATING PROCEDURES (DCP CONTROLLED SECTIONS)

THIS SECTION DESCRIBES THE USER INTERFACE FOR ALL PROGRAMS OPERATING UNDER THE DIAGNOSTIC CONTROL PROGRAM (DCP). MORE DETAIL IS PROVIDED IN THE DCP USERS GUIDE (BLOCK 10).

$$
FOR MODEL 15 SYSTEMS SEE BLOCK 10 (DCP USER'S GUIDE) FOR THAT MODEL.
$$

2.1 LOADING

THE CE MODE SELECTOR SWITCH MUST BE IN THE 'PROCESS' POSITION. ALL CE CONTROL PANEL TOGGLE SWITCHES SHOULD BE IN THE NORMAL (DOWN) POSITION.

2.1.1 LOADING ON A MODEL 10 FROM A MFCU.

1. IF DCP IS LOADED, SKIP TO STEP 5.
2. IF A DISK SYSTEM, PLACE -PROGRAM LOAD SELECTOR- IN MFCU POSITION.
3. PLACE DCP FOLLOWED BY TEST SECTION(S) INTO MFCU PRIMARY HOPPER. MAKE MFCU READY.
4. DEPRESS -PROGRAM LOAD- KEY. AFTER DCP IS LOADED, A -HA- HALT WILL OCCUR. COMMON SENSE SWITCHES MAY BE SET AT THIS TIME.
5. PLACE TEST SECTION/S INTO MFCU PRIMARY HOPPER AND MAKE MFCU READY (IF NOT ALREADY DONE).
6. IF A -HA- OR -HE- HALT OCCURS SKIP TO STEP 8.
7. DEPRESS -PROGRAM LOAD- KEY. DCP WILL PRINT SECTION, TERMINATE MESSAGE, AND HALT WITH A -HE-.
8. RESET THE HALT. DCP WILL LOAD THE SECTION AND DISPLAY A -HA- HALT.
9. MAKE DESIRED CONSOLE SWITCHES ENTRIES, IF ANY, AND RESET THE HALT.

2.1.2 LOADING ON A MODEL 10 FROM DISK WITH A 5424 (MFCU) ATTACHMENT.

1. SKIP TO STEP 5 IF DCP IS ALREADY LOADED.
2. PLACE THE CE PACK ON R1 AND MAKE DRIVE 1 READY.
3. PLACE THE -PROGRAM LOAD SELECTOR- IN REMOVABLE POSITION.
4. DEPRESS -PROGRAM LOAD- KEY. AFTER DCP IS LOADED, A -HA- HALT WILL OCCUR. COMMON SENSE SWITCHES MAY BE SET AT THIS TIME.
5. USE CONSOLE SWITCHES ENTRY -DXXX- (XXX - PROG ID) TO SPECIFY THE PROGRAMS TO BE LOADED. (SEE SECTION 2.4)
6. SET LEFTMOST SWITCH TO -0- AND RESET HALT. DCP WILL LOAD THE SECTION AND DISPLAY A -HA- HALT.
7. MAKE ANY CONSOLE SWITCH ENTRY DESIRED AND/OR RESET HALT.

2.1.3 LOADING ON A MODEL 10 FROM DISK WITH A 5422 ATTACHMENT, OR MODEL 8.

1. SKIP TO STEP 5 IF DCP IS ALREADY LOADED.
2. PLACE THE CE PACK ON R1 AND MAKE DRIVE 1 READY.
3. PLACE THE -PROGRAM LOAD SELECTOR- IN REMOVABLE POSITION.
4. PLACE -00FE- IN DATA SWITCHES AND DEPRESS -PROGRAM LOAD- KEY.

   CPU TESTS ARE LOADED AND RUN BEFORE DCP IS LOADED. TO RUN STORAGE TESTS, SEE BLOCK 5. THE ORDER OF HALTS IS LISTED BELOW. RESET THE HALTS IF THEY OCCUR IN THE FOLLOWING ORDER. IF THE HALTS AREN'T IN THE PROPER ORDER REFER TO BLOCK 5. WHEN THE -HE- HALT OCCURS GO TO STEP 5.

   HALTS
   A) -CC-
   B) -LL-
   C) -8P-
   D) -HE-

5. USE CONSOLE SWITCHES ENTRY -DXXX- (XXX - PROG ID) TO SPECIFY THE PROGRAM/S TO BE LOADED. (SEE SECTION 2.4)
6. SET LEFTMOST SWITCH TO -0- AND RESET HALT. DCP WILL LOAD THE SECTION AND DISPLAY THE -HA- HALT.
7. MAKE ANY CONSOLE SWITCH ENTRY DESIRED AND/OR RESET HALT.

2.1.4 LOADING ON A MODEL 6 FROM DISK.

1. SKIP TO STEP 8 IF DCP IS ALREADY LOADED.
2. LOAD THE CE PACK ON R1 AND MAKE DRIVE 1 READY.
3. PLACE THE -PROGRAM LOAD SELECTOR- IN REMOVABLE POSITION.
4. SET DATA SWITCHES TO -00FE- (-02FE- TO BYPASS STORAGE PROGRAMS OR -03FE- TO ALLOW SENSE SWITCH SETTING PRIOR TO PRINTING OR BYPASS THAT PORTION OF I/O LSRS INCLUDED IN THE CPU TESTS).
5. OPERATE PROGRAM LOAD.
6. THE FOLLOWING HALTS WILL OCCUR. AFTER EACH, OPERATE THE START KEY.

   A) -EE- (ABC 123)
   B) -FF5- (ABCD 12345)
   C) -805- (A 5) STORAGE SEPARATOR HALT.
   D) -805- (A 5) STORAGE SEPARATOR HALT.

   THE STORAGE SEPARATOR HALTS OCCUR ONLY IF THE DATA SWITCH ENTRIES ARE -00FE- OR -03FE-. OTHER HALTS OCCURRING AT THIS TIME SHOULD BE INVESTIGATED.

7. DCP WILL LOAD AND DISPLAY A -FA5- (ABCD 1 3 5) HALT.
8. USE CONSOLE SWITCHES ENTRY -DXXX- (XXX -PROG ID) TO SPECIFY THE PROGRAM/S TO BE LOADED. (SEE SECTION 2.4)
9. SET LEFTMOST SWITCH TO -0- AND RESET HALT. DCP WILL LOAD THE SECTION AND DISPLAY A -FA5- (ABCD 1 3 5) HALT.
10. MAKE ANY CONSOLE DATA SWITCH ENTRY DESIRED AND/OR RESET HALT.

2.2 PROGRAM RESTART

DCP STORES INSTRUCTIONS STARTING AT LOCATION '0000' TO PROVIDE FOR A PROGRAM RESTART. THESE INSTRUCTIONS ALSO CHECK THE CONSOLE SWITCHES FOR A VALID ENTRY. TO PERFORM A PROGRAM RESTART, SIMPLY DEPRESS SYSTEM RESET FOLLOWED BY CPU START.

2.3 TERMINATION

NORMAL DCP-CONTROLLED CHAINING FROM ROUTINE TO ROUTINE PROVIDES AN AUTOMATIC TERMINATION OF A SECTION. IN ADDITION, THE CE MAY TERMINATE A SECTION AT ANY TIME BY (1) ENTERING 'EE00' IN THE CONSOLE SWITCHES, OR BY (2) LOADING THE NEXT SECTION. IN ALL CASES, DCP PRINTS A MESSAGE AND PERFORMS HALT 'HE'. THE SECTION CAN STILL BE RESTARTED AT THIS TIME BY USING THE PROGRAM RESTART PROCEDURE. IF NO RESTART IS DESIRED, RESET THE HALT TO LOAD THE NEXT SECTION.

2.4 CONSOLE ADDRESS/DATA SWITCH COMMUNICATIONS

THE ROTARY DATA SWITCHES ARE THE MEANS BY WHICH THE CE CAN COMMUNICATE WITH THE DIAGNOSTICS. ENTRIES ARE MADE AS FOLLOWS--

1. STOP CPU.
2. SET UP ROTARY SWITCHES FOR ONE OF THE FOLLOWING OPTIONS. X'S INDICATE POSITIONS WHICH VARY WITH THE NEED.

SWITCHES 1	2	3	4	
F	0	X	X	- TURN OFF SENSE SWITCH 'XX'. (F008 WOULD TURN OFF SSW 08).
F	1	X	X	- TURN ON SENSE SWITCH 'XX'. (F108 WOULD TURN ON SSW 08).
F	2	X	X	- GO TO ROUTINE 'XX' AFTER CONSOLE ENTRY FINISHED. (F202 WOULD GO TO ROUTINE 2).
E	E	0	0	- TERMINATE THE CURRENT SECTION.
D	X	X	0	- DISK--EXECUTE SECTIONS FOR DEVICE WITH UNIT CODE 'XX'. (DE00 - EXECUTE ALL 5203 PRINTER PROGRAMS)
D	X	X	X	- DISK--EXECUTE SECTION XXX. (DE01 - SECTION E01). (DE01 - EXECUTE SECTION E01)

NOTE - UP TO FOUR DISK INSTRUCTIONS MAY BE ENTERED DURING ONE ENTRY PHASE.

3. DEPRESS CPU START. (SYSTEM RESET FOLLOWED BY START WILL CALL IMMEDIATE ATTENTION TO THE SWITCHES--SEE NOTE BELOW).
4. WHEN DCP RECEIVES CONTROL, IT HALTS WITH 'HP' DISPLAYED. RESET THE HALT TO ENTER THE FIRST OPTION.
5. DCP WILL DISPLAY HALT 'HU' OR 'HP'. LOAD THE NEXT OPTION AND RESET THE HALT.
6. REPEAT STEP 5 FOR AS MANY OPTIONS AS DESIRED. ALTERNATING CODES 'HU' AND 'HP' WILL SIGNAL DCP ACCEPTANCE.
7. WHEN DONE, SET LEFTMOST SWITCH TO '0' AND RESET THE HALT.

NOTE - WHEN USING F2XX IN THE SWITCHES TO GO TO A ROUTINE AFTER A SECTION HAS BEGUN, SYSTEM RESET/START SHOULD BE PERFORMED BEFORE MAKING THE ENTRY. (THIS PREVENTS ERRORS FOUND IN ONE ROUTINE FROM BEING DETECTED IN SOME OTHER ROUTINE. IT SHOULD NOT BE PERFORMED IF OTHERWISE SPECIFIED IN THE MAPS.)

2.5 COMMON SENSE SWITCHES

SENSE SWITCHES ARE EQUIVALENT TO 48 TOGGLE SWITCHES NUMBERED HEXADECIMALLY 00-2F.
SENSE SWITCHES 00-0F ARE RESERVED FOR STANDARD OPTIONS PROVIDED BY DCP (LISTED BELOW).
SENSE SWITCHES 10-2F ARE SIGNIFICANT TO THE PARTICULAR SECTION BEING RUN.
INSTRUCTIONS FOR SETTING SENSE SWITCHES ARE CONTAINED IN SECTION 2.4.

SSW NUMBER	ON	OFF (NORMAL)
00	LOOP ON SECTION.	GO TO NEXT SECTION.
01	LOOP ON ROUTINE.	GO TO NEXT ROUTINE.
02	BYPASS MANUAL INTERVENTION ROUTINES.	EXECUTE ALL ROUTINES.
03	BYPASS ERROR PRINTING.	PRINT ERROR MESSAGES.
04	BYPASS NON-ERROR PRINTING.	PRINT NON-ERROR MESSAGES.
05	USE ALTERNATE PRINTER. PRINTER KEYBOARD, IF ATTACHED. OTHERWISE, MFCU.	NORMAL PRINTER.
06	BYPASS ERROR HALTS.	HALT AFTER ERROR.
07	LOAD AND GO. BYPASS COMMENTS AND PROMPTING HALTS.	PROMPTING MODE.
08	USE 5203 RIGHT CARRIAGE.	USE LEFT CARRIAGE.
09	DON'T CLEAR SECTION SENSE SWITCHES AFTER LOADING	CLEAR SECTION SENSE SWITCHES AFTER LOADING
0A-0F	RESERVED	

2.6 CONTROL PROGRAM HALTS.

ALL CONTROL PROGRAM (DCP) HALTS USE THE CHARACTER 'H' AS THE FIRST DIGIT OF THE HALT CODE. THE SECOND DIGIT IDENTIFIES THE CONDITION ACCORDING TO THE FOLLOWING TABLE.

HALT CODES MODEL 6	8/10	CONDITION	ACTION REQUIRED
F05	H0	INVALID RECORD FOUND WHILE LOADING.	CORRECT INVALID RECORD AND RELOAD.
F15	H1	A DEVICE CALLED FOR BY THE TEST SECTION WAS NOT DEFINED IN THE UDT CARDS.	CHECK UDT CARDS AND RELOAD OR RESET HALT TO BYPASS THE ERROR (ERRORS COULD RESULT).
F25	H2	DATA SWITCH ENTRY ERROR.	CORRECT DATA SWITCHES AND RESET HALT.
F35	H3	INVALID ROUTINE PREFIX FOUND DURING CHAINING FROM ONE ROUTINE TO NEXT.	ENTER ROUTINE SELECT OPTION 'F2XX' IN DATA SWITCHES AND RESET HALT. IF THIS DOES NOT WORK, RELOAD SECTION.
F55	H5	MFCU NOT READY OR ERROR. ERROR INDICATION SHOULD BE DISPLAYED IN THE MFCU LIGHTS.	DO A NON-PROCESS RUN-OUT, RELOAD DECK STARTING WITH RUNOUT CARD/S AND RESET THE HALT.
F65	H6	PRINTER NOT READY OR ERROR.	CLEAR CONDITION AND RESET THE HALT. IF FAILURE PERSISTS, RUN PRINTER FUNCTION TEST. SENSE SWITCHES 03 AND 04 MAY BE USED TO BYPASS PRINTING. SET SENSE SWITCH 05 TO USE ALTERNATE PRINTER.
F75	H7	DISK ERROR.	RESET HALT TO RETRY. IF ERROR PERSISTS, RELOAD.
FA5	HA	CONTROL PROGRAM IS PREPARED TO RECEIVE DATA SWITCH ENTRY. OCCURS AFTER DCP AND SECTION LOADING.	RESET THE HALT IF NO ENTRY DESIRED. TO LOAD OPTIONS, SET UP DATA SWITCHES AND RESET THE HALT. SSW 07 MAY BE USED TO BYPASS THIS HALT.
FC5	HC	DISK LOADER REQUIRES SPECIFICATION OF SECTIONS TO BE LOADED FROM DISK.	IF NO ENTRY HAS BEEN MADE PREVIOUSLY, LOAD PROGRAM SELECTION ENTRY 'DXXX' AND RESET THE HALT. UP TO EIGHT ENTRIES MAY BE MADE. IF ENTRIES HAVE EVER BEEN MADE, THE PROGRAMS MAY BE REPEATED BY RESETTING THE HALT.
FD5	HD	SECTION RUNNING OR LOAD TABLE HAS SPECIFIED NEXT SECTION TO BE RUN. ARR CONTAINS -DXXX- WHERE XXX IS THE PROGRAM ID TO BE RUN.	DISK SYSTEM - DXXX IS NOT ON DISK PACK, RESET THE HALT AND THE NEXT PROGRAM IN THE LOAD TABLE WILL BE LOADED. CARD SYSTEM - PLACE DECK XXX IN THE MFCU HOPPER AND RESET THE HALT.
FE5	HE	CURRENT SECTION TERMINATED.	RESET HALT TO LOAD NEXT SECTION. SECTION MAY BE RESTARTED BY SYSTEM RESET/START.
FF5 F05	HP HU-HP	DCP HALTS WITH 'HP' DISPLAYED WHENEVER A VALID DATA SWITCH ENTRY IS RECOGNIZED. AS DCP ACCEPTS ENTRIES, ALTERNATING HALTS 'HU' AND 'HP' OCCUR.	LOAD A VALID DATA SWITCH ENTRY AND RESET THE HALT. REPEAT FOR ALTERNATING HALTS 'HU' AND 'HP'. TO TERMINATE ENTRY PROCEDURE, ROTATE LEFT-MOST SWITCH TO ZERO AND RESET HALT.
D1	D1	IPL LOADER CAN'T LOAD DCP BECAUSE OF A DISK ERROR.	RESET HALT TO RETRY. IF HALT PERSISTS, GET A NEW DISK PACK.

2.7 OPERATING PROCEDURES FOR USAGE METER TEST -FF8-

THIS TEST RUNS UNDER THE DIAGNOSTIC CONTROL PROGRAM (DCP).

2.7.1 MAKE READY EACH DEVICE TO BE TESTED.

2.7.2 AFTER THE PROGRAM HAS BEEN LOADED, HALT 'FA' WILL OCCUR, IF TAPE IS DEFINED IN THE UDT, TO GIVE SPECIAL OPERATOR INSTRUCTIONS FOR THE TAPE UNITS. THEN THE PROGRAM WILL ISSUE START I/O'S TO EACH METERED DEVICE ATTACHED AND DEFINED IN THE UDT.

2.7.3 AN -F0- HALT WILL OCCUR AFTER THE START I/O'S HAVE ALL BEEN ISSUED.

2.7.4 DO NOTHING TO THE I/O DEVICES WHICH ARE BEING TESTED. CERTAIN OPERATOR INTERVENTIONS WILL CAUSE THE USAGE METER TO STOP, SO UNLESS THE OPERATOR IS AWARE OF THE POSSIBILITIES FOR THE SPECIFIC DEVICE, IT IS RECOMMENDED THAT NC ACTION BE TAKEN.

2.7.5 CHECK TO BE CERTAIN THAT ALL METERS HAVE STOPPED (REFER TO CPU USAGE METER MAP IF THEY DID NOT) AND RECORD THE VALUES OF ALL THE USAGE METERS BEING TESTED. THIS MUST BE DONE AS ACCURATELY AS POSSIBLE IN ORDER FOP THE TEST RESULTS TO BE OF ANY VALUE.

2.7.6 RESET THE -F0- HALT. THE PROGRAM WILL RUN FOR SIX MINUTES AND THEN HALT.

2.7.7 WHEN THE -EE- HALT OCCURS, RECORD AND CONFIRM SIX MINUTES ON EACH DEVICE USAGE METER BEING TESTED.

2.7.8 REFER TO THE CPU MAP CHARTS IF THE CPU USAGE METER INCREMENTED INCORRECTLY. IF THE CPU METER IS CORRECT BUT A DEVICE METER IS INCORRECT, REFER TO THE MAP CHARTS FOR THAT DEVICE.

2.7.9 THE SIX MINUTE PROGRAM LOOP WILL BE RE-RUN IF THE -EE- HALT IS RESET. THE START I/O'S WILL NOT BE ISSUED AGAIN. ALL DEVICE USAGE METERS WILL RE-START AND RUN UNLESS THEY HAVE BEEN STOPPED BY THE UNIQUE DEVICE OPERATOR INTERVENTION WHICH WILL ALWAYS STOP A DEVICE METER. EXAMPLES OF THIS INTERVENTION ARE SPACING THE PRINTER AND EMPTYING WAIT 1 AND WAIT 2 OF THE MFCU BY THE NPRO KEY.

2.7.10 THE PROGRAM CAN BE RUN FROM THE VERY BEGINNING, INCLUDING THE MESSAGES AND THE START I/O'S, BY DOING A SYSTEM RESET, START.

2.7.11 HALTS

HALT TABLE

HALT NUMBER	CONDITION	ACTION REQUIRED
EE	A RUN TIME OF 0.1 HOUR (6 MINUTES) HAS BEEN COMPLETED.	RECORD THE USE METERS AND MAKE CERTAIN THAT EACH ONE HAS ADVANCED 0.1 HOUR. IN THE EVENT OF AN INCORRECT READING, THE USAGE METER MAP CHART FOR THAT DEVICE SHOULD BE USED. THIS TEST WILL BE RERUN IF THE HALT IS RESET.
F0	THE START I/O'S HAVE BEEN ISSUED TO THE ATTACHED DEVICES.	DO NOTHING TO THE I/O DEVICES. CHECK ALL USAGE METERS TO BE CERTAIN THAT THEY HAVE STOPPED. IF 'ALL' METERS CONTINUE TO RUN, REFER TO THE CPU USAGE METER MAP CHART. RECORD THE VALUE OF ALL USAGE METERS. RESET THE HALT.
FA	SPECIAL OPERATOR INSTRUCTIONS REQUIRED BECAUSE TAPE 3410/3411 IS DEFINED IN THE UDT.	THE TAPE UNITS TO BE TESTED MUST BE ENABLED, AND READY WITH A SCRATCH TAPE AND A WRITE ENABLE RING INSTALLED.
FC	3881 IS NOT ON-LINE AND READY IN '07' DIAGNOSTIC MODE.	PUT THE 3881 ON-LINE ,IN '07 DIAGNOSTIC MODE AND MAKE IT READY.

3. DETAILED DESCRIPTION OF TEST

INSTRUCTIONS ARE PRINTED BY THE PROGRAM WHICH WILL ENABLE THE OPERATOR TO SUCCESSFULLY RUN THE TEST WITHOUT ANY ADDITIONAL INFORMATION. THIS PROGRAM CAN BE USED TO CHECK THE METERS AGAINST REAL TIME BY MEASURING, WITH A CLOCK, FROM THE TIME THE -F0- HALT IS RESET UNTIL THE -EE- HALT OCCURS. THE DURATION OF TIME SHOULD BE SIX MINUTES.

THE METERS ARE STARTED BY ISSUING A START I/O TO EACH DEVICE WHICH HAS BEEN DEFINED IN THE UDT CARD OF DCP. IF THE I/O DEVICES HAVE NOT BEEN MADE READY PRIOR TO THE LOADING OF THE PROGRAM, THE I/O ATTENTION LIGHT WILL COME ON (FOR THE 3881 A 'FC' HALT OCCURS) IMMEDIATELY FOLLOWING THE MESSAGE TO MAKE ALL I/O DEVICES READY. WHEN ALL THE DEVICES HAVE BEEN MADE READY, THE PROGRAM WILL ISSUE THE START I/O'S, PRINT THE INSTRUCTIONS, AND PERFORM AN 'F0' HALT.

WHEN THE -F0- HALT IS RESET, THE PROGRAM WILL LOOP FOR SIX MINUTES. AT THE END OF THE SIX MINUTES THE PROGRAM WILL PERFORM AN -EE- HALT AND THE METERS SHOULD ALL STOP WITH AN ADDITIONAL SIX MINUTES INDICATED ON EACH ONE.

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1. DIAGNOSTIC CONTROL PROGRAM - SYSTEM DEFINITION

FIRST A NOTE ABOUT MODEL 15 DISK SYSTEM-- THE CARDS DESCRIBED IN THIS SECTION ALSO APPLY TO THE CARD IMAGES ON DISK AND DISKETTE.

BEFORE THE DIAGNOSTIC CONTROL PROGRAM (DCP) CAN BE USED, IT MUST BE CONFIGURED FOR YOUR SYSTEM.

TO CONFIGURE DCP ON DISK, USE THE DISK EDITOR. REFER TO USERS GUIDE, BLOCK 20. (BLOCK 94 FOR 3340).
TO CONFIGURE THE CARD DECK OF DCP, CARDS MUST BE PUNCHED TO CONFIGURE YOUR SYSTEM.
TO CONFIGURE DISKETTE DCP:

1) INSERT DISKETTE #1 IN 3741.
2) PRESS LOWER 'FUNCT SEL' AND 'SEARCH CONTENT'
3) TYPE AN ASTERISK (*) IN COL 1.
4) PRESS 'REC ADV'.
5) WHEN RECORD IS FOUND, 'REC BKSP' TO DESIRED RECORD (CPU, UDT, //CHAIN, IMAGE, MISC). DEFINE SYSTEM AS DESCRIBED FOR CARDS (TYPE OVER EXISTING DATA). 'REC ADV' ENTERS DATA DISPLAYED ON SCREEN.
6) WHEN CONFIGURATION COMPLETE, PRESS LOWER 'FUNCT SEL' AND 'RETURN TO INDEX'.

CONFIG 40 on #1 ENTRY
ON UDT ON DISKETTE
AT ~~THE~~ HALT
PUT IN DISKETTE #3
FOR 3340 MICRO
~~TEST~~
NUM 41 O @ OUTPUT
upper FEAC SEZ

CPU, UDT, AND CHAIN IMAGE CARDS ARE DESCRIBED BELOW.

80 COLUMN DECKS --
DIAGNOSTIC PROGRAMS AVAILABLE IN 80 COLUMN CARDS MAY BE IN ONE OF 2 FORMS.

1) 1 FOR 1. THE DATA PREVIOUSLY CONTAINED ON ONE 96 COLUMN CARD APPEARS ON ONE 80 COLUMN CARD USING STANDARD EBCDIC.

   FORMAT: 80 COL. CARD COLUMNS 1-72 CONTAIN DATA EQUIVALENT TO ITS CORRESPONDING 96 COLUMN CARD. COLUMN 73-80 CONTAIN SEQUENCING IDENTICAL TO THAT CONTAINED IN COLUMNS 89-96 OF THE 96 COLUMN CARD.

2) 2 FOR 1. DATA PREVIOUSLY CONTAINED ON 1 96 COLUMN CARD APPEARS THE SAME, COLUMN FOR COLUMN, ON TWO 80 COLUMN CARDS.

   FORMAT: 80 COL. CARD COLUMNS 1-76 ARE THE SAME AS 96 COLUMN CARD COLUMNS 1-76. COLUMN 77 CONTAINS CHARACTER 'X' (0-7 PUNCH). ON SECOND CARD, COL. 1-20 IS THE SAME AS 77-96 OF 96 COLUMN CARD. COLUMNS 78-80 ARE FOR SEQUENCING.

   PROGRAMS WHICH HANDLE THESE CARDS DISTINGUISH ONE TYPE FROM THE OTHER BECAUSE ONLY THE 2 FOR 1 FORMAT HAS AN 'X' IN COL. 77 OF THE FIRST CARD. ANY CHARACTER BUT 'X' SAYS THIS IS A 1 FOR 1 TYPE CARD.

   IF A 1 FOR 1 TYPE CARD IS DESTROYED AND ONE WISHES TO USE THE PROGRAM LISTING TO PUNCH A NEW CARD, HE MAY PUNCH THAT CARD IN THE 2 FOR 1 FORMAT AS IT APPEARS IN THE LISTING AND PLACE BOTH CARDS WHERE THE 1 CARD WAS.

DISKETTE --
DIAGNOSTIC PROGRAMS AVAILABLE ON DISKETTE ARE AS FOLLOWS:

1 FOR 1. THE DATA PREVIOUSLY CONTAINED ON ONE 96 COLUMN CARD APPEARS ON ONE DISKETTE RECORD USING STANDARD EBCDIC.

1.1 CPU DEFINITION CARD

| U S E N U M E R I C 0, N O T L E T T E R O. |

E,EFFF,2

COLUMN	CONTENTS
1-3	'CPU'
4	BLANK
5	SYSTEM MODEL 'E' - MODEL 15
6	COMMA
7-	STORAGE SIZE 'C000' - 48K 'FFFF' - 64K '1FFFF' - 96K '5FFFF' - 224K '2FFFF' - 128K '6FFFF' - 256K '3FFFF' - 160K 'AFFFF' - 384K '4FFFF' - 192K 'EFFFF' - 512K
NEXT	COMMA
NEXT	CPU OPTIONS '0' 5415 MODELS A, B OR C '2' 5415 MODELS D
NEXT	BLANK

SAMPLE CPU CARD

```
/ CPU E,C000,0
I
I
```

THIS CARD DEFINES A 5415 A/B/C CPU WITH 48K STORAGE.

```
/ CPU E,1FFFF,2
I
I
```

THIS CARD DEFINES A 5415 D CPU WITH 96K STORAGE.

1.2 UNIT DEFINITION CARDS (UDT UU-XYZ,UU,...,UU-WXY)

COLUMN	CONTENTS
1-3	'UDT'
4	BLANK - UDT TABLE IS CLEARED PRIOR TO PROCESSING THIS CARD. PREVIOUS UDT CARDS ARE IGNORED. NON-BLANK - IF ANY CHARACTER (LIKE X), THEN THE DEVICES ON THIS CARD WILL BE ADDED TO THE DEVICES ON THE PREVIOUS UDT CARD. THIS CARD ACTS AS A CONTINUATION OF THE PREVIOUS UDT CARD.
5-	'UU-XYZ,UU,...,UU-WXY ' (NOTE BLANK POSITION) EACH UNIT IS SEPARATED BY COMMAS. UU - DEVICE IDENTIFICATION CODE. XYZ - OPTIONAL FEATURES IDENTIFICATION NUMBERS. IF THE DEVICE HAS NO FEATURES, ENTER ONLY THE DEVICE CODE. THE FIRST DEVICE IS THE LOAD DEVICE -- 'A0' FOR DISK, 'F0' FOR MFCU ETC. THE SECOND DEVICE IS THE PRIMARY PRINTER ('E1' FOR 1403). SEE CHART ON NEXT PAGE FOR DEVICE CODES AND FEATURES FOR DEVICES. UP TO 18 DEVICES MAY BE DEFINED. WHEN A DEVICE CODE IS ENTERED MORE THAN ONCE (ON SAME OR CONTINUATION CARD), THE LAST ENTRY WILL BE USED.
NEXT	A BLANK MUST FOLLOW THE LAST ENTRY ON THE UDT CARD. DEVICE CODES AND THEIR FEATURES ARE LISTED ON THE NEXT PAGE.

--- SAMPLE UDT CARD ---

```
/ UDT A0-2,E1-0,14,15,51
I
I
```

THIS UDT CARD DEFINES A SYSTEM WITH
5444 DISK, ONE SPINDLE WITH HI SPEED ACTUATOR
1403 PRINTER, 1100 LINE PER MIN. FEATURE
3270 CRT
3284 MATRIX PRINTER
1442 CARD READER

(DISK IS THE LOAD DEVICE. 1403 PRINTER IS THE MAIN PRINTER.)

MORE SAMPLES:

```
UDT F0,E1-03,14,A0-2
UDT F0-1,E1,14,15,A0-2,B0-2
UDT A0-2,E1-03,B0-2,14,15,C0,C8,D0,D8,70,80,88,20-238
```

NOTE- USE NUMBER 0, NOT LETTER O, IN THESE CARDS

40,E1,C1-4,
80-5,87-2,89-15

TABLE OF DEVICES AND FEATURES

THE DEVICES AND FEATURES BELOW MAY OR MAY NOT BE AVAILABLE ON SYSTEM/3 MODEL 15.
IN MOST CASES DEVICES AVAILABLE ON BOTH MODEL 10 AND 15 HAVE THE SAME DEVICE CODE ETC.

| U S E N U M E R I C 0, N O T L E T T E R O. |

DEVICE	CODE -UU-	STANDARD FEATURES	OPTIONAL FEATURES -WXYZ...-
3277 CRT/ KEYBOARD	14	STANDARD KEYBOARD-- UNITED STATES FRENCH QWERTZ BELG. AZERTY ITALY GERMAN QWERTY UNITED KING.	0,1,2 - RESERVED 3 - AUSTRIA/GERMAN QWERTZ BRAZIL/PORTUGAL DENMARK NORWAY SWEDEN/FINLAND 4 - SPANISH
3284 PRINTER	15		
MLTA	20		0 - SEC. TERMINAL CONTROL TYPE (WORLD TRADE) 2 - AUTO POLL 3 - UNDER-THE-COVER LINE ADAPTER 8 - BMT CARD 2 PRESENT 9 - BMT CARD 3 PRESENT A - BMT CARD 4 PRESENT (BMT CARDS ARE FOR CONTROL STORAGE)
SIOC	30		
BSCC	28	1.EBCDIC CODE 2.TRANSPARENCY 3.ITB(ITERMEDIATE BLOCK CHECKING) 4.NO INTERNAL 27-1	1 - LINE 2 INSTALLED 2 - LINE 1 BYPASS A.P. REC. BUFFER. ** RPQ ** 3 - LINE 2 BYPASS A.P. REC. BUFFER. ** RPQ ** 4 - LINE 1 USACII 5 - LINE 2 USACII 8 - LINE 1 INTERNAL CLOCK 9 - LINE 2 INTERNAL CLOCK
2501	31		0 - 1000 CPM 1 - 600 CPM 2 - OPTICAL MARK READ 3 - 51/80 COLUMN CARDS
1231 (RPQ)	34		0 - MASTER MARK FEATURE
1255 TRIM	35	STACKERS 0,2,4,6,8	0 - RESERVED 1 - RESERVED 2 - ALTERNATE SORT FEAT. STACKERS 0,1,2,3,4 3 - DASH SYMBOL TRANS 4 - 12 STACKERS 5 - CMC7 MODELS 21,22,23
1270 (RPQ)	36		0 - 12 POCKET MODEL 1 - ALTERNATE SORT FEAT.
1419 (RPQ)	37		2 - BATCH NUMBER 3 - DASH TRANSMITTER 5 - CMC7 6 - PPL GROUP 2 7 - PPL GROUP 1
1017 (RPQ)	39		0 - ADVANCED FEED HOLE
3881 OPTICAL MARK READER	3A		
1018 (RPQ)	3B		0 - ERROR DETECTION 1 - ADVANCED FEED HOLE OR JAPANESE PUNCH
BINARY HARDWARE MULTIPLY DIVIDE RPQ	3E		NO FEATURES.
3741	40		0 - IPL FEATURE
1442	51	MODEL 6 300 CPM	0 - MODEL 7 400 CPM
PLOTTER (RPQ)	55		0 -40 PEN CMDS/SEC 1 -200 CARR/DRUM CMDS/SEC 2 -450 " " " " 3 -600 " " " " 4 -900 " " " " NOTE - 1,2,3 & 4 MUTUALLY EXCLUSIVE.

NOTE 1: LOCAL COMUNICATIONS ADAPTER (LCA) IS FUNCTIONALLY THE SAME AS BSCA-1 WITH POINT TO POINT NON-SWITCHED LINE CONTROL, LOCAL MODEMLESS ATTACHMENT (AT 2400 BPS), AND EBCDIC TRANSMISSION CODE. THE SAME DIAGNOSTICS AND MAP CHARTS USED BY BSCA-1 ARE UTILIZED FOR LCA.

NOTE 2: DCP WILL NOT SUPPORT THE SECOND 1403 PRINTER AS EITHER THE PRIMARY OR THE ALTERNATE DIAGNOSTIC OUTPUT DEVICE. THEREFORE, DO NOT SPECIFY E2 AS THE SECOND UDT CODE.

DEVICE	CODE -UU-	STANDARD FEATURES	OPTIONAL FEATURES -WXYZ...-
3411/3410 TAPE	70		
BSCA-1 OR LCA SEE NOTE 1 BELOW	80	EBCDIC CODE AUTO ANSWER ITB (INTER-MEDIATE BLOCK CHECKING)	0 - MULTIPOINT-TRIBUTARY 1 - INTERNAL CLOCK, LOCAL MODEMLESS, OR LCA 2 - HIGH SPEED 3 - AUTO CALL 4 - TRANSPARENCY 5 - MULTIPOINT - CONTROL STATION 6 - ASCII 7 - SWITCHED NETWORK 8 - 1200 BPS INTEGRATED MODEM
2972/2980	82		NOTE - ANY OPTIONS ARE SPECIFIED IN DATA CARDS
3270 (BSCA FEATURE)	87		0 - PRINTER 1 - ASCII 2 - 1920 CHAR BUFF 3 - AUTO CALL 4 - SWITCHED
BSCA-2	88	EBCDIC CODE AUTO ANSWER ITB (INTER-MEDIATE BLOCK CHECKING)	0 - MULTIPOINT-TRIBUTARY 1 - INTERNAL CLOCK OR LOCAL MODEMLESS 2 - NOT USED 3 - AUTO CALL 4 - TRANSPARENCY 5 - MULTIPOINT - CONTROL STATION 6 - ASCII 7 - SWITCHED NETWORK 8 - 1200 BPS INTEGRATED MODEM
INTE-GRATED DISPLAY ADAPTER	89	MOD-1 AND MOD-2 SUPPORT (OPTION BIT 1 MUST BE DEF.) 3 PR/REC PORTS	0-KATAKANA FEATURE 1-MOD-2 ADAPTER INST. 3-DRIVERS FOR C3-C5 4-DRIVERS FOR C6-C8 5-DRIVERS FOR C9-4B 6-DRIVERS FOR 4C-4E 7-DRIVERS FOR 4F-D1 8-DRIVERS FOR D2-D4 9-DRIVERS FOR D5-D7 A-DRIVERS FOR D8-5A B-DRIVERS FOR 5B-5D
5444 PRI SPIN DISK	A0		0 - NOT USED 1 - 100 CYLINDER DISK 2 - HIGH SPEED ACTIVATOR
5444 SEC SPIN DISK	B0		0 - REMOVABLE DISK ONLY 2 - HIGH SPEED ACTIVATOR
5445 DRIVE 1	C0		
3340 BASIC (2 DRIVES)	C1	2 DRIVES	3 -3 DRIVES 4 -4 DRIVES
5445 DRIVE 2	C8		
5445 DRIVE 3	D0		
5445 DRIVE 4	D8		
5203 PRINTER (WT RPQ)	E0	100 LPM 96 PRINT POSITIONS	0 - NOT USED 1 - 132 PRINT POSITIONS 2 - 120 PRINT POSITIONS 3 - UNIVERSAL CHAR. SET 4 - 200 LINES PER MINUTE 5 - 300 LINES PER MINUTE
1403 PRINTER	E1	600 LPM	0 - 1100 LPM 1 - 465 LPM 2 - NOT USED 3 - UCS
SECOND 1403 PRINTER (RPQ) SEE NOTE 2	E2	600 LPM	0 - 1100 LPM 1 - 465 LPM 2 - NOT USED 3 - UCS
5424 MFCU	F0	500/120/120 CPM	0 - KATAKANA READ & PUNCH 1 - 250/60/60 CPM 2 - KATAKANA PRINT
CASSETTE READER	F1		NO FEATURES
2560 MFCM	F2	MODEL A2 READ 310 CARDS/MIN PUNCH 120 COL/SEC	0 - MODEL A1 (EXPLAINED BELOW) 1 - 2 PRINT HEADS 2 - 4 PRINT HEADS 3 - 6 PRINT HEADS 4 - KATAKANA 5 - GERMANY (RESERVED) MODEL A1 - READ 500 CARDS/MIN. PUNCH 160 COL/SEC. PRINT 140 COL/SEC.

89-6

1.3 CHAIN IMAGE CARDS

DCP DEFAULTS TO A 48 CHARACTER SET FOR 1403 PRINTER. IF SOME OTHER CHAIN IS USED, THE CHAIN IMAGE MUST BE SUPPLIED TO DCP BY THE CE. TO ADD CHAIN IMAGE CARDS TO DISK DCP, USE DISK EDITOR. FOR CARD DCP, SEE FIGURE 1. (CHAIN IMAGE IS USUALLY SUPPLIED WITH THE PRINTER.)
FOR DISKETTE DCP, TYPE SAME DATA AS FOR CARDS.

THE FORMAT IS DESCRIBED BELOW--

PUNCH A CARD OR TYPE ON DISKETTE '//CHAIN' RECORD AS FOLLOWS:

```
                     1 1 1
COLUMN -->  1 2 3 4 5 6 7 8 9 0 1 2
            / /   C H A I N   N N N          NNN = 048 OR 120
```

FOLLOW THIS CARD WITH EITHER 2 OR 5 IMAGE CARDS.
EACH IMAGE CARD CONTAINS THE HEXADECIMAL CODE FOR 24 CHARACTERS.
PUNCHING FOR EACH CARD MUST BEGIN IN COLUMN 1.
THE IMAGE CARDS MUST BE IN PROPER ORDER.

THE FOLLOWING EXAMPLES APPLY TO 80 OR 96 COLUMN CARDS. THEY ARE ONLY EXAMPLES.

EXAMPLE -- CHAIN IMAGE FOR 048 CHARACTER CHAIN:

```
// CHAIN 048                                      <--- CHAIN IMAGE CONTROL CARD
F1F2F3F4F5F6F7F8F9F07B7C61E2E3E4E5E6E7E8E9506B6C  <--- 1ST  IMAGE CARD
D1D2D3D4D5D6D7D8D9605B5CC1C2C3C4C5C6C7C8C94E4B7D  <--- 2ND  IMAGE CARD
```

EXAMPLE -- CHAIN IMAGE FOR 120 CHARACTER CHAIN:

```
// CHAIN 120                                      <--- CHAIN IMAGE CONTROL CARD
7C7D6FFE9E5A5B5C6C4CB1B2B3B4B5B6B7B8B9B0A08E8D9D  <--- 1ST  IMAGE CARD
A15F4D5DBE4E6E4C8CAE4AA9FADBD9B8BABBACBCAF6DBF4F  <--- 2ND  IMAGE CARD
F1F2F3F4F5F6F7F8F9F07E4B61E2E3E4E5E6E7E8E96B7B50  <--- 3RD  IMAGE CARD
D1D2D3D4D5D6D7D8D9607F7AC1C2C3C4C5C6C7C8C98F8182  <--- 4TH  IMAGE CARD
838485868788899192939495969798 99A2A3A4A5A6A7A8A9  <--- 5TH  IMAGE CARD
```

EXAMPLE -- CHAIN IMAGE FOR 060 CHARACTER CHAIN:

DEFINE THE FIRST 60 CHARACTERS AS USUAL. THEN REPEAT THE SAME 60 CHARACTERS FOR A TOTAL OF 120.

```
// CHAIN 120                                      <--- CHAIN IMAGE CONTROL CARD
7C7D6FFE9E5A5B5C6C4CB1B2B3B4B5B6B7B8B9B0A08E8D9D  <--- 1ST  IMAGE CARD
A15F4D5DBE4E6E4C8CAE4AA9FADBD9B8BABBACBCAF6DBF4F  <--- 2ND  IMAGE CARD
F1F2F3F4F5F6F7F8F9F07E4B7C7D6FFE9E5A5B5C6C4CB1B2  <--- 3RD  IMAGE CARD
B3B4B5B6B7B8B9B0A08E8D9DA15F4D5DBE4E6E4C8CAE4AA9  <--- 4TH  IMAGE CARD
FADBD9B8BABBACBCAF6DBF4FF1F2F3F4F5F6F7F8F9F07E4B  <--- 5TH  IMAGE CARD
```

1.3.3 80 COLUMN CHAIN IMAGE CARDS

IF A TN TYPE CHAIN IMAGE IS BEING DEFINED WITH 80 COLUMN CARDS, THE FOLLOWING CHART WILL HELP YOU PUNCH CERTAIN CHARACTERS.

GRAPHIC CHARACTER	SYS/360/370 HEX CODE	SYSTEM/3 HEX CODE
LEFT BRACE	8B	C0
RIGHT BRACE	9B	D0
DEGREES SYMBOL	A1	CA

1.4 PUNCHING 80 COLUMN OBJECT (TEXT) CARDS ON THE 029 KEY PUNCH.

IF IT BECOMES NECESSARY TO PUNCH AN 80 COLUMN OBJECT (TEXT) CARD FROM THE CARD IMAGE AT THE END OF THE PROGRAM LISTING, YOU MAY DO SO BY USING THE SAME GRAPHIC SYMBOLS FOUND ON THE 029 KEY PUNCH. THERE ARE THREE SPECIAL CHARACTERS USED ON THE SYSTEM/3 PROGRAM LISTING, THE UPPER CASE 'D', UPPER CASE 'E', AND THE UPPER CASE 'H'.

THESE SPECIAL CHARACTERS MAY BE PUNCHED ON THE 029 AS FOLLOWS,

UPPER CASE 'D', USE THE 'MULTIPUNCH' FEATURE AND PUNCH AN 11-0 PUNCH IN SAME COLUMN.
UPPER CASE 'E', USE THE KEY THAT IS THE ' EXCLAMATION POINT', WHICH SHOULD PUNCH 11-2-8 PUNCH.
UPPER CASE 'H', USE THE KEY THAT IS THE 'CENTS SIGN', WHICH SHOULD PUNCH 12-2-8 PUNCH.

FOR CARD LAYOUT, REFER TO PARAGRAPH 1. CONCERNING 80 COLUMN CARDS.

1.5 PUNCHING ON SYSTEM WITHOUT A KEYPUNCH

THE FOLLOWING PROCEDURE MAY BE USED TO PUNCH CARDS ON A S/3 WHICH HAS AN MFCU.

1. FILL CORE WITH HEX '40'.
2. DIAL IN THE FOLLOWING HEX DATA BEGINNING AT LOCATION 0000: F3F000 31F6000F 31F4000F F3F600 0100
3. BEGINNING AT X'0100', DIAL IN THE DESIRED PUNCH/PRINT DATA. (EG. FOR 'CPU E,FFFF,0' DIAL 'C3D7E440C56BC6C6C6C65BF0')
   (FOR 'UDT A0,E1,14' DIAL 'E4C4E340C1F06BC5F16BF1F4')
4. PERFORM SYSTEM RESET, MAKE MFCU PRIMARY READY WITH BLANK CARDS, AND 'STEP' THROUGH THE 4 INSTRUCTIONS.
5. TO PUNCH ANOTHER CARD, REPEAT STEPS 3 AND 4 ABOVE .

2. OTHER CARD FORMATS

IPL-FORMAT LOADER, TEXT AND END CARDS ARE STANDARD OBJECT CARDS WHICH WILL NOT BE ALTERED OR PROVIDED BY THE CE. THERE ARE OTHER CARDS AVAILABLE TO THE CE TO PROVIDE FLEXABILITITY OF OPERATION. FIGURE 1 SHOWS RECOMMENDED PLACEMENT OF THESE CARDS. ON DISKETTE, THE FOLLOWING CARD DATA SHOULD BE TYPED ON 'MISC' RECORDS.

2.1 SENSE SWITCH CARDS ('SSW XX,XX,...,XX ')

SENSE SWITCH CARDS PROVIDE A MEANS OF SETTING SENSE SWITCHES WHEN THE PROGRAM LOADS. (SECTION 6. DISCUSSES SENSE SWITCHES)

'SSW' CARDS INSERTED IN DCP SHOULD SET ONLY DCP SENSE SWITCHES 00-0F.
'SSW' CARDS INSERTED IN SECTIONS SHOULD SET ONLY SECTION SWITCHES 10-2F.

WHEN A SSW CARD IS READ, DCP TURNS OFF ALL SWITCHES AND TURNS ON ONLY THOSE ON THE CARD. ALL SECTION SWITCHES (10-2F) ARE CLEARED WHEN A NEW SECTION LOADS (UNLESS SSW 09 IS ON).

COLUMN	CONTENTS
1-3	'SSW'
4	BLANK
5-	'XX,...,XX ' LIST OF SENSE SWITCHES TO BE TURNED ON FOLLOWED BY AT LEAST ONE BLANK.

EXAMPLE:

```
 ---------------------------------
/ SSW 05,07
I
I
```

THIS WILL TURN ON SENSE SWITCHES 5 & 7.

BE CAREFUL WHEN PUTTING 'SSW' CARDS ON DISK. THEY ARE DIFFICULT TO REMOVE.

2.2 COMMENT CARDS ('*...')

THESE CARDS ARE PRINTED OUT WHEN A PROGPAM LOADS. THE CE MAY WISH TO ADD TO THE COMMENT CARDS RELEASED.

COLUMN	CONTENTS
1	'*'
2-88	COMMENT. THE CONTENTS OF THE CARD IS PRINTED.
89-91	ID AS IT APPEARS ON HEADER CARD. (ON DISK, LEAVE BLANK.)
92	LEVEL AS ON HEADER CARD. (ON DISK, LEAVE BLANK)
93-96	PROPER SEQUENCE NUMBER OR, FOR ADDED COMMENT CARDS, LEAVE BLANK.

FOR CARD DECKS, PUNCH COLUMNS 89 - 92 AS ABOVE-- LEAVE 93 - 96 BLANK.

BE CAREFUL WHEN PUTTING COMMENT CARDS ON DISK. THEY CANNOT BE REMOVED.

2.3 REPLACE (PATCH) CARDS ('R XX... ')

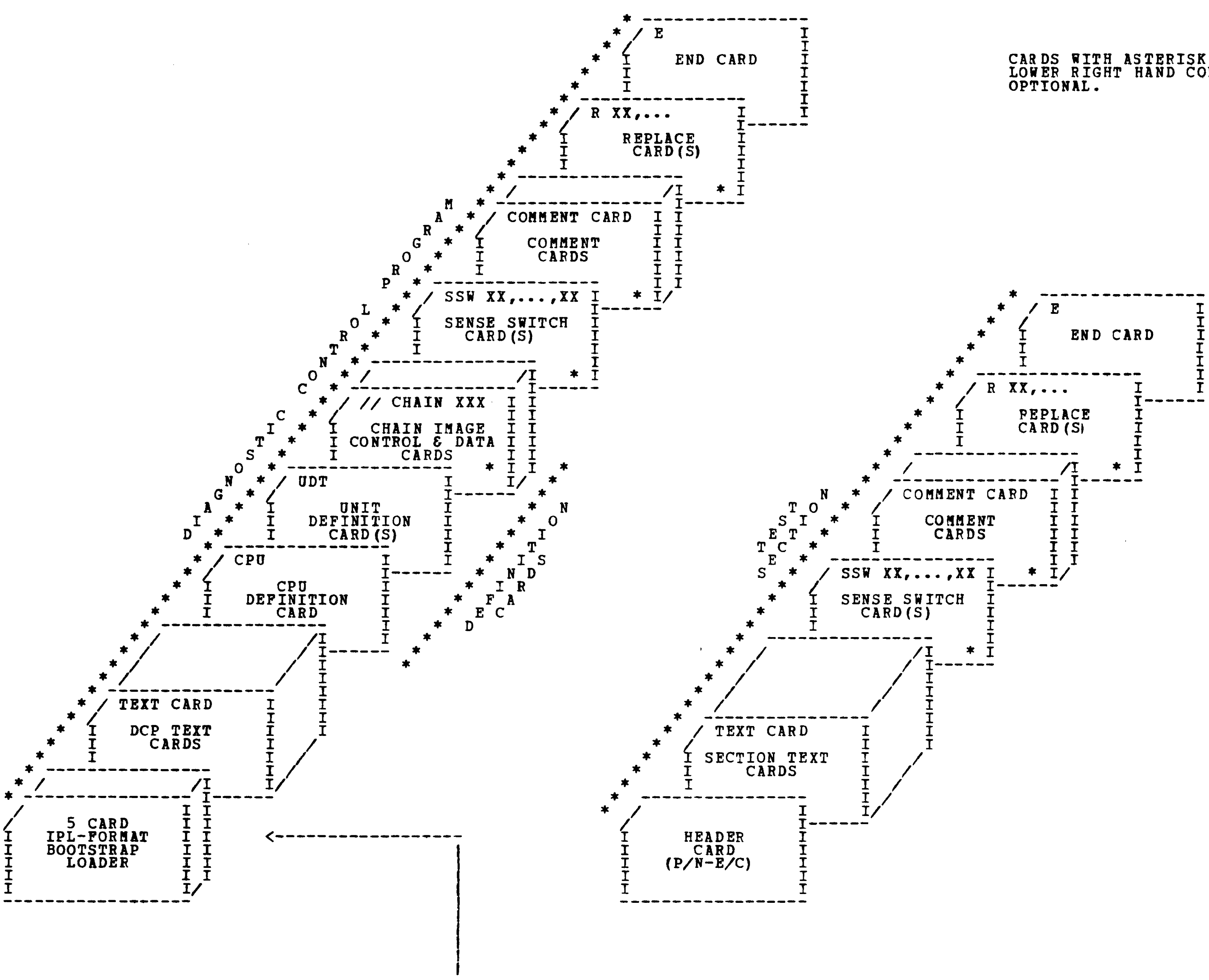
NORMALLY THE CE DOES NOT NEED TO ALTER STORAGE WHEN A PROGRAM LOADS. HOWEVER, IF IT IS NECESSARY, THE 'REP' CARD IS USED.

COLUMN	CONTENTS
1	'R'
2	BLANK - NORMAL PATCH. 'E' - WHEN DCP ENCOUNTERS THIS CARD, IT WILL IMMEDIATELY BRANCH TO THE ADDRESS IN COLUMNS 3-6.
3-6	4 HEX CHARACTERS SPECIFYING THE ADDRESS OF THE FIRST BYTE TO BE REPLACED.
7	BLANK
8-	XX,XXXX,XX,XXXXXXXX,...,XXXX HEX DATA. TWO CHARACTERS FOR EACH BYTE TO BE PATCHED. COMMAS MAY BE USED BETWEEN ANY PAIR OF HEX DATA. A BLANK MUST FOLLOW THE LAST PAIR OF HEX DIGITS.

BE CAREFUL WHEN PUTTING 'REP' CARDS ON DISK. THEY CANNOT BE REMOVED.

FIGURE 1.

DIAGNOSTICS
CARD SYSTEM



CARDS WITH ASTERISK (*) IN LOWER RIGHT HAND CORNER ARE OPTIONAL.

NOTE-- ON 80 COLUMN DECKS, THIS 5 CARD LOADER WILL BE 10 CARDS (2 CARDS FOR 1).
A SPECIAL LOADER MUST THEN PRECEDE THIS LOADER.
FOR MORE DETAIL, SEE SECTION 3.0 ON LOADING DCP.

PROCEDURES FOR LOADING DCP

3. PROGRAM LOADING

LOADING FROM DISK

DISK PACK	1.	MOUNT C.E. DISK CARTRIDGE ON REMOVABLE SPINDLE, DRIVE 1 AND MAKE READY. (DRIVE 1 ON 3340).
0 0 F E	2.	SET CONSOLE SWITCHES TO '00FE'.
PROGRAM LOAD	3.	SET IPL SELECTOR TO 'REMOVABLE DISK' DEPRESS PROGRAM LOAD KEY.
	4.	'CC' HALT MEANS IPL WORKED. RESET 'CC' HALT.
	5.	'LL' HALT. NORMAL HALT DURING CPU TESTS. RESET 'LL' HALT. (FOR MORE DETAIL SEE CPU AND MEMORY TEST USER'S GUIDE.)
	6.	CPU TESTS HAVE RUN. A. TO LOAD DCP, PUT ANYTHING BUT 'F3' IN SWITCH 3 & 4, AND RESET HALT. B. TO RUN MEMORY TESTS, SET XXF3 IN SWITCHES, AND RESET HALT. XX = 10 = 48K STORAGE; = 20 = 64K STORAGE; = 40 = 96K STORAGE; = 80 = 128K STORAGE
PRINTOUT		DCP PRINTS COMMENT CARDS, CPU , UDT INFORMATION, AND 'DCP IS LOADED'.
-------------->		(AFTER THE ABOVE MESSAGE, DCP ITSELF IS LOADED. IF ABNORMAL EVENTS OCCUR, USE THE MAPS. HOWEVER, AT ANY POINT A SYSTEM RESET AND START SHOULD CAUSE CONTINUATION OF IPL SEQUENCE OR 'HC' HALT.)
A1 HALT		IF SSW 04 IS USED, A1 AND OTHER 'A' HALTS WILL OCCUR. MEANINGS OF THESE HALTS ARE DESCRIBED UNDER FD6 IN CPU TEST USER'S GUIDE AND UNDER 143 USERS GUIDE BLOCK 26.
PRINTOUT (FD6)	7.	DCP AUTOMATICALLY LOADS LSR TESTS (ID=FD6) AND PRINTS HEADING AND SECTION LOADED MESSAGE. HALTS AT THIS TIME ARE FROM FD6.
PRINTOUT (FD6)	8.	IF FD6 RUNS OK, IT PRINTS MESSAGE.
PRINTOUT (143)	9.	DCP AUTOMATICALLY LOADS 3277 MICRO-CODE LOADER PROGRAM (ID=143) AND PRINTS HEADING AND SECTION LOADED MESSAGE. HALTS AT THIS TIME ARE FROM 143
PRINTOUT (143)	10.	143 PRINTS A MESSAGE IF MICRO CODE IS SUCCESSFULLY LOADED.
DCP DISPLAY	11.	DCP DISPLAYS A 'DCP LOADED' MESSAGE ON THE SCREEN OF 3277.
	12.	DCP'S 'HA' HALT SAYS THAT THE PROGRAM LOAD SEQUENCE IS COMPLETE. NOW TURN ON DESIRED SENSE SWITCHES, AND SELECT PROGRAM TO RUN.

LOADING FROM MFCU

DECK	1.	PLACE DCP DECK IN PRIMARY HOPPER OF MFCU, MAKE READY.
PROGRAM LOAD	2.	SET IPL SELECTOR SWITCH TO 'ALTERNATE' POSTION. DEPRESS PROGRAM LOAD KEY.
(PRINTOUT)	3.	DCP PRINTS COMMENT CARDS, CPU , UDT INFORMATION, AND 'DCP IS LOADED'.
	4.	'HA' HALT FROM DCP MEANS THAT IT IS LOADED. PLACE DESIRED PROGRAM IN HOPPER AND RESET 'HA' HALT. 3277 MICRO HAS NOT BEEN LOADED. LSR TESTS HAVE NOT BEEN RUN.

LOADING FROM 3741 (DISKETTE)

DISKETTE	1.	LOAD THE MAP ENTRY DISKETTE #1 INTO THE 3741. PLACE 3741 ON-LINE, OUTPUT MODE. (TYPE '41' IN COL 1 & 2, PRESS UPPER 'FUNCT SEL' AND 'OUTPUT FROM 3741').
0 0 F E	2.	SET CONSOLE SWITCHES TO '00FE'.
PROGRAM LOAD	3.	SET IPL SELECTOR SWITCH TO 'ALTERNATE' POSITION. DEPRESS PROGRAM LOAD KEY.
	4.	'CC' HALT MEANS IPL WORKED. RESET 'CC' HALT.
	5.	'LL' HALT. NORMAL HALT DURING CPU TESTS. RESET 'LL' HALT. (FOR MORE DETAIL SEE CPU AND MEMORY TEST USER'S GUIDE.)
	6.	CPU TESTS HAVE RUN. A. TO LOAD DCP RESET HALT.
PRINTOUT		DCP PRINTS COMMENT CARDS, CPU , UDT INFORMATION, AND 'DCP IS LOADED'.
-------------->		(AFTER THE ABOVE MESSAGE, DCP ITSELF IS LOADED. IF ABNORMAL EVENTS OCCUR, USE THE MAPS.)
A1 HALT		IF SSW 04 IS USED, A1 AND OTHER 'A' HALTS WILL OCCUR. MEANINGS OF THESE HALTS ARE DESCRIBED UNDER FD6 IN CPU TEST USER'S GUIDE AND UNDER 143 USERS GUIDE BLOCK 26.
PRINTOUT (FD6)	7.	DCP AUTOMATICALLY LOADS LSR TESTS (ID=FD6) AND PRINTS HEADING AND SECTION LOADED MESSAGE. HALTS AT THIS TIME ARE FROM FD6.
PRINTOUT (FD6)	8.	IF FD6 RUNS OK, IT PRINTS MESSAGE.
PRINTOUT (143)	9.	DCP AUTOMATICALLY LOADS 3277 MICRO-CODE LOADER PROGRAM (ID=143) AND PRINTS HEADING AND SECTION LOADED MESSAGE. HALTS AT THIS TIME ARE FROM 143
PRINTOUT (143)	10.	143 PRINTS A MESSAGE IF MICRO CODE IS SUCCESSFULLY LOADED.
DCP DISPLAY	11.	DCP DISPLAYS A 'DCP LOADED' MESSAGE ON THE SCREEN OF 3277.
	12.	'HA' HALT MEANS DCP IS LOADED. INSERT APPROPRIATE DISKETTE IN 3741. 'REC ADV' TO DESIRED PROGRAM. PLACE 3741 ON-LINE, OUTPUT MODE. (TYPE '41' IN COL 1 & 2, PRESS UPPER 'FUNCT SEL' AND 'OUTPUT FROM 3741') THEN RESET 'HA' HALT.

LOADING FROM 1442 OR 2560

DECK(S)		DCP FOR 80 COLUMN CARD READERS CONSIST OF DCP DECK IN 80 COLUMN FORM AND A SPECIAL LOADER DECK. 1442 LOADER DECK ID IS 'FE0'. 2560 LOADER DECK ID IS 'FD0'
	1.	PLACE THESE DECKS IN HOPPER: - 'FE0' OR 'FD0' - DCP DECK
PROGRAM LOAD	2.	SET IPL SELECTOR SWITCH TO 'ALTERNATE' POSTION. DEPRESS PROGRAM LOAD KEY.
(PRINTOUT)	3.	DCP PRINTS COMMENT CARDS, CPU , UDT INFORMATION, AND 'DCP IS LOADED'.
	4.	'HA' HALT FROM DCP MEANS THAT IT IS LOADED. 3277 MICRO HAS NOT BEEN LOADED. LSR TESTS HAVE NOT BEEN RUN. PLACE DESIRED PROGRAM INTO THE HOPPER. RESET THE 'HA' HALT.

```
*******************************************************************************************************************
*                                                                                                                 *
*                                           LOADING FROM CASSETTE READER                                          *
*                                           ----------------------------                                          *
*                                           ----------------------------                                          *
*                                                                                                                 *
*                1.  LOAD THE FOLLOWING BOOTSTRAP LOADER INTO STORAGE STARTING AT ADDRESS 005D AND VERIFY.        *
*                                                                                                                 *
*                              -ADDR-  -CODE-       -OP-         -DESCRIPTION-                                    *
*                               005D  C2 02 00 5D  LA     LOAD XR2                                                *
*                               0061  AF D9 FF FF  SLC    CLEAR 218 BYTE BUFFER                                   *
*                               0065  E1 E4 0E     TIO    TEST FOR CLOCK BIT                                      *
*                               0068  E0 87 08     B      BRANCH BACK IF NO CLOCK BIT                             *
*                               006B  AC FF FF FF  MVC    DELAY 784 MICRO-SEC.                                    *
*                               006F  AC 62 FF FF  MVC    DELAY 310 MICRO-SEC.                                    *
*                               0073  BA 01 FF     SBN    SET BIT ON                                              *
*                               0076  E1 E4 1F     TIO    TEST FOR DATA BIT                                       *
*                               0079  BB 01 FF     SBF    SET BIT OFF IF NO DATA BIT                              *
*                               007C  AE D9 FF FF  ALC    SHIFT DATA BUFFER 1 BIT LEFT                            *
*                               0080  E0 20 08     BNOL   BRANCH BACK IF NO OVER-FLOW                             *
*                                                                                                                 *
*                2.  INSERT THE CASSETTE CONTAINING THE LOADER AND DCP INTO THE TAPE READER (DCP, LOADER LABEL UP). *
*                                                                                                                 *
*                3.  PLUG THE TAPE OUTPUT CABLE INTO THE TAPE JACK ON BOARD A-A3, TURN THE CE IDLE CONTROL OVERRIDE SWITCH *
*                    ON (5203 RPQ ONLY) AND CONNECT THE CE JUMPER TO THE FOLLOWING PINS:                          *
*                                  SYSTEM WITH A 5203 PRINTER (RPQ):  A-B1M2G10 TO A-A3U4D13                      *
*                                  SYSTEM WITH A 1403 PRINTER      :  A-B1E2U07 TO A-A3U4D13                      *
*                                                                                                                 *
*                4.  SET VOLUME AT 6 ON THE TAPE READER AND PUSH START ON THE PRINTER.                            *
*                                                                                                                 *
*                5.  SYSTEM RESET AND SET SAR AT 005D.                                                            *
*                     *** -POWER DOWN DISK DRIVE 2, IF PRESENT, INSURE DISK DRIVE 1 IS POWERED UP. ***            *
*                     *** -TAPE READER MUST ALWAYS BE IN MOTION MORE THAN 1 SECOND BEFORE STARTING THE CPU- ***   *
*                     *** -ALWAYS HAVE THE PRINTER IN START MODE AND NEVER PUSH STOP ON THE PRINTER WHILE LOADING- *** *
*                     *** -THE PRINTER CHAIN SHOULD BE RUNNING CONTINUOUSLY (ON THE 5203 PRINTER THIS IS DUE TO THE  ) *** *
*                                                                          (CE IDLE CONTROL OVERRIDE SWITCH BEING ON) *** *
*                                                                          (WHILE PRINTER GATE IS LEFT OPEN          ) *** *
*                                                                                                                 *
*                6.  START THE TAPE READER, WAIT 2 FULL SECONDS THEN PRESS THE CPU START BUTTON.                   *
*                                                                                                                 *
*  $$$$  $$$$    7.  IF THE LOADER IS WORKING, YOU WILL HAVE A SMALL -CC- HALT APPROXIMATELY 10 SECONDS AFTER THE FIRST *
*  $     $           RECORD IS READ. RESET THE -CC- HALT AS QUICKLY AS POSSIBLE (YOU HAVE 10 SECONDS TO DO SO). THE -CC- *
*  $$$$  $$$$        HALT TELLS YOU THAT THE LOADER HAS LOADED CORRECTLY.                                         *
*                                                                                                                 *
*                    NOTE:  IF A PROCESS CHECK OCCURS BEFORE -CC- HALT, TRY ADJUSTING CASSETTE VOLUME. IF PROBLEM PERSISTS,*
*                           REFER TO MAPS.                                                                        *
*                                                                                                                 *
*    1     2222  8.  AS SOON AS DCP IS LOADED A -12- HALT WILL OCCUR. AT THIS TIME STOP THE TAPE READER AND ENTER THE *
*   11    2    2     FOLLOWING OPTIONS INTO THE DATA SWITCHES.                                                    *
*    1        2                                                                                                   *
*    1       2      - LEFT TWO SWITCHES -     - RIGHT TWO SWITCHES -                                              *
*    1      2        00 - NO DISK OPTIONS     00 - 48 CHAR IMAGE (CHAIN ARRANGEMENTS LC, AW OR HN ONLY)           *
*    1     2         02 - 100 CYL DISK        01 - 120 CHAR IMAGE (CHAIN ARRANGEMENTS PN OR GN ONLY)              *
*  11111  222222     04 - HIGH SPEED ACT.     02 - 120 CHAR IMAGE (CHAIN ARRANGEMENTS PCS AN OR PCS HN ONLY)      *
*                    06 - 100 CYL AND                                                                             *
*                    06 - HIGH SPEED ACT.                                                                         *
*                                                                                                                 *
*                    RESET THE -12- HALT.                                                                         *
*                                                                                                                 *
* (PRINTOUT)     9.  DCP PRINTS COMMENT CARDS, CPU, UDT INFORMATION, AND 'DCP IS LOADED'.                         *
*                                                                                                                 *
*  $  $   $$$$  10.  'HA' HALT FROM DCP MEANS THAT IT IS LOADED.                                                  *
*  $  $   $  $            3277 MICRO HAS NOT BEEN LOADED.                                                         *
*  $$$$   $$$$            LSR TESTS HAVE NOT BEEN RUN.                                                            *
*  $  $   $  $            ADVANCE TAPE TO DESIRED PROGRAM. RESET 'HA' HALT.                                       *
*  $  $   $  $                                                                                                    *
*******************************************************************************************************************
```

4. OPERATION OF DCP

PROGRAM RESTART

AFTER DCP LOADS A PROGRAM IT SETS UP A PROGRAM RESTART ROUTINE AT LOCATION X'0000'. THIS ROUTINE ALLOWS CONSOLE SWITCH ENTRIES AND THEN BRANCHES TO THE FIRST ROUTINE. PROGRAM RESTART IS DONE BY DEPRESSING SYSTEM RESET AND START.

HOW TO DUMP STORAGE--

FOR SPECIAL SITUATIONS IT MAY BE DESIRABLE TO DUMP THE CONTENTS OF STORAGE. THIS IS DONE AS FOLLOWS:

1. DEPRESS SYSTEM RESET.
2. TURN ON SSW 0D AND THEN TERMINATE SECTION (EE IN SWITCHES).
3. WHEN SECTION TERMINATE MESSAGE PRINTS, DCP WILL BEGIN DUMPING AT 0000.
4. IF YOU WISH TO DUMP CERTAIN AREAS OF STORAGE, SET THE DESIRED ADDRESS IN SWITCH 1 AND 2. (FOR EXAMPLE IF YOU WANT TO DUMP STARTING AT 3000, SET SWITCH 1 AND 2 TO 30.) SWITCHES 3 AND 4 ARE IGNORED. (THE ROUTINE PICKS UP A NEW ADDRESS ANY TIME THE SWITCH SETTING IS CHANGED)
5. THE ORIGINAL PROGRAM IS STILL LOADED, AND MAY BE RESTARTED BY SYSTEM RESET AND START.

NOTE: THIS FEATURE IS NOT SUPPORTED IF THE 5203 (WT RPQ) IS ATTACHED.

5. DATA SWITCH ENTRY

THE ROTARY ADDRESS SWITCHES ARE THE PRIMARY COMMUNICATIONS MEDIA BETWEEN THE DIAGNOSTICS AND THE CE. METHOD OF ENTRY--

A. STOP CPU.

B. SET UP ROTARY SWITCHES FOR ONE OF THE FOLLOWING OPTIONS.

```
      SWITCHES
   1   2   3   4
  *** *** *** ***
   F   0   X   X  - TURN OFF SENSE SWITCH XX.
   F   1   X   X  - TURN ON SENSE SWITCH XX.
   F   2   X   X  - GO TO ROUTINE XX WHEN SWITCH 1 IS SET TO '0'.

   E   E   X   X  - TERMINATE CURRENT SECTION.  (XX MAY BE ANYTHING)

   D   X   X   0  - DISK--EXECUTE SECTIONS FOR DEVICE WITH UNIT CODE XX.
   D   X   X   X  - DISK--EXECUTE SECTION XXX. (ONLY ONE PROGRAM MAY BE ENTERED.)
```

C. DEPRESS CPU START.

D. 'HF' HALT MEANS DCP READY FOR SWITCH ENTRY. RESET HALT TO ENTER FIRST OPTION. IF IMMEDIATE CONTROL FOR SWITCH ENTRY IS NEEDED, A SYSTEM RESET AND START MAY BE USED.

E. 'HU' OR 'HP' HALT MEANS DCP ACCEPTED ENTRY. CHANGE SWITCHES AND RESET HALT.

F. REPEAT STEP E FOR AS MANY OPTIONS AS DESIRED. ALTERNATING CODES 'HU' AND 'HP' WILL SIGNAL DCP ACCEPTANCE. (ONLY ONE PROGRAM MAY BE ENTERED)

G. WHEN DONE, SET SWITCH 1 TO ZERO AND RESET HALT.

NOTE -
DO SYSTEM RESET BEFORE USING OPTION 'F2XX' TO GO TO ROUTINE XX.
THIS PREVENTS ERRORS FROM ONE ROUTINE FROM BEING DETECTED IN ANOTHER.
(IF MAPS SPECIFY OTHERWISE, FOLLOW THEM)

DCP SENSE SWITCHES

6. SENSE SWITCHES

SENSE SWITCHES ARE EQUIVALENT TO 48 TOGGLE SWITCHES NUMBERED HEXADECIMALLY 00-2F. 00-0F ARE RESERVED FOR DCP USE. (LISTED BELOW).

10-2F ARE USED BY THE PROGRAMS WHICH RUN UNDER CONTROL OF DCP.

SSW NUMBER	ON	OFF (NORMAL)
00	LOOP ON SECTION.	GO TO NEXT SECTION.
01	LOOP ON ROUTINE.	GO TO NEXT ROUTINE.
02	BYPASS MANUAL INTERVENTION ROUTINES.	EXECUTE ALL ROUTINES.
03	BYPASS ERROR PRINTING.	PRINT ERROR MESSAGES.
04	BYPASS NON-ERROR PRINTING.	PRINT NON-ERROR MESSAGES.
05	USE ALTERNATE PRINTER. (3277)	NORMAL PRINTER. (1403)
06	BYPASS ERROR HALTS.	HALT AFTER ERROR.
07	LOAD AND GO. BYPASS COMMENTS AND PROMPTING HALTS.	PROMPTING MODE.
08	PRINT EACH LINE ON 3277 CRT AS WELL AS 1403. NO SPECIAL HALTS WILL OCCUR SO THE 3277 SCREEN CHANGES DURING PRINTING. SHOULD BE USED ONLY AS A CONVENIENCE WHERE APPROPRIATE. SHOULD NOT BE USED WITH PROGRAMS WHERE 3277 IS USED FOR INPUT. (SEE NOTE BELOW).	
09	DON'T CLEAR SECTION SENSE SWITCHES AFTER LOADING.	CLEAR SECTION SENSE SWITCHES AFTER LOADING.
0D	USED TO INVOKE STORAGE DUMP. SEE PARAGRAPH ON STORAGE DUMP.	
0F	EACH PRINTOUT WHICH NORMALLY SPACES UP 6 OR 7 LINES WILL SPACE 36 LINES TO AID READING ON 1403 PRINTER.	NORMAL SPACING.
OTHERS	RESERVED	

USE OF NEW OPTION (SSW 08) IS INTENDED TO FACILITATE THE RUNNING OF PROGRAMS WHICH PRINT DATA ON THE PRINTER AS INFORMATION OR INSTRUCTIONS TO THE C.E. IT AVOIDS WALKING TO THE 1403 PRINTER. IT RESULTS IN PRINTED OUTPUT ON THE PRINTER FOR REFERENCE. MOST MESSAGES FIT ON THE 3277 SCREEN. IN SOME CASES THIS PRINTOUT CAN BE CONFUSING. THEN, EITHER THE PRINTER MAY BE REFERRED TO OR THE SSW 08 SHOULD BE TURNED OFF.

HALTS

7. DIAGNOSTIC CONTROL PROGRAM (DCP) HALTS.

'H' IS ALWAYS THE FIRST CHARACTER OF A DCP HALT.

HALT CODE	CONDITION	ACTION REQUIRED
A0- A4	'A' HALTS ARE NOT DCP HALTS. THEY OCCUR DUE TO SSW 04 BEING ON.	THESE HALTS COME FROM PROGRAMS FD6 AND 143 WHICH ARE LOADED BY DCP DURING IPL SEQUENCE. SEE USERS GUIDE FOR CPU TESTS (FD6) AND 143.
H0	INVALID RECORD FOUND WHILE LOADING DCP.	RESET H0 HALT AND A SECOND HALT WILL APPEAR. LOOK UP THAT HALT IN THE TABLE BELOW. (THEN RESET HALT, UNLESS OTHERWISE SPECIFIED) 01- BLANK OR UNDEFINED RECORD. RESET TO IGNORE. (THE RECORD IS CONTAINED IN STORAGE BEGINNING AT X'880' 02- COMMENT OR END FOUND BEFORE CPU OR UDT RECORDS PROCESSED (UDT OR CPU RECORDS EITHER MISSING OR IN WRONG PLACE). CORRECT AND RELOAD. 03- MORE THAN 18 UDT ENTRIES ON UDT RECORD. FIRST 18 WILL BE USED. 04- DURING DCP'S IPL SEQUENCE, ONE OR MORE PROGRAMS USED BY DCP WERE NOT FOUND ON DISK. THE PRINTOUT TELLS WHICH ONES. RESET HALT TO CONTINUE. THE MISSING PROGRAMS SHOULD BE OBTAINED AND ADDED USING DISK EDITOR BECAUSE OTHER PROGRAMS ASSUME THAT THEY HAVE BEEN EXECUTED. (FOR EXAMPLE, LSR TEST (FD6), 3277 MICROCODE LOADER, (143)) 05- FIRST DEVICE IN UDT (WHICH SPECIFIES THE DEVICE FROM WHICH DCP IS LOADING) IS INCORRECT. IF YOU ARE LOADING FROM DISK, DCP WILL USE - UDT A0,E1 (C1,E1 IF RUNNING FROM 3340) - AS THE UDT. THEN USE RECOVERY PROCEDURE 'A' BELOW. 06- CPU RECORD IS IN ERROR. FOLLOW RECOVERY PROCEDURE 'A' BELOW. 07- // CHAIN RECORD DOESN'T HAVE 048 OR 120 IN COLUMNS 10-12. FOLLOW RECOVERY PROCEDURE 'A' BELOW. RECOVERY PROCEDURE A: A. IF LOADING FROM DISK- RESET HALT TO FINISH LOADING. THEN USE DISK EDITOR PROGRAM TO CORRECT THE RECORD IN ERROR. (SEE BLOCK 20 OF USER'S GUIDE). (OR BLOCK 94 IF RUNNING FROM 3340). IF LOADING FROM CARDS- CORRECT THE CARD IN ERROR AND RELOAD DCP. IF LOADING FROM DISKETTE- CORRECT RECORD IN ERROR & RELOAD DCP. (SEE PAGE 2, PAR 1)
H1	A DEVICE CALLED FOR BY THE TEST SECTION WAS NOT DEFINED IN THE UDT CARDS.	CHECK UDT INFORMATION. IF IT IS CORRECT THEN THE SECTION WILL NOT RUN ON THAT CPU. IF IT IS INCORRECT. TERMINATE THE SECTION AND RUN DISK EDITOR TO CHANGE UDT. (YOU MAY RESET THE HALT BUT OTHER ERRORS MAY RESULT).
H2	DATA SWITCH ENTRY ERROR.	CORRECT DATA SWITCHES AND RESET HALT. POSSIBLE PROBLEM: TRYING TO TURN ON SWITCH GREATER THAN '2F' OR USING 'F2XX' TO SELECT AN INVALID ROUTINE.
H3	INVALID ROUTINE PREFIX FOUND DURING CHAINING FROM ONE ROUTINE TO NEXT.	THIS INDICATES THAT DCP FOUND INVALID ROUTINE INFORMATION IN THE PROGRAM WHICH IS PRESENTLY LOADED. IT MAY INDICATE THAT A PORTION OF THE PROGRAM HAS BEEN DESTROYED. TRY RELOADING THE PROGRAM.
H4	RESERVED.	
H5	ALTERNATE LOADER NOT READY OR ERROR.	1. IF THIS HALT OCCURS ON 80 COLUMN CARD READER WHEN HOPPER EMPTIES, MAKE READER READY AND RESET HALT. 2. IF THIS HALT OCCURS ON 3741, RE-LOAD PROGRAM. 3. OTHERWISE, CLEAR THE CONDITION, AND RESET THE HALT. (IN THE CASE OF AN ERROR ON CARD READERS, DCP WILL TRY TO RE-LOAD THE BAD CARD WHEN HALT IS RESET).
H6	PRINTER NOT READY OR ERROR.	CLEAR CONDITION AND RESET THE HALT. IF FAILURE PERSISTS, RUN PRINTER FUNCTION TEST. SENSE SWITCHES 03 AND 04 MAY BE USED TO BYPASS PRINTING. SET SENSE SWITCH 05 TO USE ALTERNATE PRINTER.
H7	DISK ERROR.	RESET HALT TO RETRY. IF ERROR PERSISTS, RELOAD. IF IT STILL PERSISTS, RUN DISK DIAGNOSTICS.
H8	3277 MICORCODE NOT LOADED, OR ERROR ON THE 3277.	IF MICROCODE IS NOT LOADED, RUN '3277 MICROCODE LOADER' (ID=143). IF MICROCODE IS ALREADY LOADED, RESET H8 HALT TO RETRY THE OPERATION. IF ERROR PERSISTS, RUN 3277 DIAGNOSTICS. NOTE- 'H8' HALT TO SHOW THAT MICROCODE HAS NOT BEEN LOADED WILL ONLY OCCUR ONCE. IF IT IS RESET, DCP ASSUMES THAT THE MICRO WAS LOADED AT AN EARLIER TIME. (3284 IS ALSO SUPPORTED BY THIS '3277' MICROCODE)
HA	LOADING IS COMPLETE. OPTIONS MAY BE ENTERED IN CONSOLE SWITCHES.	'HA' OCCURS AFTER DCP HAS LOADED. ON DISK IT MEANS THAT LSR TEST (FD6) AND 3277 MICROCODE LOADER (143) HAVE RUN. ANY ERRORS HAVE BEEN INDICATED BY PRINTOUTS AND/OR HALTS. NOW USE CONSOLE SWITCHES TO SELECT DESIRED PROGRAM. 'HA' AFTER LOADING A PROGRAM-- DCP HAS PRINTED 'SECTION LOADED' WITH STANDARD HEADING. TURN ON APPROPRIATE SENSE SWITCHES AND/OR RESET HALT TO EXECUTE PROGRAM.
HC	DCP READY FOR SELECTION OF PROGRAM TO BE RUN.	USE CONSOLE SWITCHES TO SELECT DESIRED PROGRAM ('DXXX'). IF YOU RESET HALT, PROGRAM LAST SELECTED WILL BE LOADED AGAIN.
Hd	A PROGRAM REQUESTED BY CE OR CALLED FOR BY ANOTHER PROGRAM CANNOT BE FOUND ON DISK.	CASE 1: CE HAS JUST SELECTED A PROGRAM USING 'DXXX' IN SWITCHES. RESET 'HD' HALT TO GET 'HC' HALT AND SELECT ANOTHER PROGRAM. IF MISSING PROGRAM IS AVAILABLE IN CARD, DISKETTE OR CASSETTE FORM, IT MAY BE ADDED TO DISK WITH DISK EDITOR (ID=FF6). (ID DD6 IS RUNNING FROM 3340.) CASE 2: A PROGRAM WAS RUNNING WHEN 'HD' HALT OCCURRED. (1) DEPRESS CPU STOP KEY (2) SET LSR DISPLAY SELECTOR TO ARR. (3) TURN ROLLER DISPLAY TO 'LSR' (4) CONTENTS OF ARR IS 'DXXX' WHERE XXX IS THE ID OF THE PROGRAM WHICH COULD NOT BE FOUND. MORE DETAIL SHOULD BE AVAILABLE IN USER'S GUIDE OF PROGRAM PRESENTLY RUNNING.
HE	CURRENT SECTION TERMINATED.	RESET HALT TO LOAD NEXT SECTION. SECTION MAY BE RESTARTED BY SYSTEM RESET/START.
HF HU-HP	DCP HALTS WITH 'HF' DISPLAYED WHENEVER A VALID DATA SWITCH ENTRY IS RECOGNIZED. AS DCP ACCEPTS ENTRIES, ALTERNATING HALTS 'HU' AND 'HP' OCCUR.	LOAD A VALID DATA SWITCH ENTRY AND RESET THE HALT. REPEAT FOR ALTERNATING HALTS 'HU' AND 'HP'. TO TERMINATE ENTRY PROCEDURE, ROTATE LEFT-MOST SWITCH TO ZERO AND RESET HALT.
Ho	A NEW MESSAGE LINE HAS BEEN DISPLAYED ON THE 3277 (CRT) AND THE SCREEN IS FULL. (SSW 05 BEING ON CAUSES THIS HALT FOR MESSAGES WHICH OVERFLOW THE SCREEN	THIS HALT IS USED ONLY TO HALT LONG ENOUGH TO ALLOW THE CE TO READ THE MESSAGE. HE SHOULD IMMEDIATELY RESET IT SINCE MORE LINES OF PRINT OR A REAL HALT MAY BE COMING UP. ONLY ONE SCREEN FULL OF MESSAGE IS DISPLAYED AT A TIME. THUS, SOME NOTATIONS MAY HAVE TO BE MADE ON LONGER MESSAGES.

8. PRINTOUT HEADINGS (MESSAGE HEADING INFORMATION IS USEFUL ONLY IF THE FORMAT IS UNDERSTOOD.)

```
......................................................................
:                         EXPLANATION                                :
......................................................................
:                                                                    :
: *ID UUXX. PROG PPPR-NN. SSWS YY,YY,YY                              :
:  |------  --------- ---  ----------                                :
:  |   |        |        |      |                                    :
:  |   |        |        |      |__ SENSE SWITCHES WHICH ARE ON.     :
:  |   |        |        |           (IF THIS IS BLANK, NO           :
:  |   |        |        |            SWITCHES ARE ON.)              :
:  |   |        |        |                                           :
:  |   |        |        |__ NN- NUMBER OF THE ROUTINE WHICH         :
:  |   |        |                PRINTED THE MESSAGE.                :
:  |   |        |                                                    :
:  |   |        |__ PROG PPPR-    PPP = ID OF PROGRAM.               :
:  |   |                            R = RELEASE LEVEL OF THE PROGRAM.:
:  |   |                                                             :
:  |   |__  ID UUXX    IDENTIFICATION OF PRINTOUT.                   :
:  |                                                                 :
:  |              UU = DEVICE ID, (SAME AS UDT CODE)                 :
:  |                   SPECIAL UU CODES ARE                          :
:  |                                                                 :
:  |                      FF - DCP, SYSTEM TEST LOADER AND           :
:  |                           SYSTEM TEST SUPERVISOR, OR            :
:  |                           OTHER SYSTEM TYPE PROGRAM.            :
:  |                      FE - OTHER SYSTEM TYPE PROGRAM.            :
:  |                           (SYSTEM TYPE PROGRAM IS ONE           :
:  |                           WHICH IS NOT ASSOCIATED WITH          :
:  |                           ONE SPECIFIC DEVICE.)                 :
:  |                                                                 :
:  |              XX = MESSAGE ID.  IF HALT OCCURS NEXT, IT          :
:  |                   WILL BE 'XX'.  USED FOR LOOKING UP THE        :
:  |                   MESSAGE (HALT) IN THE MAPS OR USER'S          :
:  |                   GUIDE.                                        :
:  |                   IF XX = 00, NO SUBSEQUENT HALT OCCURS.        :
:  |                                                                 :
:  |__ *    '*' INDICATES THAT THIS PRINTOUT IS                      :
:              AN ERROR TYPE PRINTOUT.                               :
:                                                                    :
......................................................................
```

```
......................................................................
:                           EXAMPLE                                  :
......................................................................
: *ID E105. PROG E113-02. SSWS 05,12                                 :
:  |------  --------- ---  ----------                                :
:  |  |         |        |      |                                    :
:  |  |         |        |      |__ SSW 05,12     SENSE SWITCHES 05  :
:  |  |         |        |                        AND 12 ARE ON.     :
:  |  |         |        |                                           :
:  |  |         |        |__ -02   ROUTINE '02' WAS RUNNING WHEN THE :
:  |  |         |                  MESSAGE WAS PRINTED.              :
:  |  |         |                                                    :
:  |  |         |__ PROG E113    E11 = 1403 PROGRAM 'E11' IS BEING   :
:  |  |                                RUN.                          :
:  |  |                            3 = RELEASE LEVEL OF THE PROGRAM. :
:  |  |                                                              :
:  |  |__ ID E105    IDENTIFICATION OF PRINTOUT.                     :
:  |                 E1 = 1403 PRINTER (SAME AS UDT CODE)            :
:  |                 05 = MESSAGE ID.  IF HALT OCCURS NEXT, IT       :
:  |                      WILL BE '05'.  USED FOR LOOKING UP THE     :
:  |                      MESSAGE (HALT) IN THE MAPS OR USER'S       :
:  |                      GUIDE.                                     :
:  |                                                                 :
:  |__ *    '*' INDICATES THAT THIS PRINTOUT IS                      :
:              AN ERROR TYPE PRINTOUT.                               :
:                                                                    :
......................................................................
```

9. HALT CODE CONVENTIONS

DIAGNOSTIC PROGRAMS ON SYSTEM/3 USE HALTS TO COMMUNICATE TO THE CE. PRINTOUTS ARE OFTEN ASSOCIATED WITH THE HALT.

HALTS ARE USED EITHER TO INDICATE AN ERROR OR TO REQUEST THE ATTENTION OF OR INTERVENTION FROM THE CE.

HALTS FROM DIAGNOSTIC PROGRAMS CONSIST OF 2 HEX DIGITS. THEIR GENERAL MEANINGS MAY BE GROUPED AS FOLLOWS:

```
                01 - 9F   ERROR TYPE HALT.
                A0 - FF   OPERATOR INSTRUCTIONS.

                        A0 - CF    ONLY OCCUR WHEN SENSE SWITCH 04 IS ON.
                        D0 - FF    ALWAYS OCCUR.
```

SYSTEM TEST --
WHEN SYSTEM TEST IS RUNNING, HALTS OCCUR IN PAIRS. THE FIRST HALT TELLS WHICH DEVICE IS HALTING, (EXAMPLE- E1 FOR 1403 PRINTER). RESET THE FIRST HALT AND THE SECOND HALT IS THE ACTUAL HALT.

'B' AND 'D' USED AS HALT CODES -- DISPLAYED IN LOWER CASE. ALSO, DON'T CONFUSE 'B' WITH '6'.

```
              *                          **********                   *
              *                          *                            *
              *                          *                            *
              *                          *                            *
              *                          *                            *
    B =       **********       6 =       **********      D =  **********
              *        *                 *        *           *        *
              *        *                 *        *           *        *
              *        *                 *        *           *        *
              *        *                 *        *           *        *
              **********                 **********           **********
```

*************** END ***************

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SYSTEM TEST
****

1. PROGRAM OPERATION

1.1 PREPARATION--

DCP MUST BE CONFIGURED PROPERLY BEFORE RUNNING THIS TEST. CHECK THE 'MODULE CONFIGURATION LIMITATION TABLE' (PARAGRAPH 3.1), AND ALSO THE 'CPU' AND 'UDT' CARDS IN THE 'DCP' DECK.

1.2 PROGRAM LOADING--

1.2.1 PROGRAM LOADING FROM DISK

A. IPL DCP FROM DISK (LOADING OF DCP FROM DISK: SEE BLOCK 10)

B. UPON LOADING, DCP WILL HALT WITH A 'HA' DISPLAYED TO ALLOW INPUT OF OPTIONS. ENTER COMMON SENSE SWITCHES AND SECTIONS TO BE RUN (SEE BLOCK 10)
ALL SYSTEM TEST MODULES - AS DEFINED IN THE UDT CARD - ENTER -DFF1- IN THE ADDRESS SWITCHES AND RESET HALT (THIS IS THE ONLY ENTRY NEEDED AS THE LOADER TAKES CARE OF LOADING THE REST OF THE MODULES AND THE SYSTEM TEST SUPERVISOR).

C. WHEN THE SYSTEM TEST LOADER (FF1) IS LOADED, THE PROGRAM HALTS WITH A 'HA' HALT. THE SYSTEM TEST MODULES NEED NOT BE SEQUENTIALLY ON DISK. AFTER THE 'HA' HALT SENSE SWITCH 18 CAN BE SELECTED TO HALT BEFORE LOADING EACH MODULE, OTHERWISE RESET THE HALT.

D. THE SYSTEM TEST RELOCATING LOADER (FF1) WILL LOAD ALL MODULES WHICH HAVE BEEN DEFINED IN DCP'S UDT TABLE. FINALLY, AFTER THE MODULES HAVE BEEN LOADED, THE SYSTEM TEST SUPERVISOR (FF2) WILL BE LOADED.

SENSE SWITCH OPTION--RELOCATING LOADER, SECTION FF1.

SENSE SWITCH 18 - HALT BEFORE LOADING EACH MODULE. LAST MODULE LISTED MAY BE DELETED BY SETTING TWO LEFTMOST DATA SWITCHES TO 'A' BEFORE RESETTING HALT.

1.3 OPERATION AIDS--

TO ASSURE THOROUGH TESTING, ALLOW THE TEST TO RUN AT LEAST TWO MINUTES. NOTE THE FOLLOWING POINTS:

A. A DEVICE MAY BE DISABLED AT ANY TIME BY MAKING IT NOT READY.

B. A NOT READY DEVICE MAY BE BROUGHT BACK INTO THE TEST BY BEING MADE READY.

C. THE SYSTEM RESET/START PROGRAM RESTART IS AVAILABLE.

D. A LOGOUT OF ERRORS MAY BE OBTAINED BY SETTING 'BB' IN CONSOLE SWITCHES 1 AND 2(SINCE F202 IS LOGOUT ROUTINE 'F202' IN SWITCHES MAY ALSO BE USED TO GO TO ROUTINE 2 LOGOUT.

E. ANY MODULE CAN BE REMOVED AND RUN DIRECTLY UNDER THE CONTROL OF DCP.

F. THE SYSTEM TEST RELOCATING LOADER PRINTS A LIST OF MODULES AND STARTING ADDRESSES WITH AN EXAMPLE APPEARING BELOW:
NOTE - COMPARE THIS LIST TO THE 'MODULE CONFIGURATION LIMITATION TABLE'(PARAGRAPH 3.1).

```
-        ID FF00. PROG FF11-01. SSW                                  -
-        LIST OF MODULES & STARTING ADDRESSES                        -
-        FE1 - CPU MODULE                 0F00                       -
-        E0F - 5203 PRINTER MODULE        1200                       -
-        E1F - 1403 PRINTER MODULE        1300                       -
-        F0F - 5424 MFCU MODULE           1700                       -
```

THE STARTING ADDRESS PRINTED IN THE 'LIST OF STARTING ADDRESSES' IS NOT THE STARTING ADDRESS OF ANY SYSTEM TEST MODULE. IF SAR IS LOADED WITH THIS ADDRESS, THE RESULT WILL BE A PROCESSOR CHECK. THIS ADDRESS IS THE STARTING ADDRESS OF THE BLOCK OF CORE WHICH THE MODULE WAS ASSIGNED BY THE SYSTEM TEST RELOCATING LOADER. TO DETERMINE THE CONTENT OF THIS BLOCK OF CORE REFER TO THE LISTING OF THAT SYSTEM TEST MODULE.

NOTE: ALL SYSTEM TEST MODULES ARE RELOCATABLE. THE SYSTEM TEST RELOCATING LOADER ADDS A RELOCATION FACTOR TO ALL ADDRESSES IN THE MODULE. THUS, EVEN THOUGH ALL MODULES ARE ASSEMBLED BEGINNING AT LOCATION HEX -0A00-, THE FIRST ADDRESS OF THE RELOCATED MODULE CORRESPONDS TO THE STARTING ADDRESS OF THE ASSIGNED BLOCK OF CORE.
NOTE: SYSTEM TESTS ARE DESIGNED AND WRITTEN TO EXERCISE AND DETECT FAILURES WHILE RUNNING TESTS OF ANY DEVICE ON A SYSTEM. ERRORS REFLECT THAT A DEVICE HAD A FAILURE, AND IS AN INDICATION TO THE CE TO RUN THE APPROPRIATE DEVICE DIAGNOSTICS. SYSTEM TESTS ARE NOT TO BE USED FOR TROUBLE-SHOOTING A DEVICE FAILURE.

1.4 ENABLING AND DISABLING MODULES--

MODULES CAN BE ENABLED (ACTIVATED) OR DISABLED (DE-ACTIVATED) DURING EXECUTION BY ONE OF THE FOLLOWING METHODS:

A. MAKE THE DEVICE BEING TESTED NOT READY.

B. DATA SWITCHES. (STOP CPU, SET SWITCHES, START CPU).

AXXX - DISABLE MODULE XXX.
BXXX - ENABLE MODULE XXX.

MODULE IDENTIFICATIONS ARE PRINTED BY THE RELOCATING LOADER AND ARE ALSO LISTED IN 'TABLE OF SYSTEM TEST MODULES'(PAGE 5).

NOTE: AS LONG AS SWITCHES ARE SET TO 'AXXX' OR 'BXXX' THE MODULE SELECTED WILL BE DISABLED OR ENABLED. TO COMPLETE THE ENABLING OF A MODULE, REMOVE THE 'B' FROM THE LEFTMOST ADDRESS SWITCH.

1.5 I/O OVERLAP SWITCH--

THE I/O OVERLAP SWITCH SHOULD BE IN THE NORMAL OR 'ON' POSITION WHEN THE SYSTEM TEST IS BEING RUN. IF IT IS NOT ERROR HALTS MAY OCCUR.

3. TABLE OF SYSTEM TEST MODULES

MODULE ID	UNIT TESTED	PREPARATION	TEST OPERATION
14F	CRT KEYBOARD & MATRIX PRINTER	CRT/KEYBOARD AND/OR MATRIX PRINTER MUST BE READY	A RIPPLE DATA PATTERN WILL BE CONTINUALLY DISPLAYED ON THE CRT. IF THE MATRIX PRINTER IS ATTACHED, A RIPPLE DATA PATTERN WILL BE PRINTED AT 40,64,80,AND 132 CHARACTERS PER LINE. FUNCTION KEY INTERRUPTS WILL BE INDICATED WITH THE 'E0' HALT. THE TEST REQUEST KEY WILL CAUSE THE SCREEN TO BE BLANKED AND ALLOW DATA KEYS TO BE PRESSED. PRESSING THE 'ENTER' KEY WILL RESUME THE DISPLAYING OF THE RIPPLE PATTERN.
20F	MLTA	1. CONFIGURE THE MLTA SYSTEM TEST TO THE SYSTEM USING THE MLTA CONFIGURATOR PROGRAM -FE7-. 2. CONFIGURATION OF SYSTEM TEST MODULE 2.1 RUNNING FROM CARDS. TAKE THE LAST CARD PUNCHED OUT BY -FE7- (R 0A0D XXXXXX REP CARD FOR 20F) AND PLACE IT BEFORE THE END CARD OF THE MLTA SYSTEM TEST MODULE (20F). 2.1 RUNNING FROM DISK. THE SYSTEM TEST MODULE WILL BE CONFIGURED AUTOMATICALLY IF OUTPUT TO DISK IS SELECTED. 3. LOAD MLTA MICROCODE (ID = FF0) USING THE MICROCODE LOADER (ID=205)	DEFINITIONS: ADJACENT PAIRS - LINES 1-2, 3-4, 5-6, AND 7-8 LOOP TEST - SAMPLING THE DATA TRANSMITTED ON ONE LINE OF THE ADJACENT PAIR WRAP TEST - TRANSMITTING ON ONE LINE OF AN ADJACENT PAIR AND RECEIVING ON THE OTHER TEST OPERATION:THE LOOP AND WRAP TESTS WILL BE PERFORMED FOR THE SPEED(S) DEFINED FOR THE SYSTEM. IF JUMPERED (WORLD TRADE) AS WELL AS NON-JUMPERED SPEEDS ARE PRESENT, THE TESTS WILL BE PERFORMED FOR THE NON-JUMPERED SPEEDS ONLY. IF ONLY ONE LINE OF AN ADJACENT PAIR IS PRESENT, ONLY THE LOOP TEST WILL BE PERFORMED. IF BOTH LINES OF AN ADJACENT PAIR ARE PRESENT, TESTING WILL ALTERNATE BETWEEN LOOP TEST ON EACH LINE AND THE WRAP TEST. WRAPPING WILL BE DONE IN BOTH DIRECTIONS.
28F	BSCC	MICRO CODE MUST BE LOADED BEFORE RUNNING 28F. (LOAD & RUN 28C)	IF UDT IS CONFIGURED FOR 2 LINES BOTH LINES ARE TESTED OTHERWISE ONLY LINE 1 IS TESTED. A SINGLE BYTE OF DATA IS SENT AND WRAPPED 256 TIMES BY MICRO CODE. WHEN THE INTERRUPT OCCURS IT IS CHECKED FOR LINE, WHETHER ANY MICRO-DETECTED ERRORS & IF THE RETURNED DATA IS AS EXPECTED.
31F	2501	LOAD HOPPER WITH RIPPLE PATTERN CARDS (DECK PN 2441566) IN ANY ORDER.	READ TRANSLATE AND READ CARD IMAGE COMMANDS ARE ISSUED IN RANDOM ORDER. READ LENGTH VARIES FROM 1 TO 80 COLUMNS. DATA, STATUS, AND THE NUMBER OF READ CHARACTERS ARE CHECKED.
35F	1255 MAGNETIC CHARACTER READER	THE READER/SORTER MUST BE PLACED IN THE 'ON-LINE' MODE AND THE START KEY DEPRESSED IN PREPARATION OF DOCUMENT FEEDING. LOAD HOPPER WITH DOCUMENTS. ALL DATA FIELDS SHOULD BE ENABLED (SWITCHES DEPRESSED): AMOUNT, PROCESS CONTROL, ACCOUNT NUMBER, TRANSIT ROUTING, AND SERIAL NUMBER.	THE SIOC WILL BE CHECKED UPON INITIAL ENTRY INTO THIS MODULE. ONCE THE SIOC HARDWARE IS CHECKED, THE 1255 WILL BE EXERCISED. ONE DOCUMENT AT A TIME WILL BE READ FROM THE HOPPER AND STACKED. THE DOCUMENTS WILL BE RIPPLE STACKED. STACKING WILL BE AS FOLLOWS: UDT ENTRY 35 6 STACKERS, STANDARD SORT: 0-2-4-6-8-R 35-2 6 STACKERS, ALTERNATE SORT: 0-1-2-3-4-R 35-4 12 STACKERS, SORT: 0-1-2-3-4-R-5-6-7-8-9-A NOTE: IF THE CPU 'STOP' KEY IS DEPRESSED, THE 1255 MAY HALT WITH A 'STACKER COMMAND' CHECK. RESET THE STACKER COMMAND CHECK PRIOR TO DEPRESSING CPU 'START'.
36F	1270 OPTICAL CHARACTER READER	THE READER/SORTER MUST BE PLACED IN THE 'ON-LINE' MODE AND THE START KEY DEPRESSED IN PREPARATION OF DOCUMENT FEEDING. LOAD HOPPER WITH DOCUMENTS. ENABLE ALL 7 DATA FIELDS (SWITCHES DEPRESSED).	THE SIOC WILL BE CHECKED UPON INITIAL ENTRY INTO THIS MODULE. ONCE THE SIOC HARDWARE IS CHECKED, THE 1270 WILL BE EXERCISED. ONE DOCUMENT AT A TIME WILL BE READ FROM THE HOPPER AND STACKED. THE DOCUMENTS WILL BE RIPPLE STACKED. STACKING WILL BE AS FOLLOWS: UDT ENTRY 36 6 STACKERS, STANDARD SORT: 0-2-4-6-8-R 36-1 6 STACKERS, ALTERNATE SORT: 0-1-2-3-4-R 36-0 12 STACKERS, SORT: 0-1-2-3-4-R-5-6-7-8-9-A NOTE: IF THE CPU 'STOP' KEY IS DEPRESSED, THE 1270 MAY HALT WITH A 'SORT' CHECK. RESET THE 'SORT' CHECK PRIOR TO DEPRESSING CPU 'START'.
3AF	3881 OPTICAL MARK READER	THE FOLLOWING (4) STEPS MUST BE PERFORMED ON THE 3881 CE PANEL TO PUT THE 3881 IN DIAGNOSTIC MODE : 1. SET OFF/ON LINE SWITCH TO OFF. 2. SET A BINARY 07 IN THE DIAGNOSTIC MODE SWITCHES. 3. PRESS CE RESET. 4. SET OFF/ON LINE SWITCH TO ON. ALSO, READER MUST BE MADE READY WITH BLANK DOCUMENTS IN THE HOPPER. NOTE - REMOVE FROM DIAGNOSTIC MODE AFTER TESTING VIA '00' IN THE SWITCHES	THE SIOC WILL BE CHECKED UPON INITIAL ENTRY INTO THIS MODULE. ONCE THE SIOC HARDWARE IS CHECKED, THE 3881 WILL BE EXERCISED. ONE DOCUMENT AT A TIME WILL BE READ IN DIAGNOSTIC MODE INTO THE NORMAL STACKER. NOTE - RUN THIS MODULE MINIMUM OF 5 MINUTES.
40F	3741	PLUG IN 3741 I/O CABLE. INSERT SCRATCH DISKETTE INTO DRIVE 1. THE HEADER (HDR) OF THE FIRST DATA SET IS DISPLAYED. CHECK THAT THE RECORD LENGTH IS 128. IF NOT, -REC ADV- KEY WILL DISPLAY SUBSEQUENT DATA SET HEADERS (UNTIL NO MORE ARE AVAILABLE). WHEN A SUITABLE DATA SET IS FOUND, USE -NUM SHIFT- TO TYPE 41. DEPRESS -FUNCT SEL UPPER-. DEPRESS EITHER -INPUT- OR -OUTPUT TO TRANSFER DATA EITHER TO OR FROM 3741 RESPECTIVELY.	THE TEST WILL READ OR WRITE RECORDS UNTIL END OF DATA SET (OR END OF DISK) IS REACHED. (SEE DESCRIPTION OF HALT 83). NOTE-- WRITING ON DISKETTE DESTROYS DATA, USE A SCRATCH DISKETTE.
50F	1442 RPQ READER PUNCH	LOAD THE HOPPER WITH BLANK CARDS.	FEED, READ AND PUNCH COMMANDS ARE EXERCISED IN RANDOM ORDER. BOTH STACKERS ARE USED. PUNCHED CARDS MUST BE LOADED BACK INTO THE HOPPER FOR PROGRAM VERFICATION. AT LEAST ONCE WHEN THE 1442 BECOMES NOT READY DUE TO AN EMPTY HOPPER, THE OPERATOR SHOULD DEPRESS THE 1442 START KEY -- WITHOUT RELOADING THE HOPPER. THE MESSAGE '1442 LAST CARD' SHOULD BE PRINTED AFTER THE NEXT FEED CYCLE TO INDICATE THAT THE 'LAST CARD' BIT WAS SET. IF THIS MESSAGE APPEARS AT ANY OTHER TIME, AN ERROR CONDITION EXISTS. RUNS IN INTERRUPT MODE WITH OTHER SYSTEM TEST MODULES.
51F	1442 ATTACH. READER PUNCH		
70F	3410/3411 TAPE	MAKE THE TAPE UNIT(S) READY WITH THE WRITE-ENABLE RING INSTALLED.	A STORED TABLE OF TAPE COMMANDS IS EXECUTED REPEATEDLY ON ALL TAPE UNITS,ATTACHED AND READY,UNTIL EOT MARK IS DETECTED. NOTE-A WRITE RETRY IS PERFORMED (15) TIMES BEFORE AN ERROR IS INDICATED.
80F AND 88F	BSCA 1 OR LCA AND BSCA 2	THE EXTERNAL CABLE SWITCH MAY OPTIONALLY BE PUT ON. (ONLY IF NOT HIGH SPEED FEATURE OR 1200 BPS MODEM) IF THE SWITCH IS ON, THE DATA GOES OUT TO THE END OF THE DATA SET CABLE AND BACK INTO THE ADAPTER. A BSCA ERROR WILL OCCUR IF THIS SWITCH IS THROWN DURING BSCA OPERATION. * NOTICE * A BSCA WITH SWITCHED NETWORK WILL GET A UNIT CHECK (DISCONNECT TIMEOUT) IF THE LOGOUT TAKES OVER 20 SECONDS.THIS ERROR SHOULD BE DISREGARDED.	THE BSCA DIAGNOSTIC INSTRUCTION 'TEST LOOP' IS USED IN THIS ROUTINE. A BYTE OF DATA 7F IS CYCLE STEALED OUT OF CORE INTO THE BSCA. (THE BSCA IS FIRST ENABLED). THE BYTE IS THEN SENT INTO THE SHIFT REGISTER, SHIFTED OUT THE TRANSMIT TRIGGER AND INTO THE RECIEVE TRIGGER WHERE IT GOES BACK TO THE SHIFT REGISTER. THIS BYTE (SHIFTED LEFT 7 BIT POSITIONS) IS THEN PUT BACK IN CORE AT N+1 ADDRESS WHERE N WAS STARTING ADDRESS. THIS BYTE IS CONTINUALLY SHIFTED AND STORED IN CORE AT THE INCREMENTED ADDRESS UNTIL FINALLY WHEN THE INCREMENTED ADDRESS EQUALS THE STOP LSR ADDRESS AN INTERRUPT OCCURS. IN THE INTERRUPT ROUTINE THE DATA IN CORE AND THE STATUS CONDITIONS ARE CHECKED FOR PROPER VALUES.

MODULE ID	UNIT TESTED	PREPARATION	TEST OPERATION
89F	INTEGRATED DISPLAY ADAPTER	MICROCODE MUST BE LOADED BEFORE ATTEMPTING TO RUN 89F. (LOAD AND RUN 893)	GENERAL EACH INDIVIDUAL DEVICE IN A GROUP OF THREE DEVICES (ESTABLISHED BY UDT) IS POLLED. IF THAT DEVICE IS NOT ATTACHED, POWERED UP AND READY, THE APPROPRIATE HALT (NOTE 1 UNDER HALTS) WILL OCCUR. RESETTING THE HALT WILL DROP THAT DEVICE FROM THE TEST. SHOULD THE DEVICE COME READY LATER ON, IT WILL BE PICKED UP. IF THE POLL SHOWS THE DEVICE READY AND AVAILABLE, A 40 CHARACTER PATTERN WILL BE WRITTEN TO THE DEVICE BUFFER. THIS 40 CHARACTER PATTERN WILL HAVE THE CURSOR POSITIONED AT ITS START AND ITS MDT BITS WILL BE SET ON. ALL MDT BITS WHICH MAY HAVE BEEN LEFT ON THE SCREEN WILL BE SET OFF. THE PATTERN CONSISTS OF THE DEVICE ADDRESS (HIGH INTENSITY, PROTECTED), 29 RIPPLED DATA CHARACTERS (NORMAL INTENSITY, UNPROTECTED), AND 2 ATTRIBUTE CHARACTERS. A READ MODIFIED IS THEN DONE AND THE DATA READ BACK IS COMPARED TO THE DATA JUST WRITTEN. IF THE DATA IS CORRECT, THE DEVICE IS DROPPED AND THE PROGRAM PROCEEDS TO THE NEXT AVAILABLE DEVICE. NOTES: DO NOT DEPRESS ANY KEYS OTHER THAN 'AID' KEYS (PF,PA,ENTER, TEST REQ., CLEAR) UNTIL INSTRUCTED UNDER MANUAL OPERATIONS. DEPRESSING SYSTEM RESET WHILE THIS TEST IS RUNNING MAY DESTROY THE DATA IN A DEVICE BUFFER CAUSING A DATA CHECK WHEN THE TEST IS RESTARTED. ON SOME KEYBOARDS IT IS NECESSARY TO BE IN LOWER SHIFT FOR THE 'PA' KEYS TO FUNCTION. PRINTERS IF THE DEVICE IS A PRINTER, TO SAVE TIME NO PRINT OPERATION IS NORMALLY DONE. HOWEVER, A READ IS DONE TO CHECK THE DATA IN THE DEVICE BUFFER. IF PA1 ON ANY AVAILABLE 3277 IS DEPRESSED, ALL PRINTERS WILL START PRINTING AN 80 CHARACTER PATTERN AS FOLLOWS: 40 CHARACTER PATTERN 40 BLANKS 40 CHARACTER PATTERN ETC. TO KEEP THE PRINTOUT SHORT, ALL OTHER DATA IN THE PRINTER BUFFER IS ERASED EACH TIME A PATTERN IS WRITTEN. IF PA2 IS DEPRESSED ON ANY AVAILABLE 3277, ALL PRINTERS WILL REVERT BACK TO THEIR NORMAL NON-PRINT OPERATION. IF ALL DEVICES PROWERED ON AND AVAILABLE ARE PRINTERS, THEY WILL ALWAYS PRINT. MANUAL OPERATIONS IF 'TEST REQ' IS DEPRESSED ON ANY AVAILABLE 3277, THAT 3277 WILL REVERT TO MANUAL MODE. A PATTERN WILL BE SENT TO THE SCREEN INSTRUCTING YOU TO KEY IN UP TO 20 CHARACTERS AND THEN DEPRESS 'ENTER'. WHEN THIS IS DONE, THE CHARACTERS YOU JUST ENTERED WILL BE PLACED ON THE SCREEN AND YOU WILL BE INSTRUCTED TO DEPRESS 'CLEAR'. WHEN THIS IS DONE, THE DEVICE GOES BACK TO NORMAL OPERATION. IF YOU ENTER TOO MANY CHARACTERS OR DEPRESS THE WRONG 'AID' KEY, 'INPUT INHIBIT' WILL COME ON AND STAY ON. TO CONTINUE, DEPRESS 'RESET' ON THE 3277. 'INPUT INHIBIT' WILL GO OFF AND YOU CAN DEPRESS THE CORRECT 'AID' KEY. BECAUSE OF THE HIGH REPETITION RATE, ESPECIALLY WITH ONLY A FEW DEVICES ON LINE, IT MAY BE DIFFICULT TO CAUSE AN 'AID' KEY TO TAKE. AN AUDIBLE CLICK WHEN YOU PUSH THE KEY INDICATES THAT IT WAS ACCEPTED. IF THE CLICK IS NOT HEARD, RELEASE IT AND DEPRESS AGAIN UNTIL THE CLICK IS HEARD. AID KEYS OTHER THAN PA1, PA2, TEST REQ, ENTER, AND CLEAR ARE IGNORED.
A0F	5444 DISK	MAKE SURE SPINDLE DRIVE(S) ARE READY.	A STORED TABLE OF DISK COMMANDS IS EXECUTED REPEATEDLY. THE PROGRAM ALTERS THESE COMMANDS TO EXERCISE BOTH FIXED AND REMOVABLE DISKS. BOTH SPINDLE DRIVES ARE EXERCISED WHEN THE DUAL SPINDLE FEATURE IS INSTALLED. THE TESTING OF INTERRUPTS IS ALSO INCLUDED.
C0F	5445 DISK	MAKE SURE DRIVE(S) ARE READY. POWER SWITCH FOR DRIVE 3 AND 4 (IF ATTACHED) MUST BE TURNED ON EVEN IF 3 AND 4 NOT USED.	A STORED TABLE OF DISK COMMANDS IS EXECUTED REPEATEDLY. THE PROGRAM ALTERS THESE COMMANDS TO EXERCISE ANY DRIVES ATTACHED TO THE SYSTEM.
C1F	3340	MICROCODE MUST BE LOADED. THIS MAY BE DONE EITHER BY IPL FROM THE 3340 OR BY EXECUTION OF SECTION C17. MAKE SURE ALL DRIVES TO BE TESTED ARE READY. THE CE DATA MODULE MAY BE USED ON ANY ONE OF THE DRIVES, HOWEVER, USE OF A NORMAL CONFIGURATION OF USER DATA MODULES WILL INSURE THAT THE DATA MODULES AS WELL AS THE DRIVES ARE TESTED.	A SERIES OF TESTS IS EXECUTED REPEATEDLY AGAINST EACH DRIVE TO TEST ACCESS, READ, WRITE, AND SCAN FUNCTIONS. TESTING IS AUTOMATICALLY BYPASSED ON ANY DRIVE FOUND TO BE NOT READY WHEN HALT 05 IS RESET. ALL WRITE TESTS ARE BYPASSED ON ANY DRIVE THAT IS FOUND TO BE IN READ ONLY MODE WHEN HALT 0A IS RESET. ALL NORMAL USER AREAS ON THE DATA MODULE ARE PROTECTED. WRITE TESTING IS DONE ONLY ON THE CE TRACKS.
E0F	5203 PRINTER (WT RPQ)	LOAD PAPER, MAKE READY	COMMANDS ARE ISSUED IN RANDOM ORDER. A RIPPLE PATTERN IS PRINTED.
E1F	1403 PRINTER	LOAD PAPER, MAKE READY.	COMMANDS ARE ISSUED IN RANDOM ORDER. A RIPPLE PATTERN IS PRINTED. 60 CHAR. CHAIN IMAGE CAUSES RIPPLE PATTERN TO HAVE A 60 CHAR.GAP.
E2F	2ND 1403 PRINTER (RPQ) (RPQ)	LOAD PAPER, MAKE READY.	COMMANDS ARE ISSUED IN RANDOM ORDER. A RIPPLE PATTERN IS PRINTED. 60 CHARACTER CHAIN IMAGE CAUSES RIPPLE PATTERN TO HAVE A 60 CHARACTER GAP.
F0F	5424 MFCU	PLACE BLANK CARDS IN BOTH HOPPERS AND MAKE MFCU READY.	PRIMARY CARDS ARE READ INTO STACKER 1. CARDS FROM THE SECONDARY UNDERGO ONE OF THE FOLLOWING OPERATIONS. 1. PUNCH ONLY TO STACKER 2. 2. PRINT ONLY TO STACKER 3. 3. PUNCH/PRINT TO STACKER 4. COMMANDS ARE ISSUED IN RANDOM ORDER. PUNCHED CARDS FROM STACKERS 2 AND 4 SHOULD BE RELOADED INTO THE PRIMARY HOPPER FOR PROGRAM VERIFICATION. NOTE: THE PUNCHED CARDS MUST BE CHECKED WITH A CARD GAUGE. OFF PUNCHING CAN BE FAIRLY SEVERE AND YET NOT CAUSE READ ERRORS WHEN THE CARDS ARE RELOADED FOR PROGRAM VERIFICATION.
F2F	2560 MFCM	PLACE BLANK CARDS IN BOTH HOPPERS AND MAKE 2560 READY.	A STORED TABLE OF COMMANDS IS EXECUTED, IN SEQUENTIAL ORDER, EXERCISING BOTH FEEDS. READ, PUNCH AND PRINT COMMANDS ARE ISSUED TO BOTH FEEDS. PRINT ONLY COMMANDS ARE OVERLAPPED WITH A PUNCH COMMAND WHICH FOLLOWS. BLANK CARDS FROM EITHER FEED WILL STACK IN STKR 1, PRI PCHED CARDS WILL BE IN STKR 2, SEC PCHED CARDS IN STKR 3. PRINTED CARDS FROM EITHER FEED WILL BE IN STKR 4. THESE WILL INCLUDE PCHED & PRINTED CARDS. PUNCHED CARDS FROM STKRS 2 & 3 MAY BE PLACED BACK IN EITHER HOPPER AND THEY WILL BE READ. THEY WILL NOT BE REPUNCHED & WILL GO TO STKR 5 (4 ON MOD 2). * WHEN INTERSPERSED BLANK AND PCHED CARDS ARE READ, SOME CARDS IN STKR 4 WILL NOT BE PRINTED. *
FE1	5415 CPU		CPU INSTRUCTIONS ARE EXECUTED AND TESTED IN SEGMENTS. ALSO, ALL AVAILABLE CORE IS SCANNED. INTERRUPT LEVEL 0, IAR'S AND PMR'S ARE CHECKED, ATT REGS. ARE CHECKED, PGM. CHECK REGS. AND LEVEL 7 INT. IS CHECKED, MEMORY USING ATT IS CHECKED AND INTERVAL TIMER. ERRORS WILL APPEAR AS PROC. CHECK WHEN USING THE ATT REGS.

4. LOGOUT OF ERROR RECORDING TABLES--

EACH TEST MODULE HAS A TABLE IN WHICH INFORMATION CONCERNING ERRORS AND CURRENT OPERATION IS STORED. IT WAS MENTIONED PREVIOUSLY THAT THE LOGOUT CAPABILITY IS CONTAINED IN ROUTINE 2 OF THE SYSTEM TEST SUPERVISOR. THEREFORE, A DATA SWITCH CALL FOR ROUTINE '02' CAN BE USED TO OBTAIN A LOGOUT. AN ALTERNATE METHOD IS DESCRIBED BELOW:

1) STOP THE CPU
2) SET LEFT TWO ADDRESS SWITCHES TO 'BB'
3) START CPU
4) AFTER LOGOUT OCCURS, CHANGE DATA SWITCHES BEFORE RESTARTING

NOTE - BEFORE LOGGING OUT, BE SURE EACH I/O DEVICE HAS HAD SUFFICIENT TIME TO RECORD ANY PENDING ERRORS. THIS CAN BE HURRIED BY MAKING I/O DEVICES NOT READY.

MODULE ID	UNIT TESTED	SAMPLE LOGOUT	COMMENTS AND EXPLANATIONS
14F	3277 KEYBOARD	3277 LOG-OUT LAST 3 SIOS 0000 0000 0000 SENSE DATA AFTER LAST 3 INTRPTS (INTERRUPT CONDITION REGISTER) 0000 0000 0000 SENSE DATA AFTER LAST 3 ERRORS (MSDAR, COUNT, CURAR, MBAR, ICR) 00000000000000000000 00000000000000000000 00000000000000000000	DATA ARRANGED AS FOLLOWS: LEAST RECENT PREVIOUS MOST RECENT
20F	MLTA	MLTA ERRORS XX	XX NUMBER OF ERRS FOUND
28F	BSCC 1 AND 2	- BSCC LOGOUT - NUMBER OF TESTS XXXXXX ERR- NO ERRORS DETECTED ERR LINE NUMBER X X X STATUS SENSE IS XXXX XXXX XXXX DATA EXP IS CARD DEPENDENT SEE BSCC DESC. NOTE. FOR STATUS BIT SIGNIFICANCE SEE BSCC DESCRIPTION.	WHEN THERE ARE NUMBERS ON THE 'ERR-' LINE IT INDICATES ONE OF THE FOLLOWING ERROR CONDITIONS: 1 MICRO DETECTED ERROR 2 UNEXPECTED INTERRUPT 3 WRONG DATA RETURNED DATA ARRANGED ACROSS AND DOWN AS FOLLOWS: LEAST RECENT PREVIOUS MOST RECENT THE NUMBER OF TESTS IS A COUNTER OF THE TIMES THE TEST LOOP INSTRUCTIONS WERE PERFORMED. SYSTEM RESET/START WILL RESET THIS COUNTER.
31F	2501	2501 LAST 3 ERRORS SIO Q XX XX XX STATUS XXXX XXXX XXXX HALT XX XX XX	DATA ARRANGED AS FOLLOWS: LEAST RECENT---PREVIOUS---MOST RECENT
35F	1255 MAGNETIC CHARACTR READER	LAST 3 1255 ERRORS 0000 0000 0000	DATA ARRANGED AS FOLLOWS: ENTRIES ARE ERROR HALTS. LEAST RECENT PREVIOUS MOST RECENT
36F	1270 OPTICAL CHARACTR READER	LAST 3 1270 ERRORS 0000 0000 0000	DATA ARRANGED AS FOLLOWS: ENTRIES ARE ERROR HALTS. LEAST RECENT PREVIOUS MOST RECENT
3AF	3881 OPTICAL MARK READER	LAST 3 3881 ERRORS 0000 0000 0000	DATA ARRANGED AS FOLLOWS: ENTRIES ARE ERROR HALTS. LEAST RECENT PREVIOUS MOST RECENT
40F	3741	LOGOUT -- NONE	
50F 51F	RPQ --1442-- READER PUNCH --1442-- ATTACH.	1442 - LAST 3 CMDS AND STATUS XXXXXX XXXXXX XXXXXX XXXX	DATA ARRANGED AS FOLLOWS: LEAST REC CMD & CONT BYTE PREVIOUS CMD & CONT BYTE MOST REC CMD & CONT BYTE STATUS BYTES SEE 1442 DESC FOR BIT SIG.
70F	3410/ 3411 TAPE	3410/3411 TAPE LAST ADDRESS AND COMMAND XXXX SENSE DATA XXXXXXXXXXXXXXXXXXXXXXXXXXX	DATA ARRANGED AS FOLLOWS: ADDR.& CMD (LEFT TO RIGHT) Q BYTE OF LAST ERROR CMD R BYTE OF LAST ERROR CMD SENSE DATA (LEFT TO RIGHT) BYTES 0&1-ADAPTER SENSE BYTES 2&3-HARDWARE SENSE BYTES 4-11- SUB-SYSTEM BYTES 12&13-MAGNETIC TAPE ADDR.REGISTER
80F AND 88F	BSCA 1 OR LCA AND BSCA 2	- BSCA LOGOUT - ERR- XX XX XX XX XX XX XX DIAGNOSTIC SENSE IS XXXX STATUS SENSE IS XXXX TEST NUMBER IS XXXX DATA EXP IS 7FFCF1C71F7FFFCF1C71F7FFCF1C71F7F DATA ACT IS XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX NOTE: FOR ASCII ADAPTER REPLACE THE 2ND TO THE LAST LINE WITH: DATA EXP IS 7F7C7147147FFC71471F7FFC71471F7F NOTE: A BSCA WITH SWITCHED NETWORK WILL GET A UNIT CHECK CONDITION (DISCONNECT TIMEOUT) IF THE LOGOUT TAKES OVER 20 SECONDS.THIS ERROR SHOULD BE IGNORED. NOTE. THIS PRINTOUT WILL ALSO OCCUR IF THERE IS AN ERROR. WHEN THAT OCCURS, THE FIRST LINE IS REPLACED WITH ** BSCA X ERROR ** WHERE X IS EITHER 1 OR 2. NOTE: LOCAL COMUNICATIONS ADAPTER(LCA) IS FUNCTIONALLY THE SAME AS BSCA-1 WITH POINT TO POINT NON-SWITCHED LINE CONTROL, LOCAL MODEMLESS ATTACHMENT (AT 2400 BPS), AND EBCDIC TRANSMISSION CODE. THE SAME DIAGNOSTICS AND MAP CHARTS USED BY BSCA-1 ARE UTILIZED FOR LCA.	THE LINE WITH 'ERR' ON IT INDICATES AN ERROR OR COMBINATION OF ERRORS WHEN THERE ARE NUMBERS AFTER THE WORD. THE NUMBERS AND THEIR MEANING ARE: 1 UNIT CHECK NOT READY 2 'BUSY' ALWAYS ON 3 INTERRUPT REQUEST PENDING NOT ON 4 OP-END INTERRUPT NOT ON 5 ITB INTERRUPT ON 6 DATA IN CORE WRONG 7 NO INTERRUPT OCCURED FOR THE DIAGNOSTIC AND STATUS SENSE SEE THE BSCA DESCRIPTION FOR BIT SIGNIFICANCE. THE TEST NUMBER IS A COUNTER OF THE NUMBER OF TIMES A TEST LOOP INSTRUCTION WAS PERFORMED. A SYSTEM RESET AND START OF THE SYSTEM TEST WILL REINITIALIZE THIS COUNTER. DATA ACT IS THE DATA THE BSCA SHIFTED AND PUT BACK IN CORE.

MODULE ID	UNIT TESTED	SAMPLE LOGOUT	COMMENTS AND EXPLANATIONS
89F	INTE- GRATED DISPLAY ADAPTER	DA LOG-OUT WRITE TOTALS XXXXXX READ TOTALS XXXXXX SELECT TOTALS XXXXXX POLL TOTALS XXXXXX DEVICE XX MESSAGE STATUS=XXXX CAR=XXXX TAR=XXXX SAR=XXXX XMIT/REC=XXX______________________XXX XXX______________________XXX THE EXPECTED DATA OUTPUT BELOW WILL BE PRINTED ON A DATA MISCOMPARE ERROR ONLY. EXPECTED=XXX______________________XXX XXX______________________XXX NOTE: IF RUNNING UNDER SUPERVISOR CONTROL, 'BB' MUST BE PUT INTO DATA SW 1&2 AT THE TIME OF THE HALT, IN ORDER TO GET A MEANING-FUL LOG-OUT.	MESSAGE IS REPLACED BY A BRIEF DESCRIPTION OF THE ERROR. X'S ARE REPLACED BY THE APPROPRIATE DATA. THE COUNTERS WILL NOT RESET EXCEPT WHEN THEY WRAP OR THE PROGRAM IS RELOADED.
A0F	5444 DISK	5444 ERROR LOG HALT STATUS BYTES SIO ID 0 1 2 3 Q R A0XX .. .. B0XX .. .. NOTE - FOR HALT CODES 01,02,03 & 06, THE STATUS AND SIO BYTES WILL CONTAIN ONLY DOTS SINCE THEY DO NOT OCCUR ON SIO COMMANDS.	DATA ARRANGED AS FOLLOWS: XX - IS THE ERROR HALT THAT IS RECORDED. A0 - IDENTIFIES ERROR TO DRIVE 1. B0 - IDENTIFIES ERROR TO DRIVE 2. .... - NO ERROR LOGGED YET ERRORS: TOP LINE - LEAST RECENT 2ND LINE - PREVIOUS 3RD LINE - MOST RECENT
C0F	5445 DISK	5445 ERROR LOG HALT STATUS BYTES SIO ID 0 1 2 3 Q R DR HD C0XX .. .. C8XX .. .. NOTE - FOR HALT CODES 01,02,03,06, & 99 THE STATUS AND SIO BYTES WILL CONTAIN ONLY DOTS SINCE THEY DO NOT OCCUR ON SIO COM-MANDS. DR=(DRIVE #) & HD=(HEAD #) ON WHICH ERROR OCCURRED.	DATA ARRANGED AS FOLLOWS: XX - IS THE ERROR HALT THAT IS RECORDED. C0 - IDENTIFIES DRIVE 1. C8 - IDENTIFIES DRIVE 2. D0 - IDENTIFIES DRIVE 3. D8 - IDENTIFIES DRIVE 4. .... - NO ERROR LOGGED YET ERRORS: TOP LINE - LEAST RECENT 2ND LINE - PREVIOUS 3RD LINE - MOST RECENT
C1F	3340	3340 LOG DRIVE 1 - NO ERRORS 000000000000000000000000000000000000000000000000 DRIVE 2 - ERR HALT 0A 01000201C800001B290A60ED001040848001000000001200 DRIVE 3 - READ ONLY 80020206D2BA41000000000000000000000000000000000 DRIVE 4 - NOT READY 400000000000001500000052000800841101000000001915 NOTE: WHEN TEST EXECUTION IS FIRST STARTED, OR RESTARTED AFTER SYSTEM RESET, THE LOG IS INITIALIZED TO THE 'NO ERRORS' CONDITION FOR EACH DRIVE. IT REMAINS SO UNTIL ONE OF THE DESCRIBED ABNORMAL CONDITIONS IS DETECTED.	LOG SHOWS LAST CONDITION DETECTED ON EACH DRIVE. SAMPLE LOGOUT SHOWS: DRIVE 1-NO ABNORMAL CONDITION DETECTED DRIVE 2-AN ERROR WAS DETECTED. THE ERROR HALT INDEX NUMBER IS INCLUDED IN THE PRINTOUT DRIVE 3-APPEARS TO BE IN 'READ ONLY' MODE. WRITE TESTS WERE BYPASSED DRIVE 4-APPEARS TO BE IN 'NOT READY'. ALL TESTS WERE BY-PASSED THE HEX INFORMATION IN THE LOGOUT CONTAINS THE 24 'READ DIAGNOSTIC SENSE' BYTES FOR EACH DRIVE.
E0F	5203 PRINTER (WT RPQ)	(LOGOUT SAME AS 1403 BELOW)	DATA ARRANGED AS IN 1403 PRINTER BELOW SEE 5203 DESC FOR BIT SIG
E1F	1403 PRINTER	1403 PRINTER LAST 3 COMMANDS XXXX XXXX XXXX	DATA ARRANGED AS FOLLOWS: COMMANDS: LEAST RECENT PREVIOUS MOST RECENT
E2F	SECOND 1403 PRINTER (RPQ)	LAST 3 ERRORS COMMANDS XXXX XXXX XXXX CK STATUS XXXX XXXX XXXX PRINT POS XXX XXX XXX	ERRORS: CMDS: LEAST PREV MOST CK S: REC REC PRNT: SEE 1403 DESC FOR BIT SIG.
F0F	5424 MFCU	5424 MFCU LAST 3 CMNDS XXXX XXXX XXXX LAST 3 ERRORS XXXX XXXX XXXX	DATA ARRANGED AS FOLLOWS: CMNDS & ERRORS: LEAST RECENT PREVIOUS MOST RECENT ERRORS: SEE 5424 DESC FOR BIT SIG.
F2F	2560 MFCM	2560 MFCM LAST 5 CMNDS XXXX XXXX XXXX XXXX XXXX LAST 3 ERRORS F0 F1 F2 F3 XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX	DATA ARRANGED AS FOLLOWS: CMNDS & ERRORS: LEAST RECENT PREVIOUS MOST RECENT
		ID FFE1. PROG FF20-02. SSWS 07 LOGOUT COMPLETE - RESET HALT TO RESTART	AFTER LOGOUT COMPLETED SET LEFT ADDRESS SWS TO SETTING OTHER THAN X'BB' BEFORE RESETTING HALT

5. SYSTEM TEST HALTS AND PRINTOUTS

A FOUR DIGIT IDENTIFICATION CODE IS ASSOCIATED WITH EVERY PRINTOUT AND HALT. 'UUXX' UU - UNIT IDENTIFICATION CODE.
IN A PRINTOUT, THIS INFORMATION APPEARS IN THE HEADING LINE AS 'ID UUXX...'. XX - INDEX NUMBER.
FOR HALTS, THE INFORMATION IS PRESENTED AS HALT 'UU' FOLLOWED BY HALT 'XX'.

'UU' UNIT OR PROGRAM	-XX- INDEX NUMBER	MEANING
'14' 3277 CRT KEYBOARD '15' 3284/87 PRINTER	01	DATA MISCOMPARE AFTER A PARTIAL READ TO THE CRT. RESET HALT FOR THE EXPECTED AND RECEIVED DATA PRINTOUT
	02	CURSOR CHECK
	05	ATTACHMENT CHECK
	06	TRANSMIT CHECK
	07	RECEIVE CHECK
	08	DEVICE CHECK
	09	CONTROL CHECK
	0C	MICRO-CODE NOT LOADED
	10	EQUIPMENT CHECK
	11	NO BUSY ERROR
	12	NOT READY ERROR
	13	PROGRAM ERROR
	17	DATA MISCOMPARE AFTER A PARTIAL READ TO THE PRINTER. RESET HALT FOR EXPECTED AND RECEIVED DATA PRINTOUT
	24	PRINTER BUSY ERROR
	25	PRINTER WENT NOT READY ERROR
	27	NO 3284/87 UNIT - INTERRUPT INDICATING PRINTER WENT FROM BUSY TO NOT BUSY.
	28	NO INTERRUPT RECEIVED FROM THE LAST COMMAND.
	30	RECEIVE CHECK & CONTROL CHECK
	33	ANY ERROR BIT ON IN STATUS BUT NO INFORMATION IS AVAILABLE AS TO THE TYPE OF ERROR
	E0	FUNCTION KEY INTERRUPT (NOT AN ERROR) IF IT IS A TEST REQUEST INTERRUPT, THE SCREEN WILL BE CLEARED AND DATA KEYS MAY BE TESTED. PRESSING THE 'ENTER' KEY WILL ALLOW THE SYSTEM TEST TO CONTINUE. ANY OTHER FUNCTION KEY INTERRUPTS MAY BE RESET FROM THE 'E0' HALT AND THE SYSTEM TEST WILL CONTINUE.
'20' MLTA	01	ADAPTER CHECK.
	02	INTERRUPT TAKEN WITHOUT OP-END INTERRUPT PENDING.
	03	OP-END INTERRUPT TAKEN BUT NO LINES WITH OP-END INTERRUPT PENDING.
	04	LINE LOOP/WRAP ERROR.
	FF	SYSTEM TEST MODULE NOT CONFIGURED FOR SYSTEM.
'28' BSCC	01	MICRO CODE DETECTED ERROR.
	02	UNEXPECTED INTERRUPT.
	03	DATA RETURNED NOT AS EXPECTED.
	04	MICRO CODE NOT LOADED PRIOR TO RUNNING SYSTEM TEST.
	05	MICRO CODE NO LONGER CORRECT.
'3X' SIOC THESE HALTS MAY OCCUR ON ANY DEVICE MODULE BEGINNING WITH 3 .	01	SIOC IS BUSY.
	02	NO SIOC DEVICE ATTACHED, CHECK CONNECTORS.
	03	DATA TRANSFER REGISTER AND DIAGNOSTIC BYTE ERROR.
	04	FUNCTION REGISTER BITS STUCK ON OR OFF.
	05	LENGTH COUNT REGISTER BITS STUCK ON OR OFF.
	06	DATA ADDRESS REGISTER BITS STUCK ON OR OFF.
	07	DATA TRANSFER REGISTER BITS STUCK ON OR OFF.
	08	INTERRUPT TAKEN IN LEVEL 4 WITHOUT INTERRUPT REQUEST.
	09	REMOVE DIAGNOSTIC CONNECTOR AND ATTACH DEVICE.
	10	SIOC INTERRUPT ENABLE LATCH COULD NOT BE TURNED OFF.
	11	INTERRUPT IN LEVEL 4 WAS NOT TAKEN.
	12	INTERRUPT LEVEL 4 COULD NOT BE DISABLED.
	13	INTERRUPT LEVEL 4 IAR BITS STUCK ON OR OFF.
	14	DATA TRANSFER PARITY CHECK.
'31' 2501	20	STATUS BYTE IS INCORRECT
	21	DAR IS INCORRECT
	22	DATA NOT AS EXPECTED
	9F	INTERRUPT ERROR WAS DECTECTED
'35' 1255 MAGNETIC CHARACTER READER	21	1255 DEVICE ID BITS NOT EQUAL TO -0011-.
	22	SIOC BUSY TOO LONG.
	23	ISSUED ENGAGE BUT NO DOCUMENTS WERE FED.
	24	INTERRUPT DID NOT OCCUR AFTER READ WAS COMPLETED.
	25	INTERRUPT LEVEL 4 NOT RESET.
	26	1255 STATUS BYTE ERROR-LCR OVERFLOW.
	27	DATA NOT TRANSFERED (DAR NOT DECREMENTED). CHECK DOCUMENTS FOR PROPER ORIENTATION.
	28	DATA NOT READ INTO CORE.
	29	DATA TRANSFER REG PARITY CHECK OR NO-OP BIT ON.
	30	(MESSAGE ONLY) '1255 READY DROPPED BEFORE INTERRUPT REQUESTED'
	31	ISSUED DISENGAGE BUT DOCUMENTS CONTINUED TO FEED.
	32	'I/O DISCONNECT' ON AFTER SIO INSTRUCTION EXECUTED.
	33	'SORTER IS STOPPED' DID NOT BECOME ACTIVE (1.6 SEC).
	34	(MESSAGE ONLY) '1255 AUTO REJECT'. CAUSES OF AUTO REJECT: DOCUMENT SPACING, DOCUMENT LENGTH, LATE READ, LATE STACKER SELECT.

'UU' UNIT OR PROGRAM	-XX- INDEX NUMBER	MEANING
'36' 1270 OPTICAL CHARACTER READER	21	1270 DEVICE ID BITS NOT EQUAL TO -0011-.
	22	SIOC BUSY TOO LONG.
	23	ISSUED ENGAGE BUT NO DOCUMENTS WERE FED.
	24	INTERRUPT DID NOT OCCUR AFTER READ WAS COMPLETED.
	25	INTERRUPT LEVEL 4 NOT RESET.
	26	1270 STATUS BYTE ERROR-LCR OVERFLOW.
	27	DATA NOT TRANSFERED (DAR NOT DECREMENTED). CHECK DOCUMENTS FOR PROPER ORIENTATION.
	28	DATA NOT READ INTO CORE.
	29	DATA TRANSFER REG PARITY CHECK OR NO-OP BIT ON.
	30	ISSUED DISENGAGE BUT DOCUMENTS CONTINUED TO FEED.
	31	'I/O DISCONNECT' ON AFTER SIO INSTRUCTION EXECUTED.
	32	'SORTER IS STOPPED' DID NOT BECOME ACTIVE (1.6 SEC).
	33	(MESSAGE ONLY) '1270 AUTO REJECT'. CAUSES OF AUTO REJECT: DOCUMENT SPACING, DOCUMENT LENGTH, LATE READ, LATE STACKER SELECT.
'3A' 3881 OPTICAL MARK READER	21	3881 ID BITS NOT EQUAL TO -0010-
	22	SIOC BUSY TO LONG
	23	3881 EQUIPMENT CHECK
	25	FEED CHECK
	27	DATA ADDRESS REG.DID NOT INCREMENT DURING A READ COMMAND.
	28	THE 256 BYTES OF DATA ON A DIAGNOSTIC READ CMD.DID NOT TRANSFER TO MEMORY CORRECTLY.
	29	PARITY CHECK DURING DATA TRANSFER,OR THE COMMAND WAS NO-OPED.
	33	SIOC DID NOT INDICATE BUSY AFTER A READ COMMAND WAS ISSUED TO THE 3881.
'40' 3741	80	INTERRUPT DID NOT OCCUR BECAUSE 3741 WENT OFF LINE.
	81	BUS OUT PARITY ERROR (DATA TRANSFER REGISTER PARITY ERROR).
	82	SIO- NO OP
	83	3741 DETECTED ERROR -- SEE PRINTOUT. CAUTION -- IF '3741 ATTENTION REQUIRED' ERROR OCCURS AND THE ERROR DISPLAYED ON THE 3741 IS '10E1', THEN IGNORE THE ERROR. WRITING SPACE ON THE DISKETTE WAS USED UP.
	84	MISSED INTERRUPT (IF RUNNING ALONE WITH DCP, INTERRUPT PENDING BIT DID NOT COME ON).
	86	BOTH READ AND WRITE MODE ON SIMULTANEOUSLY.
	87	UNEXPECTED INTERRUPT OCCURRED.
	88	LCR ERROR -- SEE PRINTOUT.
	8C	EXPECTED EITHER READ OR WRITE MODE BUT BOTH WERE OFF.
	8E	BUSY TOO LONG.
'50' 1442 RPQ	08	STATUS ERROR.
READER PUNCH	11	A NON-BLANK CARD WAS READ AND DID NOT CONTAIN THE PATTERN BEING PUNCHED BY THE 1442 MODULE. NPRO TO OBTAIN THE CARD IN ERROR.
	97	INTERRUPT NOT RECEIVED WHEN COMMAND XXXXXX ISSUED.
	98	A FEED COMMAND CAUSED DATA TRANSFER.
'51' 1442 ATTACH	99	WARNING: THE 'LAST CARD' BIT WAS SET. THE LAST CARD SHOULD BE AT THE 1442 PRE-PUNCH STATION.
'70' 3410/3411 TAPE	01	TAPE UNIT FAILURE. SEE TAPE LOGOUT DESCRIPTION TO DETERMINE TYPE OF FAILURE. (LOGOUT IS THE SAME FORMAT AS THE ERROR PRINTOUT.)
	02	OP END INTERRUPT
'80'OR'88' BSCA-1, LCA OR BSCA-2	01	BSCA FAILURE. SEE DESCRIPTION OF BSCA LOGOUT TO DETERMINE NATURE OF FAILURE. (LOGOUT WILL BE THE SAME AS ERROR PRINTOUT IN FORMAT)
'89'	01	BSCA-2 HAS GONE NOT READY OR A UNIT CHECK WAS DISCOVERED.
INTEGRATED	02	BSCA-2 WAS BUSY GREATER THAN APPROXIMMATELY 1 SECOND.
DISPLAY	03	AN INTERRUPT OCCURRED, BUT A TIO FOR INTERRUPT PENDING FAILED TO BRANCH.
ADAPTER	04	THE CONTENTS OF THE TRANSMIT/RECEIVE FIELD WERE NOT AS EXPECTED. THIS HALT WILL OFTEN OCCUR AFTER RESETTING FROM A 20 OR 40 HALT.
	05	AN ATTACHMENT CHECK HAS OCCURRED.
	06	AN ITB INTERRUPT WAS DETECTED. ITB INTERRUPTS SHOULD NEVER OCCUR.
	07	NO INTERRUPT WAS TAKEN.
	08	A READ MODIFIED AFTER A WRITE DID NOT RECEIVE THE CORRECT DATA.
	09	THE DEVICE HAS BEEN BUSY FOR GREATER THAN 20 SECONDS.
	0A	THE ATTACHMENT IS NOT READY.
	0B	UNEXPECTED INTERRUPT.
	0F	MICRO-CODE NOT LOADED.
	10	AN EOT WAS RECEIVED IN RESPONSE TO A COMMAND. IF THIS HALT IS RESET, IT WILL BE FOLLOWED BY AN 04 HALT. THE TRANSMIT/RECEIVE FIELD WILL SHOW THE CAUSE OF THE PROBLEM.
	20	AN RVI WAS RECEIVED IN RESPONSE TO A SELECT. IF THIS HALT IS RESET, IT WILL BE FOLLOWED BY AN 04 HALT AND THE TRANSMIT/RECEIVE FIELD WILL SHOW THE CAUSE OF THE PROBLEM.
	40-5D	NOTE 1: HALTS STARTING WITH 4 OR 5 INDICATE DEVICES WHICH SHOW INTERVENTION REQUIRED OR NOT AVAILABLE STATUS AS FOLLOWS: 40 - DEVICE 40 41-49 - DEVICES C1-C9 4A-4F - DEVICES 4A-4F 50 - DEVICE 50 51-59 - DEVICES D1-D9 5A-5D - DEVICES 5A-5D NOTE 2: THE PRINTOUT FOR EACH HALT CONSISTS OF: 1. THE DEVICE ADDRESS 2. DESCRIPTION OF THE ERROR 3. DUMP OF BSCA-2 STATUS, CAR, SAR & TAR 4. DUMP OR THE TRANSMIT/RECEIVE FIELD 5. IN THE CASE OF A DATA MISCOMPARE, THE EXPECTED TRANSMIT/RECEIVE FIELD IS DUMPED 6. A COUNT OF READS, WRITES, SELECTS, AND POLLS

'UU' UNIT OR PROGRAM	-XX- INDEX NUMBER	MEANING
'A0' & 'B0' 5444 DISK	01	SEEK BUSY BIT IS INITIALLY ACTIVE.
	02	DISK IS INITIALLY BUSY.
	03	LOAD/SENSE OF THE DISK REGISTERS REVEALS A BAD REGISTER.
	04	SEEK TRAVEL CHECK. THE HEADS ARE NOT LOCATED AT THE EXPECTED TRACK.
	05	STATUS CHECK. STATUS BYTE(S) ARE IN ERROR AFTER THE LAST COMMAND.
	06	DISK IS NOT READY. NOTE THIS HALT WILL ONLY OCCUR ONCE.
	07	SEEK BUSY DID NOT TIME OUT.
	08	DISK READ/WRITE BUSY DID NOT TIME OUT.
	09	DISK DATA ADDRESS REGISTER DID NOT INCREMENT PROPERLY.
	0A	DATA WAS NOT TRANSFERRED DURING A READ OPERATION.
	0C	DATA WAS NOT TRANSFERRED DURING A WRITE OPERATION.
	0E	THE DISK DRIVE DROPPED READY AFTER ISSUING A SEEK COMMAND.
	31	A SEEK 0 INTERRUPT IS PENDING
	32	A SEEK 1 INTERRUPT IS PENDING
	33	A OP-END INTERRUPT IS PENDING
	35	MULTIPLE INTERRUPTS ON CONDITION
	37	A SEEK 0 INTERRUPT IS MISSING
	38	A SEEK 1 INTERRUPT IS MISSING
	39	AN OP-END INTERRUPT IS MISSING
'C0' DRIVE 1 'C8' DRIVE 2 'D0' DRIVE 3 'D8' DRIVE 4 5445 DISK	01	SEEK BUSY BIT IS INITIALLY ACTIVE.
	02	DISK IS INITIALLY BUSY.
	03	LOAD/SENSE OF THE DISK REGISTERS REVEALS A BAD REGISTER.
	04	SEEK TRAVEL CHECK. THE HEADS ARE NOT LOCATED AT THE EXPECTED TRACK.
	05	STATUS CHECK. STATUS BYTE(S) ARE IN ERROR AFTER THE LAST COMMAND.
	06	DISK IS NOT READY. NOTE THIS HALT WILL ONLY OCCUR ONCE.
	07	SEEK BUSY DID NOT TIME OUT.
	08	DISK READ/WRITE BUSY DID NOT TIME OUT.
	09	DISK DATA ADDRESS REGISTER DID NOT INCREMENT PROPERLY.
	0A	DATA WAS NOT TRANSFERRED DURING A READ OPERATION.
	0C	DATA WAS NOT TRANSFERRED DURING A WRITE OPERATION.
	0E	THE DISK DRIVE DROPPED READY AFTER ISSUING A SEEK COMMAND.
	10	NO SCAN HIT AFTER DOING A SCAN EQUAL OPERATION.
	11	SCAN EQUAL SENSE BIT NOT ON AFTER DOING A SCAN EQUAL OPERATION.
	20	EXPECTED INTERRUPT NOT RECEIVED
C0	99	AN ERROR IS PENDING (INDICATED VIA THE TIO FOR NOT READY/UNIT CHECK) WHICH REFERS TO THE LAST SIO ISSUED. SINCE THE LAST SIO ISSUED IS NOT KNOWN, DRIVE DETERMINATION IS NOT POSSIBLE. THEREFORE, 'C0' DOES NOT REFER TO ANY DRIVE (FOR THIS HALT ONLY).
'C1' 3340	01	ATTACHMENT BUSY PRIOR TO COMMAND EXECUTION.
	02	DDCR FAILED TO LOAD CORRECTLY.
	03	DDDR FAILED TO LOAD CORRECTLY.
	05	UNIT CHECK OR NOT READY PRIOR TO SIO. (RESET HALT TO BYPASS NOT-READY DRIVE).
	06	ATTACHMENT DID NOT GO BUSY AFTER SIO.
	07	SEEK COMMAND DID NOT SET SEEK BUSY.
	08	SEEK BUSY WITH NO SEEK IN PROGRESS.
	09	ATTACHMENT BUSY FAILED TO GO OFF.
	0A	UNIT CHECK OR NO-OP STATUS. (RESET HALT TO BYPASS WRITE TESTS ON ''READ ONLY'' DRIVE).
	0C	ADAPTER CHECK.
	0E	ADAPTER SENSE BYTES DO NOT INDICATE CAUSE OF INTERRUPT.
	0F	ADAPTER CHECK ON READ DIAGNOSTIC SENSE COMMAND.
	10	EXPECTED OP END INTERRUPT DID NOT OCCUR.
	11	EXPECTED SEEK COMPLETE INTERRUPT DID NOT OCCUR.
	12	INTERUPT PENDING, BUT INTERUPT DID NOT OCCUR.
	13	EXPECTED SCAN EQUAL DID NOT OCCUR.
	14	EXPECTED SCAN HIT DID NOT OCCUR.
	15	UNEXPECTED SCAN HIT CONDITION.
	16	INCORREST RESIDUAL DDDR.
	17	INCORRECT RESIDUAL DDCR.
	18	INCORRECT RESIDUAL DDCF.
	19	INCORRECT RESIDUAL DDDF.
	1A	UNEXPECTED SCAN EQUAL CONDITION.
	1C	INTERRUPT DID NOT CAUSE INTERRUPT PENDING TIO CONDITION.
	1E	UNEXPECTED INTERRUPT.

'UU' UNIT OR PROGRAM	-XX- INDEX NUMBER	MEANING
'E0' 5203 PRINTER (WT RPQ)	01	CARRIAGE SYNC CHECK.
	02	CARRIAGE SPACE CHECK.
	03	FORMS JAM CHECK.
	04	CHAIN SYNC CHECK.
	05	INCREMENTER SYNC OR SLIP CHECK.
	06	INCREMENTER FAILURE CHECK.
	07	THERMAL CHECK.
	08	NO-OP STATUS BIT SET WITH NO OTHER STATUS BITS.
	09	HAMMER ECHO CHECK. THE PRINT POSITION LISTED IN THE LOGOUT IS THE POSITION THE LPDAR WAS ADDRESSING WHEN THE ERROR OCCURRED. (IGNORE IT IF IT IS NOT BETWEEN 1 - 132.) IF PRINT POSITION (P) IS 1-4 OR 13-16, THE FAILING HAMMER IS =(P+119)/4. IF P IS 5-12 OR 17-24, THE FAILING HAMMER IS = (P+107)/4. AND IF P IS 25-132, THE FAILING HAMMER IS = (P-21)/4. (IGNORE ANY REMAINDERS)
	0A	ANY HAMMER ON CHECK.
	0C	UNPRINTABLE CHARACTER SKIPPED.
	14	PRINTER BUSY TOO LONG.
	33	NO ERROR CHECK STATUS BIT, BUT CARRIAGE LINE COUNTER WAS IN ERROR.
	0E	MISSING OR EXTRA INTERRUPT OR CARR. BUSY TIO ERROR.
'E1' 1403 PRINTER OR 'E2' SECOND 1403 PRINTER	01	CARRIAGE SYNC CHECK.
	03	FORMS JAM CHECK./CARRIAGE STOP KEY.
	04	CHAIN SYNC CHECK.
	05	PRINT DATA CHECK.
	08	NO-OP STATUS BIT SET WITH NO OTHER STATUS BITS.
	09	HAMMER ECHO CHECK (OF SET ARRRESS OR RESET ADDRESS). THE HAMMER NUMBER FAILING (SAME AS PRINT POSITION) IS AVAILABLE IN LOGOUT. (UNLIKE 5203, THE VALUE IN LOGOUT IS, ITSELF, THE HAMMER NUMBER).
	0A	ANY HAMMER ON CHECK.
	0C	UNPRINTABLE CHARACTER SKIPPED.
	0E	MISSING OR EXTRA INTERRUPT OR CARR. BUSY TIO ERROR.
	14	PRINTER BUSY TOO LONG.
	33	NO ERROR CHECK STATUS BIT, BUT CARRIAGE LINE COUNTER WAS IN ERROR. (AN ERROR PRINT OCCURS).
'F0' 5424 MFCU	12	FEED CHECK. MFCU INDICATORS SPECIFY WHICH TYPE.
	13	HOPPER CHECK.
	14	PRINT CLUTCH CHECK.
	15	PRINT DATA CHECK.
	16	PUNCH INVALID.
	17	PUNCH CHECK.
	18	READ CHECK.
	19	NO-OP STATUS BIT SET WHEN NO ERROR WAS PRESENT.
	1A	OVERRUN
	1C	MISSING OR EXTRA INTERRUPT OR A PRINT BUFFER BUSY INVALID SENSE STATUS. NOTE: IF STOP & START KEYS ARE DEPRESSED REPEATEDLY IN RAPID SUCCESSION THERE IS A CHANCE FOR AN INVALID 1C ERROR.
	35	COMPARE ERROR. NON-BLANK CARD WAS READ FROM PRIMARY HOPPER AND DID NOT CONTAIN THE PATTERN BEING PUNCHED BY THE SYSTEM TEST. CARD IN ERROR IS IN PRIMARY WAIT STATION.

'UU' UNIT OR PROGRAM	-XX- INDEX NUMBER	MEANING
'F2' 2560 MFCM	0A	MACHINE CHECK BIT IS ON BUT NO OTHER ERROR BITS. FALSE MACHINE CHECK.
	0C	FEED CHECK BIT IS ON BUT NO OTHER ERROR BITS. FALSE FEED CHECK.
	0E	ANY DATA CHECK BIT IS ON BUT NO OTHER ERROR BITS. FALSE DATA CHECK.
	18	DATA COMPARE ERROR. A PUNCHED CARD HAS THE INCORRECT PUNCH PATTERN.
	1A	AN INTERRUPT WAS NOT SERVICED. SHOULD HAVE BEEN.
	1C	AN INTERRUPT OCCURRED BUT BUSY WAS NOT UP PREVIOUSLY.
	1F	PRIMARY LAST CARD BIT WAS SET. (DO NOT CONSIDER THIS AN ERROR HALT WHEN GOING THRU LAST CARD ROUTINE)
	21	CONTROL STORE ADDRESS REGISTER ERROR.
	22	CONTROL STORE OUTPUT ERROR.
	23	ALU OUTPUT ERROR.
	24	X REGISTER CONTROL ERROR.
	25	ALU BUS ERROR.
	26	LOCAL STORE/MAIN STORE/EXTERNAL INPUT ERROR.
	27	Y REGISTER OUTPUT ERROR.
	28	SECONDARY HOPPER CHECK.
	29	PRIMARY HOPPER CHECK.
	2A	A COMMAND WAS NO-OPED. POSSIBLE CAUSES - NO LENGTH CNT OR NO HD SEL FOR PRT.
	2F	SECONDARY LAST CARD BIT WAS SET. (DO NOT CONSIDER THIS AN ERROR HALT WHEN GOING THRU LAST CARD ROUTINE)
	30	PRINT TRANSLATE ERROR.
	31	FIBER OPTICS ERROR.
	32	INVALID CHARACTER ERROR.
	33	PUNCH COMPARE ERROR.
	34	READ COMPARE ERROR.
	35	PRINT OVERRUN ERROR.
	36	PUNCH OVERRUN ERROR.
	37	READ OVERRUN ERROR.
	3A	COVER INTERLOCK OPEN.
	3C	JAM BAR CHECK.
	40	READ STATION EARLY CHECK.
	41	SECONDARY PUNCH PUSHER CHECK.
	42	SECONDARY PRE-PUNCH CHECK.
	43	SECONDARY PRE-READ CHECK.
	44	PRIMARY PUNCH PUSHER CHECK.
	45	PRIMARY PRE-PUNCH CHECK.
	46	PRIMARY PRE-READ CHECK.
	47	INPUT STATION CHECK.
	48	CORNER STATION CHECK.
	49	CELL 8 TO CELL 9 CHECK.
	4A	PRINT STATION CHECK.
	4C	PUNCH STATION CHECK.
	4E	READ STATION LATE CHECK.
	50	PRINT CB SEQUENCE.
	51	PUNCH INCREMENTOR CB SEQUENCE.
	52	EXTRA PUNCH PUSHER CYCLE.
	53	FEED CB SEQUENCE ERROR.
	54	EXTRA FEED CLUTCH CYCLE.
	55	COLUMN EMITTER ERASE ERROR.
	56	COLUMN EMITTER READ/WRITE ERROR.
	5F	NO READ DATA WAS TRANSFERRED.

'UU' UNIT OR PROGRAM	-XX- INDEX NUMBER	MEANING
'FE' 5415 CPU	01	JUMP FALSE DID NOT JUMP ON A FALSE CONDITION.
	02	JUMP TRUE DID NOT JUMP ON A TRUE CONDITION.
	03	BRANCH FALSE DID NOT BRANCH ON A FALSE CONDITION.
	04	JUMP TRUE DID NOT JUMP ON A TRUE CONDITION.
	05	BRANCH TRUE DID NOT BRANCH ON A TRUE CONDITION. (TEST BITS ON)
	06	BRANCH TRUE DID NOT BRANCH ON A TRUE CONDITION. (TEST BITS OFF)
	07	JUMP EQUAL DID NOT JUMP ON AN EQUAL CONDITION. (COMPARE LOGICAL IMMEDIATE - ZEROS)
	08	JUMP EQUAL DID NOT JUMP ON AN EQUAL CONDITION. (COMPARE LOGICAL IMMEDIATE - F'S)
	09	ZERO AND ADD ZONED DECIMAL FAILED.
	0A	ADD ZONED DECIMAL FAILED.
	0B	LOAD AND STORE XR1 FAILED.
	0C	LOAD AND STORE XR2 FAILED.
	0D	MOVE IMMEDIATE INDEXED BY XR1 FAILED.
	0E	MOVE IMMEDIATE INDEXED BY XR2 FAILED.
	0F	LOAD ADDRESS USING XR1 FAILED.
	10	MOVE ZONE TO ZONE FAILED.
	11	MOVE NUMERIC TO ZONE FAILED.
	12	MOVE NUMERIC TO NUMERIC FAILED.
	13	MOVE ZONE TO NUMERIC FAILED.
	14	LOAD ADDRESS OF XR2 USING XR1 AS DISPLACEMENT FAILED.
	15	LOAD ADDRESS OF XR1 USING XR2 AS DISPLACEMENT FAILED.
	16	JUMP ON DECIMAL OVERFLOW FAILED
	17	BRANCH ON DECIMAL OVERFLOW FAILED.
	18	BRANCH ON NO DECIMAL OVERFLOW FAILED.
	19	JUMP ON NO DECIMAL OVERFLOW FAILED.
	1A	EDIT INSTRUCTION FAILED.
	1C	INSERT AND TEST CHARACTER FAILED TO SET FIELD CORRECTLY.
	1E	ARR NOT SET CORRECTLY AFTER INSERT AND TEST CHARACTER INSTRUCTION.
	20	LOAD/STORE OF AN ATT. REG. FAILED.
	21	IAR ERROR HALT
	22	PMR ERROR HALT
	23	NO LEVEL 0 INTERRUPT
	26	LOAD/STORE OF PROG. CHECK REG. FAILED
	28	PROG. CHECK INTERRUPT DID NOT OCCUR.
	29	STATUS REG. WRONG AFTER AN INVALID OP CODE PROG. CHK. INTERRUPT.
	2A	INTERVAL TIMER ERROR - NO INTERRUPT, INTERRUPT DID NOT RESET, OR THE TIMER VALUE IS WRONG.
'FF' SYSTEM TEST LOADER AND SUPERVISOR	01	AVAILABLE CORE HAS BEEN USED. THE REMAINING MODULES WILL BE BYPASSED.
	02	DEVICE CALLED FOR IN MODULE UDT NOT DEFINED. RESET HALT TO OVERLAY THIS MODULE.
	E0	HALT BEFORE LOADING A MODULE TO ALLOW DELETION. SET LEFTMOST SWITCH TO 'A' TO DELETE LAST MODULE LISTED.
	E1	ROUTINE 2 LOGOUT COMPLETE. REMOVE 'BB' FROM CONSOLE SWITCHES AND RESET HALT TO RESTART.
	F2	DISK ERROR WHILE SEARCHING DISK FOR SYSTEM TEST. RESET HALT TO RETRY.

NOTE - HALT CODE CHARACTERS 'B' AND 'D' ARE DISPLAYED AS LOWER CASE LETTERS.

6. ERROR PRINTOUTS

INTERRUPT ERRORS HANDLED BY SUPERVISOR

- INTERRUPT NOT RESET, SOURCE OF INTERRUPT UNKNOWN, LAST MODULE TO RESET WAS XX -

DEVICE CAUSES AN INTERRUPT BUT HARDWARE INDICATIONS (TIO, SNS) INDICATE NO OP-END PENDING. SUPERVISOR PRINTS MESSAGE CONTINUOUSLY IF STILL IN INTERRUPT LEVEL AFTER ENTERING ALL INTERRUPT ROUTINES OF ALL MODULES 4 TIMES.
XX IS THE LAST MODULE WHICH COMMUNICATED TO THE SUPERVISOR THAT THE PENDING INTERRUPT WAS HIS. THIS MODULE MAY OR MAY NOT HAVE SUCCESSFULLY RESET HIS INTERRUPT. THERE ARE THREE POSSIBILITIES -- EITHER THAT MOUDLE WAS UNSUCCESSFUL IN RESETTING HIS INTERRUPT AND YET WAS SUCCESSFUL IN RESETTING HIS OWN INDICATIONS OF AN INTERRUPT PENDING, OR THAT MODULE WAS IN FACT SUCCESSFUL IN RESETTING HIS INTERRUPT AND SOME OTHER MODULE HAS GENERATED AN INTERRUPT BUT HIS INDICATIONS THROUGH HARDWARE SAY THAT IT IS NOT HIS INTERRUPT. A THIRD POSSIBILITY IS THAT XX IS 00. THIS MEANS THAT SINCE THE INTERRUPT, NO MODULE HAS ADMITTED HE HAS ONE PENDING.

- MODULE WITH ID XX DID NOT RESET INTERRUPT -

A DEVICE CAUSES AN OP-END INTERRUPT. HARDWARE INDICATIONS TO THE MODULE SAY THE OP-END INTERRUPT IS PENDING. MODULE TRIES TO RESET INTERRUPT BUT UNSUCCESSFULLY. THE MESSAGE OCCURS IF STILL IN INTERRUPT LEVEL AFTER THE SUPERVISOR ATTEMPTS 4 TIMES TO RESET INTERRUPT IN THE SAME MODULE.
XX IS THE ID OF THE MODULE WHICH FAILED TO RESET THE INTERRUPT. IN THIS CASE, THE MODULE XX IS RESPONDING REPEATEDLY TO THE SUPERVISOR THAT IT IS HIS INTERRUPT WHICH IS PENDING, AND YET HE IS UNSUCCESSFUL IN RESETTING IT.

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1. GENERAL PROGRAM SUMMARY

1.1 TEST AND OPTIONS

1.1.1 TEST

SECTION	ROUTINE	INTENT	APPLICABLE SENSE SWITCHES
FF4 - MASTER TIMING ANALYSIS PROGRAM -MTAP-	01	RECORD AND INDICATE, BY PRINTOUT, THE CONDITION OF A MAXIMUM OF EIGHT SENSE LINES.	28,29,2A,2B

1.1.2 LOADING

MTAP MAY BE LOADED FROM CARDS OR DISK AS DESCRIBED IN SECTION 2.1. ONCE MTAP HAS BEEN LOADED, A TAP WILL BE LOADED EACH TIME THE -FF- HALT IS RESET. THE ACTION REQUIRED TO SET UP TAPS FOR LOADING FROM CARDS OR DISK IS DESCRIBED UNDER THE -FF- HALT CODE IN SECTION 3. IF THE TWO LEFT CONSOLE SWITCHES ARE SET AT -AA- THE PREVIOUS TAP WILL BE RE-EXECUTED.

NOTE--EACH TIME A NEW DEVICE IS TO BE TESTED, MTAP MUST BE RELOADED.

1.1.3 PROGRAM IDENTIFICATION

THE PROGRAM ID IS IN COLUMNS 89-91. THE ID OF MTAP IS -FF4-. TAP ID'S BEGIN AT -001- AND GO THRU -OFF-.

1.1.4 TERMINATION

ANY TAP MAY BE TERMINATED AT ANY POINT IN IT'S OPERATION BY PRESSING STOP AND THEN SYSTEM RESET.

1.1.5 SENSE SWITCHES

THE SENSE SWITCHES UNIQUE TO MTAP AND THE FUNCTIONS OF EACH ARE AS FOLLOWS.

SENSE SWITCH NUMBER	ON	OFF
28	REPEAT EXECUTION OF COMMANDS AND THE REQUIRED SAMPLING. THERE WILL BE NO DATA PRINTED UNTIL A STATUS ERROR OR A DEVICE NOT-READY CONDITION OCCURS. THE DATA WHICH WILL THEN BE PRINTED WILL BE ONLY THE ONE SET OF SAMPLES WHICH WERE TAKEN IMMEDIATELY PRECEDING OR DURING THE OCCURENCE OF THE STATUS ERROR OF NOT-READY CONDITION.	THE DATA WILL NORMALLY BE PRINTED AT THE COMPLETION OF SAMPLING OF THE SPECIFIED NUMBER OF COMMANDS. A STATUS ERROR OR DEVICE NOT-READY CONDITION WILL CAUSE A PRINTOUT OF DATA, BUT THE DATA WILL BE THE COMBINED RESULT OF ALL SAMPLES TAKEN.
29	THE DATA WILL BE PRINTED IN A TABULAR FORM. THIS OPTION SHOULD BE SELECTED IF THE OUTPUT DEVICE IS OTHER THAN THE LINE PRINTER. NOTE--A SCOPE TYPE PRINTOUT OF THE SAME IDENTICAL INFORMATION MAY BE RECEIVED FOLLOWING THE TABULAR PRINTOUT IF THE DATA SWITCHES ARE AT -FF- WHEN THE TABULAR PRINTOUT IS COMPLETED.	THE DATA WILL BE PRESENTED IN A SCOPE TYPE GRAPHIC PRINTOUT.
2A	HALT TO MAKE MODIFICATIONS, AFTER M1 AND M2 RECORDS ARE READ.	NO HALT OCCURS
2B	THIS OPTION IS APPLICABLE ONLY WHEN RUNNING TAP'S ON THE MFCU BECAUSE THE FUNCTION IS AUTOMATIC FOR TAP'S ON ALL OTHER DEVICES. THIS OPTION WILL BYPASS THE NORMAL INITIALIZING PRIOR TO FIRST SAMPLING. IT MAY BE NECESSARY TO USE THIS OPTION WHEN THE PROBLEM PREVENTS PROPER DEVICE OPERATION THRU THE NORMAL SAMPLE TIME. ITS NEED MAY BE INDICATED BY DATA WHICH INDICATES NO LEVEL CHANGE.	WHEN RUNNING TAP'S ON THE MFCU, ALL OF THE COMMANDS FROM THE COMMAND TABLE WILL BE EXECUTED ONCE WITH NO SAMPLING DONE FOLLOWING THE NORMAL SAMPLE COMMAND. THIS IS DONE TO INSURE PROPER INITIALIZATION PRIOR TO EXECUTION OF THE FIRST SAMPLE COMMAND SO THAT THE DATA WILL BE AS EXPECTED.

2. OPERATING PROCEDURES (DCP CONTROLLED SECTIONS)

THIS SECTION DESCRIBES THE USER INTERFACE FOR ALL PROGRAMS OPERATING UNDER THE DIAGNOSTIC CONTROL PROGRAM (DCP). MORE DETAIL IS PROVIDED IN THE DCP USERS GUIDE (BLOCK 10).

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         FOR MODEL 15 SYSTEMS SEE BLOCK 10 (DCP USER'S GUIDE) FOR THAT MODEL.
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2.1 LOADING

THE CE MODE SELECTOR SWITCH MUST BE IN THE 'PROCESS' POSITION. ALL CE CONTROL PANEL TOGGLE SWITCHES SHOULD BE IN THE NORMAL (DOWN) POSITION.

2.1.1 LOADING ON A MODEL 10 FROM A MFCU.

1. IF DCP IS LOADED, SKIP TO STEP 5.
2. IF A DISK SYSTEM, PLACE -PROGRAM LOAD SELECTOR- IN MFCU POSITION.
3. PLACE DCP FOLLOWED BY TEST SECTION(S) INTO MFCU PRIMARY HOPPER. MAKE MFCU READY.
4. DEPRESS -PROGRAM LOAD- KEY. AFTER DCP IS LOADED, A -HA- HALT WILL OCCUR. COMMON SENSE SWITCHES MAY BE SET AT THIS TIME.
5. PLACE TEST SECTION/S INTO MFCU PRIMARY HOPPER AND MAKE MFCU READY (IF NOT ALREADY DONE).
6. IF A -HA- OR -HE- HALT OCCURS SKIP TO STEP 8.
7. DEPRESS -PROGRAM LOAD- KEY. DCP WILL PRINT SECTION, TERMINATE MESSAGE, AND HALT WITH A -HE-.
8. RESET THE HALT. DCP WILL LOAD THE SECTION AND DISPLAY A -HA- HALT.
9. MAKE DESIRED CONSOLE SWITCHES ENTRIES, IF ANY, AND RESET THE HALT.

2.1.2 LOADING ON A MODEL 10 FROM DISK WITH A 5424 (MFCU) ATTACHMENT.

1. SKIP TO STEP 5 IF DCP IS ALREADY LOADED.
2. PLACE THE CE PACK ON R1 AND MAKE DRIVE 1 READY.
3. PLACE THE -PROGRAM LOAD SELECTOR- IN REMOVABLE POSITION.
4. DEPRESS -PROGRAM LOAD- KEY. AFTER DCP IS LOADED, A -HA- HALT WILL OCCUR. COMMON SENSE SWITCHES MAY BE SET AT THIS TIME.
5. USE CONSOLE SWITCHES ENTRY -DXXX- (XXX - PROG ID) TO SPECIFY THE PROGRAMS TO BE LOADED. (SEE SECTION 2.4)
6. SET LEFTMOST SWITCH TO -0- AND RESET HALT. DCP WILL LOAD THE SECTION AND DISPLAY A -HA- HALT.
7. MAKE ANY CONSOLE SWITCH ENTRY DESIRED AND/OR RESET HALT.

2.1.3 LOADING ON A MODEL 10 FROM DISK WITH A 5422 ATTACHMENT, OR MODEL 8.

1. SKIP TO STEP 5 IF DCP IS ALREADY LOADED.
2. PLACE THE CE PACK ON R1 AND MAKE DRIVE 1 READY.
3. PLACE THE -PROGRAM LOAD SELECTOR- IN REMOVABLE POSITION.
4. PLACE -00FE- IN DATA SWITCHES AND DEPRESS -PROGRAM LOAD- KEY.

   CPU TESTS ARE LOADED AND RUN BEFORE DCP IS LOADED. TO RUN STORAGE TESTS, SEE BLOCK 5. THE ORDER OF HALTS IS LISTED BELOW. RESET THE HALTS IF THEY OCCUR IN THE FOLLOWING ORDER. IF THE HALTS AREN'T IN THE PROPER ORDER REFER TO BLOCK 5. WHEN THE -HE- HALT OCCURS GO TO STEP 5.

   ```
      HALTS
   A) -CC-
   B) -LL-
   C) -8P-
   D) -HE-
   ```

5. USE CONSOLE SWITCHES ENTRY -DXXX- (XXX - PROG ID) TO SPECIFY THE PROGRAM/S TO BE LOADED. (SEE SECTION 2.4)
6. SET LEFTMOST SWITCH TO -0- AND RESET HALT. DCP WILL LOAD THE SECTION AND DISPLAY THE -HA- HALT.
7. MAKE ANY CONSOLE SWITCH ENTRY DESIRED AND/OR RESET HALT.

2.1.4 LOADING ON A MODEL 6 FROM DISK.

1. SKIP TO STEP 8 IF DCP IS ALREADY LOADED.
2. LOAD THE CE PACK ON R1 AND MAKE DRIVE 1 READY.
3. PLACE THE -PROGRAM LOAD SELECTOR- IN REMOVABLE POSITION.
4. SET DATA SWITCHES TO -00FE- (-02FE- TO BYPASS STORAGE PROGRAMS OR -03FE- TO ALLOW SENSE SWITCH SETTING PRIOR TO PRINTING OR BYPASS THAT PORTION OF I/O LSRS INCLUDED IN THE CPU TESTS).
5. OPERATE PROGRAM LOAD.
6. THE FOLLOWING HALTS WILL OCCUR. AFTER EACH, OPERATE THE START KEY.

   ```
   A) -EE-    (ABC  123  )
   B) -FF5-   (ABCD 12345)
   C) -805-   (A        5)   STORAGE SEPARATOR HALT.
   D) -805-   (A        5)   STORAGE SEPARATOR HALT.
   ```

   THE STORAGE SEPARATOR HALTS OCCUR ONLY IF THE DATA SWITCH ENTRIES ARE -00FE- OR -03FE-. OTHER HALTS OCCURRING AT THIS TIME SHOULD BE INVESTIGATED.

7. DCP WILL LOAD AND DISPLAY A -FA5- (ABCD 1 3 5) HALT.
8. USE CONSOLE SWITCHES ENTRY -DXXX- (XXX -PROG ID) TO SPECIFY THE PROGRAM/S TO BE LOADED. (SEE SECTION 2.4)
9. SET LEFTMOST SWITCH TO -0- AND RESET HALT. DCP WILL LOAD THE SECTION AND DISPLAY A -FA5- (ABCD 1 3 5) HALT.
10. MAKE ANY CONSOLE DATA SWITCH ENTRY DESIRED AND/OR RESET HALT.

2.2 PROGRAM RESTART

DCP STORES INSTRUCTIONS STARTING AT LOCATION '0000' TO PROVIDE FOR A PROGRAM RESTART. THESE INSTRUCTIONS ALSO CHECK THE CONSOLE SWITCHES FOR A VALID ENTRY. TO PERFORM A PROGRAM RESTART, SIMPLY DEPRESS SYSTEM RESET FOLLOWED BY CPU START.

2.3 TERMINATION

NORMAL DCP-CONTROLLED CHAINING FROM ROUTINE TO ROUTINE PROVIDES AN AUTOMATIC TERMINATION OF A SECTION. IN ADDITION, THE CE MAY TERMINATE A SECTION AT ANY TIME BY (1) ENTERING 'EE00' IN THE CONSOLE SWITCHES, OR BY (2) LOADING THE NEXT SECTION. IN ALL CASES, DCP PRINTS A MESSAGE AND PERFORMS HALT 'HE'. THE SECTION CAN STILL BE RESTARTED AT THIS TIME BY USING THE PROGRAM RESTART PROCEEDURE. IF NO RESTART IS DESIRED, RESET THE HALT TO LOAD THE NEXT SECTION.

2.4 CONSOLE ADDRESS/DATA SWITCH COMMUNICATIONS

THE ROTARY DATA SWITCHES ARE THE MEANS BY WHICH THE CE CAN COMMUNICATE WITH THE DIAGNOSTICS. ENTRIES ARE MADE AS FOLLOWS--

1. STOP CPU.
2. SET UP ROTARY SWITCHES FOR ONE OF THE FOLLOWING OPTIONS. X'S INDICATE POSITIONS WHICH VARY WITH THE NEED.

```
      SWITCHES
   1   2   3   4
  *** *** *** ***
   F   0   X   X  - TURN OFF SENSE SWITCH 'XX'. (F008 WOULD TURN OFF SSW 08).
   F   1   X   X  - TURN ON SENSE SWITCH 'XX'.  (F108 WOULD TURN ON SSW 08).

   F   2   X   X  - GO TO ROUTINE 'XX' AFTER CONSOLE ENTRY FINISHED. (F202 WOULD GO TO ROUTINE 2).

   E   E   0   0  - TERMINATE THE CURRENT SECTION.

   D   X   X   0  - DISK--EXECUTE SECTIONS FOR DEVICE WITH UNIT CODE 'XX'. (DE00 - EXECUTE ALL 5203 PRINTER PROGRAMS)
   D   X   X   X  - DISK--EXECUTE SECTION XXX. (DE01 - SECTION E01).     (DE01 - EXECUTE SECTION E01)

  NOTE - UP TO FOUR DISK INSTRUCTIONS MAY BE ENTERED DURING ONE ENTRY PHASE.
```

3. DEPRESS CPU START. (SYSTEM RESET FOLLOWED BY START WILL CALL IMMEDIATE ATTENTION TO THE SWITCHES--SEE NOTE BELOW).
4. WHEN DCP RECEIVES CONTROL, IT HALTS WITH 'HP' DISPLAYED. RESET THE HALT TO ENTER THE FIRST OPTION.
5. DCP WILL DISPLAY HALT 'HU' OR 'HP'. LOAD THE NEXT OPTION AND RESET THE HALT.
6. REPEAT STEP 5 FOR AS MANY OPTIONS AS DESIRED. ALTERNATING CODES 'HU' AND 'HP' WILL SIGNAL DCP ACCEPTANCE.
7. WHEN DONE, SET LEFTMOST SWITCH TO '0' AND RESET THE HALT.

NOTE - WHEN USING F2XX IN THE SWITCHES TO GO TO A ROUTINE AFTER A SECTION HAS BEGUN, SYSTEM RESET/START SHOULD BE PERFORMED BEFORE MAKING THE ENTRY. (THIS PREVENTS ERRORS FOUND IN ONE ROUTINE FROM BEING DETECTED IN SOME OTHER ROUTINE. IT SHOULD NOT BE PERFORMED IF OTHERWISE SPECIFIED IN THE MAPS.)

2.5 COMMON SENSE SWITCHES

SENSE SWITCHES ARE EQUIVALENT TO 48 TOGGLE SWITCHES NUMBERED HEXADECIMALLY 00-2F.
SENSE SWITCHES 00-0F ARE RESERVED FOR STANDARD OPTIONS PROVIDED BY DCP (LISTED BELOW).
SENSE SWITCHES 10-2F ARE SIGNIFICANT TO THE PARTICULAR SECTION BEING RUN.
INSTRUCTIONS FOR SETTING SENSE SWITCHES ARE CONTAINED IN SECTION 2.4.

SSW NUMBER	ON	OFF (NORMAL)
00	LOOP ON SECTION.	GO TO NEXT SECTION.
01	LOOP ON ROUTINE.	GO TO NEXT ROUTINE.
02	BYPASS MANUAL INTERVENTION ROUTINES.	EXECUTE ALL ROUTINES.
03	BYPASS ERROR PRINTING.	PRINT ERROR MESSAGES.
04	BYPASS NON-ERROR PRINTING.	PRINT NON-ERROR MESSAGES.
05	USE ALTERNATE PRINTER. PRINTER KEYBOARD,IF ATTACHED. OTHERWISE, MFCU.	NORMAL PRINTER.
06	BYPASS ERROR HALTS.	HALT AFTER ERROR.
07	LOAD AND GO. BYPASS COMMENTS AND PROMPTING HALTS.	PROMPTING MODE.
08	USE 5203 RIGHT CARRIAGE.	USE LEFT CARRIAGE.
09	DON'T CLEAR SECTION SENSE SWITCHES AFTER LOADING	CLEAR SECTION SENSE SWITCHES AFTER LOADING
0A-0F	RESERVED	

2.6 CONTROL PROGRAM HALTS.

ALL CONTROL PROGRAM (DCP) HALTS USE THE CHARACTER 'H' AS THE FIRST DIGIT OF THE HALT CODE. THE SECOND DIGIT IDENTIFIES THE CONDITION ACCORDING TO THE FOLLOWING TABLE.

HALT CODES MODEL 6	8/10	CONDITION	ACTION REQUIRED
F05	H0	INVALID RECORD FOUND WHILE LOADING.	CORRECT INVALID RECORD AND RELOAD.
F15	H1	A DEVICE CALLEC FOR BY THE TEST SECTION WAS NOT DEFINED IN THE UDT CARDS.	CHECK UDT CARDS AND RELOAD OR RESET HALT TO BYPASS THE ERROR (ERRORS COULD RESULT).
F25	H2	DATA SWITCH ENTRY ERROR.	CORRECT DATA SWITCHES AND RESET HALT.
F35	H3	INVALID RCUTINE PREFIX FOUND DURING CHAINING FROM ONE ROUTINE TO NEXT.	ENTER ROUTINE SELECT OPTION 'F2XX' IN DATA SWITCHES AND RESET HALT. IF THIS DOES NOT WORK, RELOAD SECTION.
F55	H5	MFCU NOT READY OR ERROR. ERROR INDICATION SHOULD BE DISPLAYED IN THE MFCU LIGHTS.	DO A NON-PROCESS RUN-OUT, RELOAD DECK STARTING WITH RUNOUT CARD/S AND RESET THE HALT.
F65	H6	PRINTER NOT READY OR ERROR.	CLEAR CONDITION AND RESET THE HALT. IF FAILURE PERSISTS, RUN PRINTER FUNCTION TEST. SENSE SWITCHES 03 AND 04 MAY BE USED TO BYPASS PRINTING. SET SENSE SWITCH 05 TO USE ALTERNATE PRINTER.
F75	H7	DISK ERROR.	RESET HALT TO RETRY. IF ERROR PERSISTS, RELOAD.
FA5	HA	CONTROL PROGRAM IS PREPARED TO RECEIVE DATA SWITCH ENTRY. OCCURS AFTER DCP AND SECTION LOADING.	RESET THE HALT IF NO ENTRY DESIRED. TO LOAD OPTIONS, SET UP DATA SWITCHES AND RESET THE HALT. SSW 07 MAY BE USED TO BYPASS THIS HALT.
FC5	HC	DISK LOADER REQUIRES SPECIFICATION OF SECTIONS TO BE LOADED FROM DISK.	IF NO ENTRY HAS BEEN MADE PREVIOUSLY, LOAD PROGRAM SELECTION ENTRY 'DXXX' AND RESET THE HALT. UP TO EIGHT ENTRIES MAY BE MADE. IF ENTRIES HAVE EVER BEEN MADE, THE PROGRAMS MAY BE REPEATED BY RESETTING THE HALT.
FD5	HD	SECTION RUNNING OR LOAD TABLE HAS SPECIFIED NEXT SECTION TO BE RUN. ARR CONTAINS -DXXX- WHERE XXX IS THE PROGRAM ID TO BE RUN.	DISK SYSTEM - DXXX IS NOT ON DISK PACK, RESET THE HALT AND THE NEXT PROGRAM IN THE LOAD TABLE WILL BE LOADED. CARD SYSTEM - PLACE DECK XXX IN THE MFCU HOPPER AND RESET THE HALT.
FE5	HE	CURRENT SECTION TERMINATED.	RESET HALT TO LOAD NEXT SECTION. SECTION MAY BE RESTARTED BY SYSTEM RESET/START.
FF5 F05	HF HU-HP	DCP HALTS WITH 'HP' DISPLAYED WHENEVER A VALID DATA SWITCH ENTRY IS RECOGNIZED. AS DCP ACCEPTS ENTRIES, ALTERNATING HALTS 'HU' AND 'HP' OCCUR.	LOAD A VALID DATA SWITCH ENTRY AND RESET THE HALT. REPEAT FOR ALTERNATING HALTS 'HU' AND 'HP'. TO TERMINATE ENTRY PROCEDURE, ROTATE LEFT-MOST SWITCH TO ZERO AND RESET HALT.
D1	D1	IPL LOADER CAN'T LOAD DCP BECAUSE OF A DISK ERROR.	RESET HALT TO RETRY. IF HALT PERSISTS, GET A NEW DISK PACK.

3. INDEX TABLE FOR HALTS

THE HALTS UNIQUE TO MTAP ARE LISTED AND EXPLAINED BELOW.

HALT CODE	CONDITION	ACTION REQUIRED
F1	THIS HALT OCCURS IF SENSE SWITCH 2A WAS ON PREVIOUS TO THE LOADING OF THE M1 RECORD.	THE M1 RECORD, WHICH IS LOCATED AT -1F00-, AND HAS JUST BEEN PRINTED, MAY NOW BE MODIFIED. RESET HALT IF NO MODIFICATION IS DESIRED. THE FORMAT IS UNPACKED AND THE LOCATION OF THE VARIOUS FIELDS CAN BE DETERMINED FROM THE CARD DESCRIPTION. AT THE COMPLETION OF MODIFICATION, THE PROGRAM MUST BE RESTARTED AT -0A76-.
F2	THIS HALT OCCURS IF SENSE SWITCH 2A WAS ON PREVIOUS TO THE LOADING OF THE M2 RECORD.	THE M2 RECORD, WHICH IS LOCATED AT -1F00-, AND HAS JUST BEEN PRINTED, MAY NOW BE MODIFIED. RESET HALT IF NO MODIFICATION IS DESIRED. THE FORMAT IS UNPACKED AND THE LOCATION OF THE VARIOUS FIELDS CAN BE DETERMINED FROM THE CARD DESCRIPTION. AT THE COMPLETION OF MODIFICATION, THE PROGRAM MUST BE RESTARTED AT -0AEB-.
F9	THIS HALT OCCURS IF THE REQUIRED COMMANDS WERE ISSUED, BUT SAMPLING WAS NOT PERFORMED. IT MAY OCCUR BECAUSE OF NOT ENOUGH CARDS, THE DEVICE BEING SAMPLED NOT BEING READY, ETC.	THE TEST MUST BE REPEATED. THIS MAY BE DONE BY MAKING THE DEVICE READY IN THE PRESCRIBED MANNER, SETTING THE TWO LEFT ADDRESS SWITCHES TO -AA- AND RESETTING THE HALT.
FE	THIS HALT IS SPECIFIED BY THE M2 CARD IN THE TAP DECK TO ALLOW FOR OPERATOR INTERVENTION.	THE TASK NORMALLY SPECIFIED IN A CONTROL CARD MESSAGE SHOULD BE DONE AT THIS TIME. THE HALT SHOULD THEN BE RESET TO CONTINUE.
FF	THE PROGRAM IS READY TO LOAD A TAP DECK. THIS HALT OCCURS AT THE VERY BEGINNING OF PROGRAM EXECUTION BEFORE THE FIRST TAP IS LOADED. THE SAME HALT ALSO OCCURS AT THE COMPLETION OF DATA PRINTOUT, WHICH IS AGAIN AN INDICATION THAT A TAP MAY BE LOADED OR THAT THE TWO LEFT ADDRESS SWITCHES MAY BE SET TO -AA- FOR RE-EXECUTION OF THE PREVIOUSLY LOADED TAP. A SYSTEM RESET, START FROM ANYWHERE IN THE PROGRAM WILL ALSO RESULT IN THE SAME HALT AND THE SAME CONDITON.	LOADING FROM CARDS: THE DESIRED TAP DECK MUST BE LOADED INTO THE PRIMARY FEED, THE MFCU MADE READY AND THE HALT RESET TO LOAD THE PROGRAM. WHEN RUNNING ON THE MFCU THE SECONDARY MUST BE MADE READY WITH 12 CARDS AND THERE MUST BE 12 CARDS BEHIND THE TAP DECK BEFORE THE HALT IS RESET. IF A TAP DECK HAS ALREADY BEEN LOADED AND IT IS DESIRED TO REPEAT THE TEST, THE TWO LEFT ADDRESS SWITCHES MUST BE SET TO -AA- BEFORE THE HALT IS RESET. BOTH FEEDS MUST AGAIN BE READY WITH THE SAME NUMBER OF CARDS. LOADING FROM DISK: SELECT THE TAP TO BE RUN BY SETTING THE CONSOLE SWITCHES TO 0XXX WHERE XXX IS THE ID OF THE TAP DESIRED. WHEN THE SWITCHES ARE SET TO THE DESIRED TAP ID, RESET THE HALT.

4. DETAILED DESCRIPTION OF TEST

4.1 SECTION FF4

NOTE: THE DEVICE BEING SAMPLED MUST BE READY AT THE TIME THE -FF- OR -F9- HALT IS RESET. THIS IS NECESSARY EVEN THOUGH THE COMMAND BEING ISSUED DOES NOT REQUIRE A READY DEVICE.

4.1.1 ROUTINE 1 - MASTER TIMING ANALYSIS PROGRAM (MTAP)

THIS PROGRAM IS WRITTEN TO UTILIZE A SET OF CONTROL CARDS CALLED A TIMING ANALYSIS PROGRAM (TAP) WHICH WILL CAUSE IT TO RECORD AND PRINTOUT SPECIFIC TIMINGS.

THE PROGRAM HAS 5 INTERRELATED FUNCTIONS.

4.1.1.1 INITIALIZING

THIS SECTION CONTROLS THE LOADING OF THE TAP'S WHETHER FROM CARDS OR DISK. IT PRINTS THE CONTENTS OF EACH CARD AS IT IS READ AND MODIFIES THE PROGRAM TO PERFORM AS SPECIFIED IN THE FOLLOWING AREAS.

4.1.1.1.1 COMMANDS AND/OR DELAYS

THERE MAY BE UP TO 7 COMMANDS AND/OR DELAYS.

FOR FURTHER DETAILS REFER TO M1 CARD INFORMATION.

4.1.1.1.2 LINES TO BE SAMPLED AND RECORDED

BITS FROM 2 DIFFERENT SENSE COMMANDS MAY BE SAMPLED AND RECORDED. ONLY BITS FROM 2 OF THE POSSIBLE 4 BYTES INVOLVED MAY BE SAMPLED. A TOTAL OF 8 OF THE POSSIBLE 16 BITS IN THOSE 2 BYTES MAY BE SAMPLED.

FOR FURTHER DETAILS REFER TO M2 CARD INFORMATION (COLUMNS 05-20).

4.1.1.1.3 SAMPLE TIME

THIS IS A DECIMAL NUMBER BETWEEN 1 AND 999 WHICH SPECIFIED THE TIME BETWEEN SAMPLES IN INCREMENTS OF 50 MICRO-SECONDS.

4.1.1.1.4 NUMBER OF SAMPLES

THIS IS A DECIMAL NUMBER BETWEEN 1 AND 250 WHICH SPECIFIED HOW MANY SAMPLES WILL BE TAKEN.

4.1.1.1.5 NUMBER OF COMMANDS TO BE SAMPLED

THIS IS A DECIMAL NUMBER BETWEEN 1 AND 9999 WHICH SPECIFIES HOW MANY TIMES THE COMMAND WHICH IS BEING ISSUED FOR SAMPLING PURPOSES WILL BE EXECUTED AND SAMPLED. AN ERROR OR NOT READY CONDITION WILL TERMINATE SAMPLING AND CAUSE A DATA PRINTOUT REGARDLESS OF THE NUMBER.

4.1.1.1.6 HALT REQUEST

THIS ALLOWS FOR AN -FE- HALT FOLLOWING THE LOADING OF THE TAP FOR MANUAL INTERVENTION,IF REQUIRED.

4.1.1.1.7 LOAD I/O'S

THIS PROVIDES FOR THE SETTING UP OF THE LOAD I/O'S, WHICH ARE UNIQUE FOR EACH DEVICE.

FOR FURTHER DETAILS REFER TO M2 CARD INFORMATION (COLUMNS 37-42).

4.1.1.1.8 SYNC INFORMATION

THERE MAY BE UP TO 3 SEQUENTIAL SYNC'S. EACH SYNC SPECIFICATION MAY ALSO CALL FOR A DELAY OF FROM 50 MICRO-SECONDS TO .5 SECONDS FOLLOWING THE OCCURRENCE OF THE SYNC. ONE DELAY ONLY, WITH NO SYNC REQUIRED, MAY BE SPECIFIED BY LEAVING THE FINAL SYNC SENSE AREA BLANK.

IT IS ALSO POSSIBLE TO SPECIFY THE SYNC AS THE GOING OFF OF A TEST I/O CONDITION. THIS REQUIRES A -T- IN COLUMN 51 AND THE TIO 'Q' CODE IN COLUMNS 53 & 54. ALL OTHER SYNC INFORMATION AREA MUST BE BLANK WHEN USING A TIO SYNC.

FOR FURTHER DETAILS REFER TO M2 CARD INFORMATION (COLUMNS 51-86).

4.1.1.2 COMMAND EXECUTION

THIS SECTION HANDLES ALL LOAD I/O'S INCLUDING THOSE WHICH REQUIRE SPECIAL SETUPS BECAUSE OF SPECIFIC DEVICE REQUIREMENTS. IT ALSO HANDLES EXECUTION OF ALL COMMANDS, SAMPLED AND NON-SAMPLED.

4.1.1.3 SYNC

THIS SECTION WILL REMAIN IN CONTROL UNTIL SUCH TIME AS ALL SYNC CONDITIONS SPECIFIED HAVE BEEN FULFILLED

4.1.1.4 SAMPLING

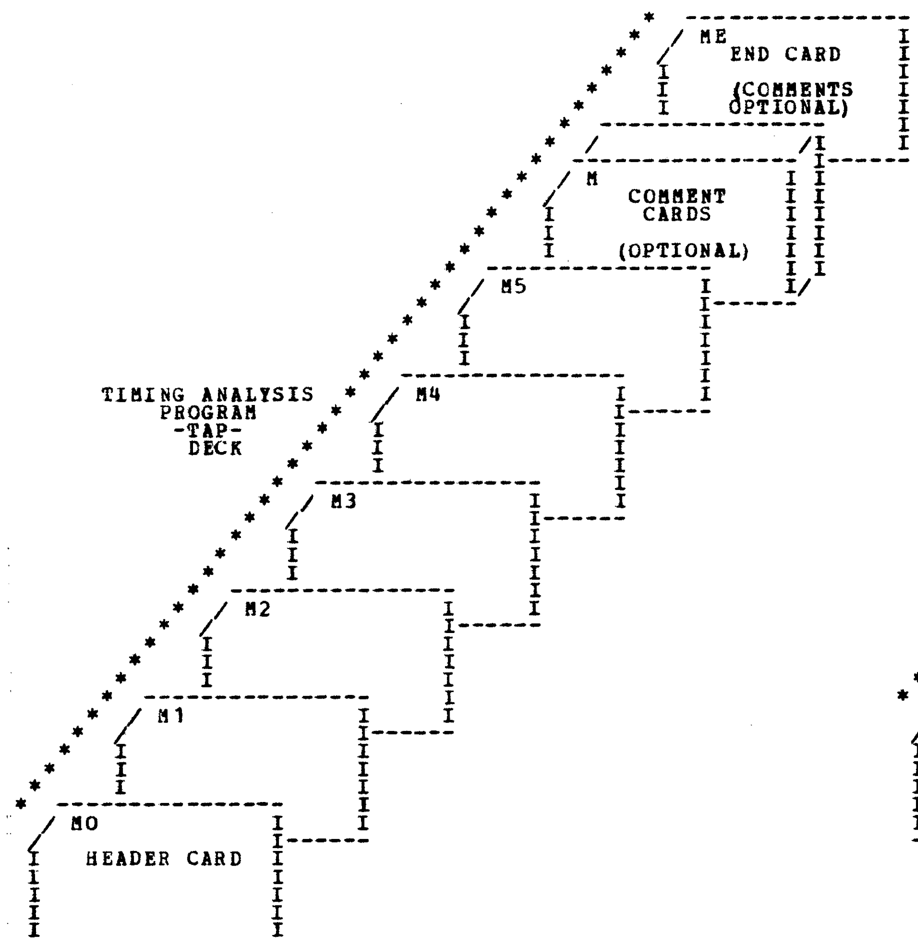
THIS SECTION WILL SENSE AND STORE THE UP AND DOWN LEVELS OF THE LINES CONTAINED IN THE SPECIFIED SENSE BYTES. THE INFORMATION WILL BE STORED IN SUCH A WAY THAT THE EARLIEST AND THE LATEST EXCURSION OF EACH LINE CHANGE WILL BE RECORDED. DATA COLLECTION WILL CONTINUE UNTIL THE SPECIFIED NUMBER OF SAMPLES HAVE BEEN TAKEN.

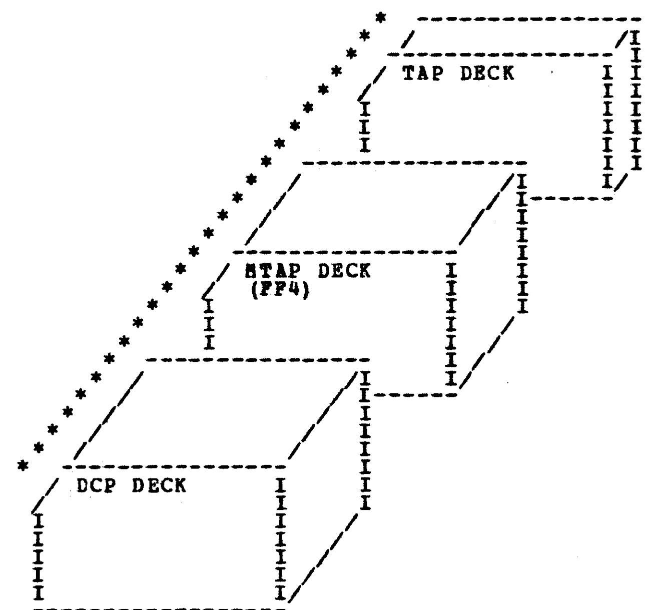
4.1.1.5 OUTPUT

THIS SECTION WILL SELECT THE INFORMATION FOR THE LINES SPECIFIED AND PRINT IT IN THE FORMAT SPECIFIED. THE NORMAL FORMAT WILL BE A GRAPHIC SCOPE TYPE PRINTOUT. IT WILL SHOW THE UP AND DOWN CONDITIONS OF THE SPECIFIED LINES AND THE EARLIEST AND LATEST TIME OF ANY LEVEL CHANGE. EACH LINE WILL BE IDENTIFIED FROM THE NAME INFORMATION WHICH IS ENTERED BY MEANS OF AN M3 AND AN M4 CARD. A TABULAR TYPE OUTPUT, WHICH CONTAINS THE SAME INFORMATION, MAY BE SPECIFIED BY TURNING ON SENSE SWITCH -29- AFTER MTAP HAS BEEN LOADED. A SCOPE TYPE PRINTOUT OF THE SAME IDENTICAL INFORMATION MAY BE RECEIVED FOLLOWING THE TABULAR PRINT OUT IF THE DATA SWITCHES ARE AT -FF- WHEN THE TABULAR PRINTOUT IS COMPLETED.

NOTE: THERE IS A TIME DELAY OF A MINIMUM OF 115 MICRO-SECONDS BETWEEN THE EXECUTION OF THE START I/O TO BE SAMPLED AND THE FIRST DATA THAT CAN BE SAMPLED. THEREFORE, IF THERE IS NO SYNC SPECIFIED, OR THE SYNC LINE CHANGES AT THE TIME OF THE SIO, THE PRINTOUT WILL VARY FROM WHAT WILL BE SEEN WITH A SCOPE. THE AMOUNT OF VARIANCE WILL DEPEND UPON THE SAMPLE TIME.

4.1.1.6 DECK CONFIGURATION
THE DECKS NECESSARY TO RUN A TAP ARE DCP, MTAP AND THE REQUIRED TAP.





4.1.1.7 CONTROL CARD CONFIGURATION

```
M0 CARD

HEADER CARD.

COLUMN
   01     -M-
   02     -O-
   03-11  -BLANK-
   12     -P-
   13     -N-
   14     -BLANK-
   15-21  PART NUMBER
   22     -BLANK-
   23     -E-
   24     -C-
   25     -BLANK-
   26-32  EC NUMBER (RIGHT JUSTIFIED)
   33-87  TAP PROGRAM NAME
   88     -BLANK-
   89   * PROGRAM
   90    * IDENTIFICATION
   91     * NUMBER
   92     ENGINEERING CHANGE LEVEL
   93   * CARD
   94    * DECK
   95     * SEQUENCE
   96      * NUMBER
```

```
M1 CARD

THIS CARD CONTAINS COMMAND AND DELAY INFORMATION.

COLUMN
   01     -M-
   02     -1-
   03     -BLANK-
   04     -BLANK-
   05   * EACH AREA MAY            * THIS AREA MAY CONTAIN UP TO 7 COMMANDS AND/OR DELAYS.
   06    * CONTAIN A               *
   07     * DELAY OR               * COMMANDS:
   08      * A COMMAND             *
   09   *                          * EACH COMMAND IS FOUR CHARACTERS LONG AND CONTAINS THE Q AND R BYTE OF THE DESIRED COMMAND.
   10    *                         * SAMPLING WILL BE DONE FOLLOWING EXECUTION OF THE LAST COMMAND ONLY.
   11     *                        * THE LAST COMMAND IS THE ONE IMMEDIATELY PRECEEDING A -0000-.
   12      *                       *
   13-16                           * DELAYS:
   17-20                           *
   21-24                           * EACH DELAY SPECIFICATION AREA IS 4 DIGITS LONG AND MUST BEGIN WITH A -0-.
   25-28                           * THE LAST 3 DIGITS ARE A DECIMAL NUMBER OF 100 MSEC INCREMENTS OF DELAY BETWEEN COMMANDS.
   29-32                           *
   33-36                           *
   37-50  THIS AREA MAY CONTAIN THE FUNCTION OF THE COMMAND BEING SAMPLED IN PLAIN ENGLISH.
   51-88  THIS AREA MAY BE USED FOR COMMENTS.
   89   * PROGRAM
   90    * IDENTIFICATION
   91     * NUMBER
   92     ENGINEERING CHANGE LEVEL
   93   * CARD
   94    * DECK
   95     * SEQUENCE
   96      * NUMBER
```

```
                                        M2 CARD

  THIS CARD CONTAINS INFORMATION REGARDING BITS TO BE RECORDED, SAMPLE TIME, NUMBER OF SAMPLES, LOAD I/O'S REQUIRED, SYNC'S ETC.

COLUMN
   01   -M-
   02   -2-
   03   -BLANK-
   04   -BLANK-

   05  * FIRST SENSE COMMAND.  Q BYTE ONLY.
   06   *
   07  * SENSE BYTE CONTAINING DESIRED INFORMATION.  LOW CORE BYTE -00-.  HIGH CORE BYTE -01-.
   08   *
   09  * BITS -IN HEX- OF BYTE SPECIFIED TO BE INCLUDED IN PRINTED OUTPUT.  MAXIMUM OF 8 BITS MAY BE SPECIFIED ON CARD.
   10   *
   11  * CONTAINS -OR- IF BYTE SPECIFIED ABOVE IS TO BE CONTINUOUSLY SAMPLED EVERY 50 MICROSECONDS.
   12   *

   13  * SECOND SENSE COMMAND, IF REQUIRED.  IT MAY BE THE SAME AS THE FIRST WITH THE OTHER BYTE SPECIFIED.
   14   *
   15  * SPECIFIES SIGNIFICANT BYTE OF THIS SENSE AS COLUMNS 7,8 DO FOR THE FIRST SENSE.
   16   *
   17  * BITS -IN HEX- OF BYTE DEFINED ABOVE.  8 BIT MAXIMUM INCLUDES CONTENTS OF COLUMNS 9,10,17 AND 18.
   18   *
   19  * SAME AS COLUMNS 11,12.  ONLY ONE -OR- MAY BE SPECIFIED.  THE FIRST ONE WILL ASSUME PRIORITY.
   20   *

   21   -0-
   22  * SAMPLE TIME IN 50 MICROSECOND INCREMENTS.  IT MUST BE FROM 001 TO 999.
   23   *
   24    *
   25   -BLANK-
   26  * NUMBER OF SAMPLES TO BE TAKEN.  MUST NOT EXCEED 250.
   27   *
   28    *
   29   -BLANK-
   30  * NUMBER OF COMMANDS TO BE SAMPLED.  MUST BE FROM 0001 TO 9999.
   31   *
   32    *
   33     *
   34   -BLANK-
   35    HALT REQUEST.  MUST CONTAIN AN -H- IF -FE- HALT IS DESIRED FOLLOWING THE LOADING OF THE COMPLETE -TAP-.
   36   -BLANK-
   37  * REQUIRED LOAD-I/O Q CODE FOR DEVICE BEING TESTED.
   38   *
   39  * ADDITIONAL LOAD-I/O Q CODE IF REQUIRED.  IF NOT REQUIRED, RE-INTER SAME ONE ENTERED IN COLUMNS 37,38.
   40   *
   41  * ADDITIONAL LOAD-I/O Q CODE IF REQUIRED.  IF NOT REQUIRED, RE-INTER SAME ONE ENTERED IN COLUMNS 37,38.
   42   *

   43  * THIS AREA MUST
   44   * CONTAIN THE
   45    * FOUR BYTE
   46     * DISK CONTROL FIELD
   47      * FOR DISK TAP'S.
   48       * IT SHOULD BE
   49        * BLANK IF NOT
   50         * A DISK TAP.
                                                    NOTE:  THE GOING OFF OF A TIO CONDITION MAY BE THE SYNC BY
   51  * SENSE COMMAND Q BYTE OF FINAL SYNC.  THIS IS THE          PLACING A -T- IN COLUMN 51 AND THE TIO -Q- CODE IN
   52   * SYNC TO SPECIFY IF ONLY ONE SYNC IS REQUIRED.            COLUMNS 53 & 54.  COLUMNS 55 TO 86 MUST THEN BE BLANK.
   53   -7-
   54    -8- IF THE LINE LOGIC LEVEL BEGIN SYNCED ON IS TO BE DOWN.  -9- IF IT IS TO BE UP.
   55  * BIT OR BITS -IN HEX- WHICH WILL BE TESTED FOR THE LEVEL SPECIFIED ABOVE.
   56   *
   57  * SENSE BYTE CONTAINING THE BITS SPECIFIED ABOVE.  HIGH -01-.  LOW -00-.
   58   *
   59  * DELAY FOLLOWING THE SYNC BEFORE SAMPLING IS BEGUN.  THIS IS A DECIMAL NUMBER OF 50 MICROSECOND INCREMENTS.
   60   *
   61    *   NOTE: AREA MUST BE ALL ZEROS IF NO DELAY IS REQUIRED.
   62     *

   63  * SENSE COMMAND Q BYTE OF FIRST SYNC IF THERE TWO, OR SECOND SYNC IF THERE ARE THREE.
   64   *
   65  * SAME
   66   * TYPE
   67    * INFORMATION
   68     * AS SPECIFIED
   69      * IN COLUMNS
   70       * 53-62
   71        * IF THIS
   72         * SYNC
   73          * IS
   74           * REQUIRED

   75  * SENSE COMMAND Q BYTE OF FIRST SYNC
   76   * IF THREE ARE REQUIRED.
   77  * SAME
   78   * TYPE
   79    * INFORMATION
   80     * AS SPECIFIED
   81      * IN COLUMNS
   82       * 53-62
   83        * IF THIS
   84         * SYNC
   85          * IS          * NOTE: IF THIS IS A DISK TAP, THIS BYTE MAY CONTAIN ANOTHER 3RD BYTE OF THE 4 BYTE DISK CONTROL
   86           * REQUIRED   *       FIELD. THIS PROVIDES FOR FOREWARD-REVERSE BIT MODIFICATION SO THAT A SAMPLE COMMAND CAN BE
                                     EXECUTED REPEATEDLY WITHOUT RUNNING OUT OF DISK. THIS BYTE WILL NOT BE USED UNLESS THERE ARE
                                     AT LEAST TWO COMMANDS, IN WHICH CASE THIS BYTE WILL BE USED FOR THE NON-SAMPLE COMMAND AND
                                     THE BYTE LOCATED IN COLUMNS 47 AND 48 WILL BE USED FOR THE SAMPLE COMMAND.
   87  * NO OF TIMES TO REPEATEDLY SYNC AND SAMPLE AFTER 1 COMMAND.
   88   * MUST BE BLANK IF THIS OPERATION IS NOT DESIRED.
   89  * PROGRAM
   90   * IDENTIFICATION
   91    * NUMBER
   92   ENGINEERING CHANGE LEVEL
   93  * CARD
   94   * DECK
   95    * SEQUENCE
   96     * NUMBER
```

```
******************************************************************************************
*                                      M3 CARD                                           *
******************************************************************************************
* THIS CARD CONTAINS THE FIRST HALF (9 CHARACTERS) OF THE NAME OF THE BIT BEING RECORDED. THE LAST NAME IS LIMITED TO 7 CHAR. *
* THE NAME IN COLUMNS 05-13 IS FOR THE LEFT MOST BIT SPECIFIED IN COLUMNS 9-10 OF THE M2 CARD, 16-24 FOR NEXT BIT RIGHT, ETC. *
******************************************************************************************
* COLUMN
*   01    -M-
*   02    -3-
*   03    -BLANK-
*   04    -BLANK-
*  05-13 FIRST HALF OF BIT NAME. 9 CHARACTERS.
*   14    -BLANK-
*   15    -BLANK-
*  16-24 FIRST HALF OF BIT NAME.
*   25    -BLANK-
*   26    -BLANK-
*  27-35 FIRST HALF OF BIT NAME.
*   36    -BLANK-
*   37    -BLANK-
*  38-46 FIRST HALF OF BIT NAME.
*   47    -BLANK-
*   48    -BLANK-
*  49-57 FIRST HALF OF BIT NAME.
*   58    -BLANK-
*   59    -BLANK-
*  60-68 FIRST HALF OF BIT NAME.
*   69    -BLANK-
*   70    -BLANK-
*  71-79 FIRST HALF OF BIT NAME.
*   80    -BLANK-
*   81    -BLANK-
*  82-88 FIRST HALF IF BIT NAME. 7 CHARACTERS ONLY.
*   89  * PROGRAM
*   90   * IDENTIFICATION
*   91    * NUMBER
*   92  ENGINEERING CHANGE LEVEL
*   93  * CARD
*   94   * DECK
*   95    * SEQUENCE
*   96     * NUMBER
******************************************************************************************

******************************************************************************************
*                                      M4 CARD                                           *
******************************************************************************************
* THIS CARD CONTAINS THE SECOND HALF (9 CHARACTERS) OF THE NAME OF THE BIT BEING RECORDED. THE LAST NAME IS LIMITED TO 7 CHAR. *
******************************************************************************************
* THIS CARD IS THE SAME AS THE M3 CARD EXCEPT THAT IT CONTAINS THE LAST HALF OF THE BIT NAMES. *
******************************************************************************************

******************************************************************************************
*                                      M5 CARD                                           *
******************************************************************************************
* THIS CARD CONTAINS THE TOLERANCE LIMITS FOR UP TO 17 LEVEL CHANGES.                    *
******************************************************************************************
* COLUMN
*   01    -M-
*   02    -5-
*   03    -BLANK-
*   04    -BLANK-
*  05-88 * CONTAINS UP TO 17 PAIRS OF DOUBLE HEXIDECIMAL NUMBERS WHICH INDICATE THE BEGINNING AND ENDING PRINTER LINES WHERE
*         * TRANSITION LIMITS ARE TO BE SHOWN.  AN 'FF' MUST SEPARATE LIMITS OF ONE SENSE BIT FROM ANOTHER.  IF NO LIMITS ARE
*          * WANTED FOR A PARTICULAR SENSE BIT, THE 'FF' MUST BE PRESENT.  THE DATA ON THE CARD MUST BE TERMINATED BY AN 'FE'.
*
*           EXAMPLE:  M5  0209FFFF041F232FFFFFFF0102FF0A0BFF101BFE
*
*           LEFT LINE OF DATA WOULD HAVE ASTERICKS IN PRINT LINES 2-9
*           NEXT LINE OF DATA WOULD HAVE NO LIMITS.
*           NEXT LINE OF DATA WOULD HAVE ASTERICKS IN PRINT LINES 4-31 & 35-47.
*           NEXT LINE OF DATA WOULD HAVE NO LIMITS.
*           NEXT LINE OF DATA WOULD HAVE NO LIMITS.
*           NEXT LINE OF DATA WOULD HAVE ASTERICKS IN PRINT LINES 1-2.
*           NEXT LINE OF DATA WOULD HAVE ASTERICKS IN PRINT LINES 10-11.
*           NEXT LINE OF DATA WOULD HAVE ASTERICKS IN PRINT LINES 16-27.
*
*           IF NO LIMITS ARE WANTED, THERE MUST BE AN M5 CARD LIKE THE FOLLOWING.   M5  FE
*
*   89  * PROGRAM
*   90   * IDENTIFICATION
*   91    * NUMBER
*   92  ENGINEERING CHANGE LEVEL
*   93  * CARD
*   94   * DECK
*   95    * SEQUENCE
*   96     * NUMBER
******************************************************************************************

******************************************************************************************
*                                   M AND ME CARDS                                       *
******************************************************************************************
* THE M CARD IS AN OPTIONAL COMMENT CARD, WITH ANY NUMBER OF CARDS PERMISSIBLE.
* THE ME CARD IS AN END CARD WHICH STARTS EXECUTION OF THE TAP.
******************************************************************************************
* COLUMN
*   01    -M-
*   02    -X-  (MUST CONTAIN AN 'E' ON THE ME CARD, AND BE BLANK ON THE M CARD.)
*  03-88 COMMENTS  (OPTIONAL ON THE ME CARD)
*
*   89  * PROGRAM
*   90   * IDENTIFICATION
*   91    * NUMBER
*   92  ENGINEERING CHANGE LEVEL
*   93  * CARD
*   94   * DECK
*   95    * SEQUENCE
*   96     * NUMBER
******************************************************************************************
```

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NOTE 1 - THIS BLOCK OF THE USERS GUIDE IS ALSO USED FOR THE LOCAL COMMUNICATIONS ADAPTER (LCA).
THE LCA IS FUNCTIONALLY THE SAME AS BSCA-1 WITH POINT TO POINT NON-SWITCHED LINE CONTROL,
LOCAL MODEMLESS ATTACHMENT (AT 2400 BPS), AND EBCDIC TRANSMISSION CODE.
THE SAME DIAGNOSTICS AND MAP CHARTS USED BY BSCA-1 ARE UTILIZED FOR LCA.

NOTE 2: INTEGRATED COMMUNICATION ADAPTER (ICA) IF ICA IS INSTALLED IN BSCA-1 POSITION THE ICA USES BSCA-1
DIAGNOSTIC PROGRAMS (PID 80X). IF ICA IS INSTALLED IN BSCA-2 POSITION,THE ICA USES BSCA-2 DIAGNOSTICS
(PID 88X).
ICA IS THE SAME AS BSCA WITH THE FOLLOWING MODIFICATIONS:

.BASIC ICA- THE FOLLOWING DO NOT APPLY TO ICA: HIGH SPEED, AUTO CALL, NEW SYNC,
MULTIPOINT TRIBUTARY, MINI 12 AND INTERNAL CLOCK.

.OPTIONS:
ASCII
TRANSPARENCY (EBCDIC)

.SYNCHRONOUS LINE, MEDIUM SPEED (REMOTE)
DATA SET CLOCKING ONLY
SWITCHED, NON-SWITCHED OR MULTIPOINT CONTROL STATION.

.8000 BPS LOCAL INTERFACE (LOCAL 1)
EIA LOCAL MODEMLESS ATTACHMENT WIRED FOR 8000 BPS.

.2400 BPS LOCAL INTERFACE (LOCAL 2)
EIA LOCAL MODEMLESS ATTACHMENT WIRED FOR 2400 BPS.

NOTE: THE INTERFACE SWITCH IS ONLY INSTALLED WHEN ANY 2 OR MORE DATA LINK INTERFACES ARE INSTALLED.

1. GENERAL PROGRAM SUMMARY

1.1 UDT SELECTION

NOTE 1

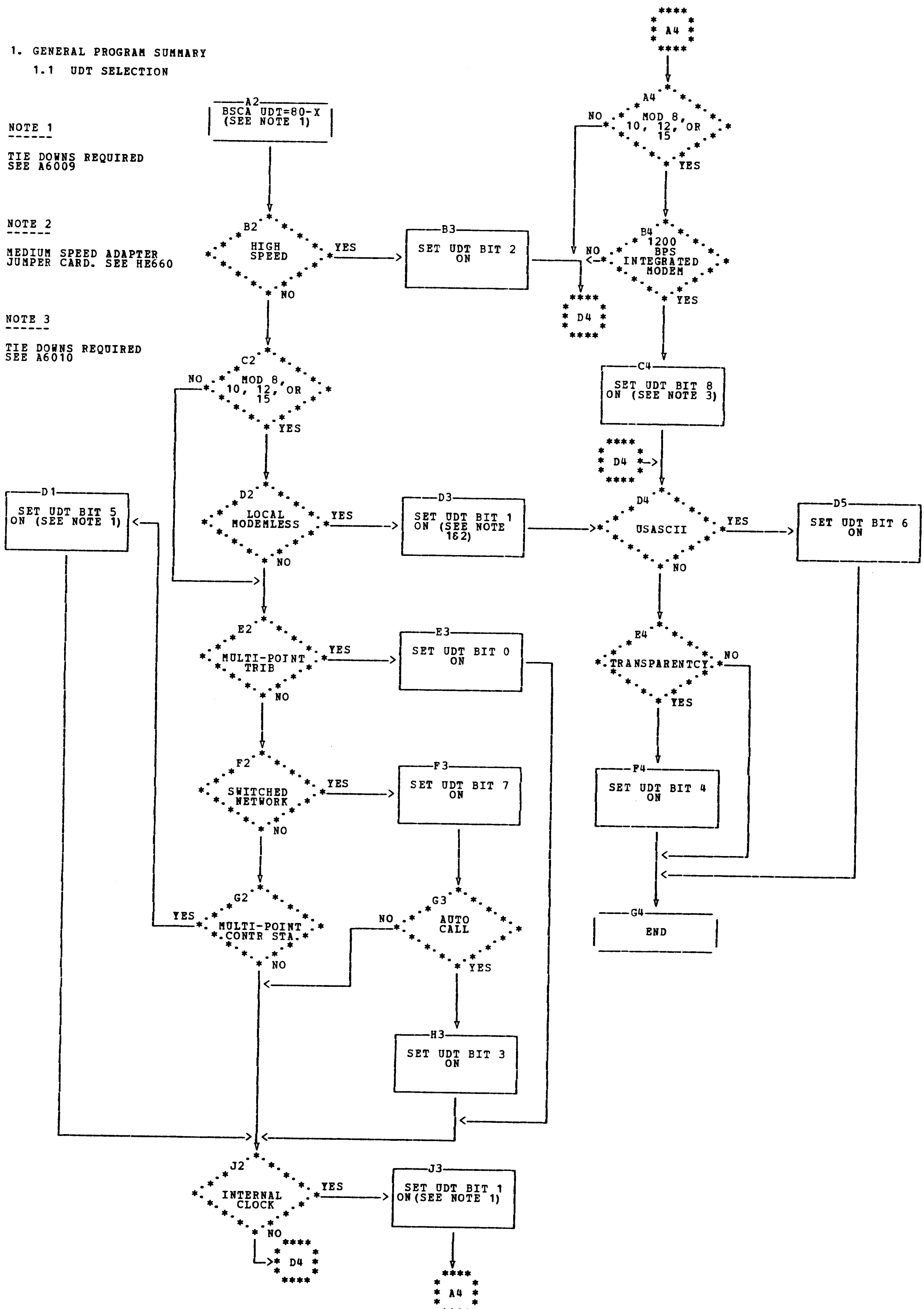
TIE DOWNS REQUIRED
SEE A6009

NOTE 2

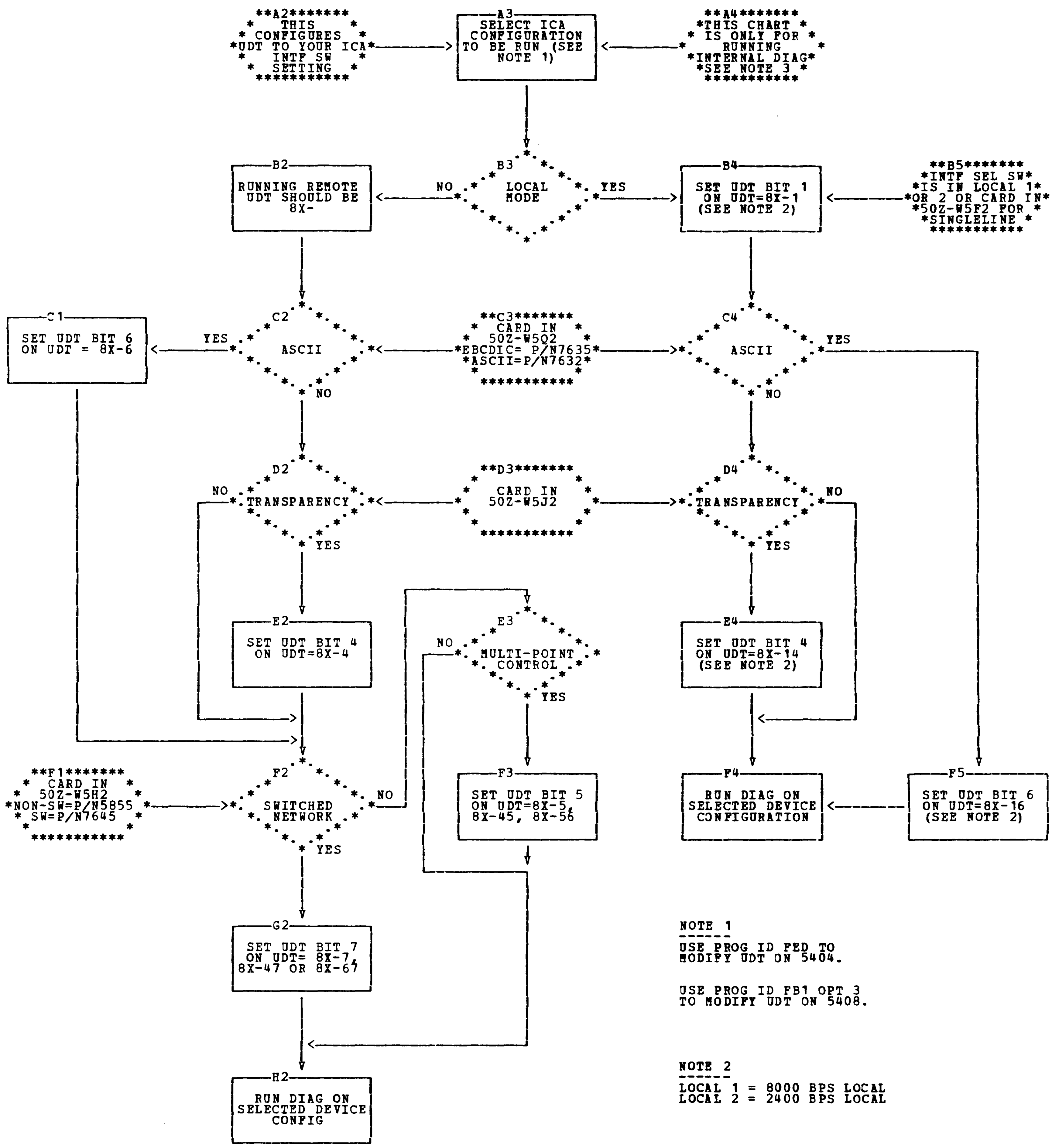
MEDIUM SPEED ADAPTER
JUMPER CARD. SEE HE660

NOTE 3

TIE DOWNS REQUIRED
SEE A6010



1.1.1 UDT SELECTION



NOTE 1

USE PROG ID FED TO MODIFY UDT ON 5404.

USE PROG ID FB1 OPT 3 TO MODIFY UDT ON 5408.

NOTE 2

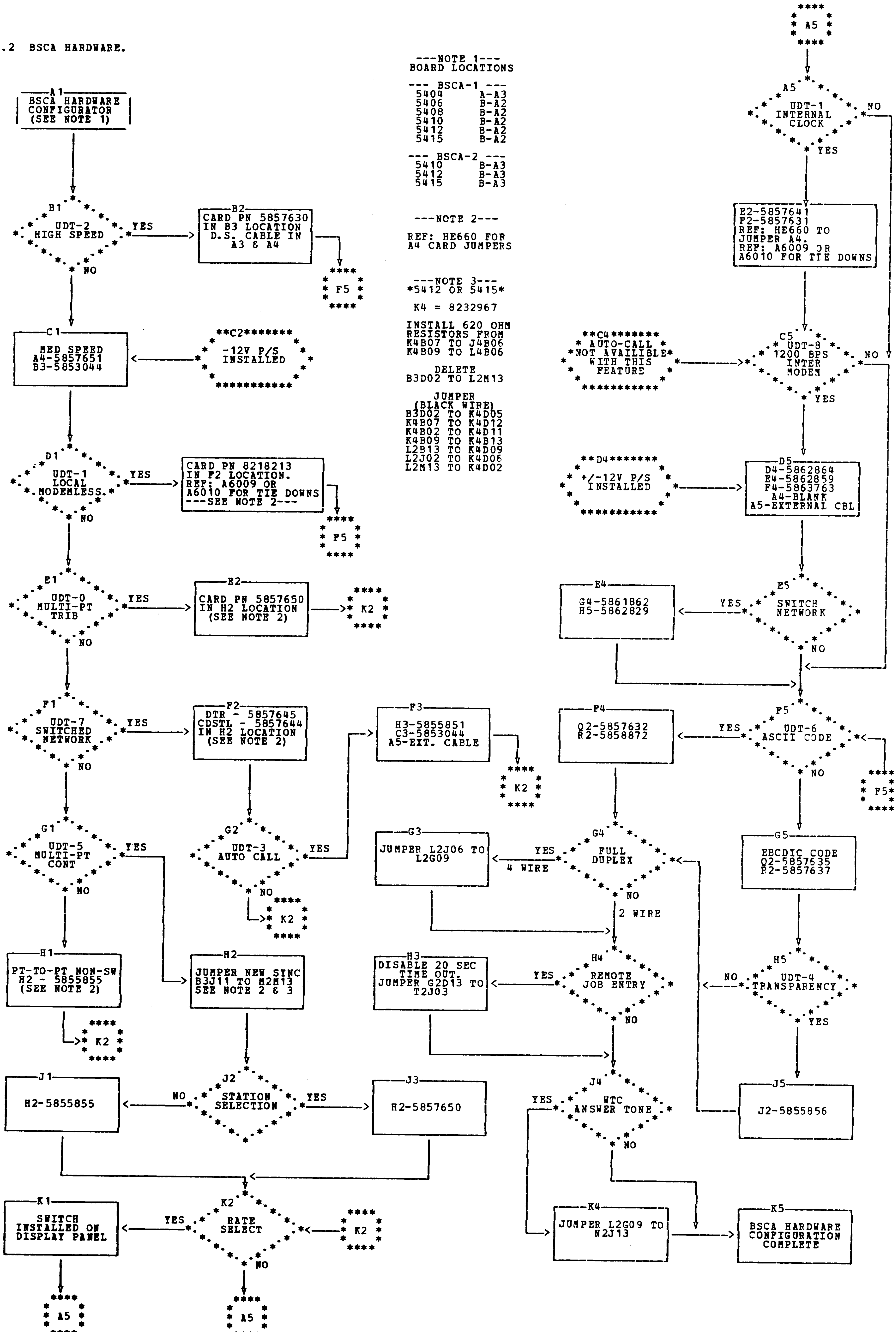
LOCAL 1 = 8000 BPS LOCAL
LOCAL 2 = 2400 BPS LOCAL

NOTE 3

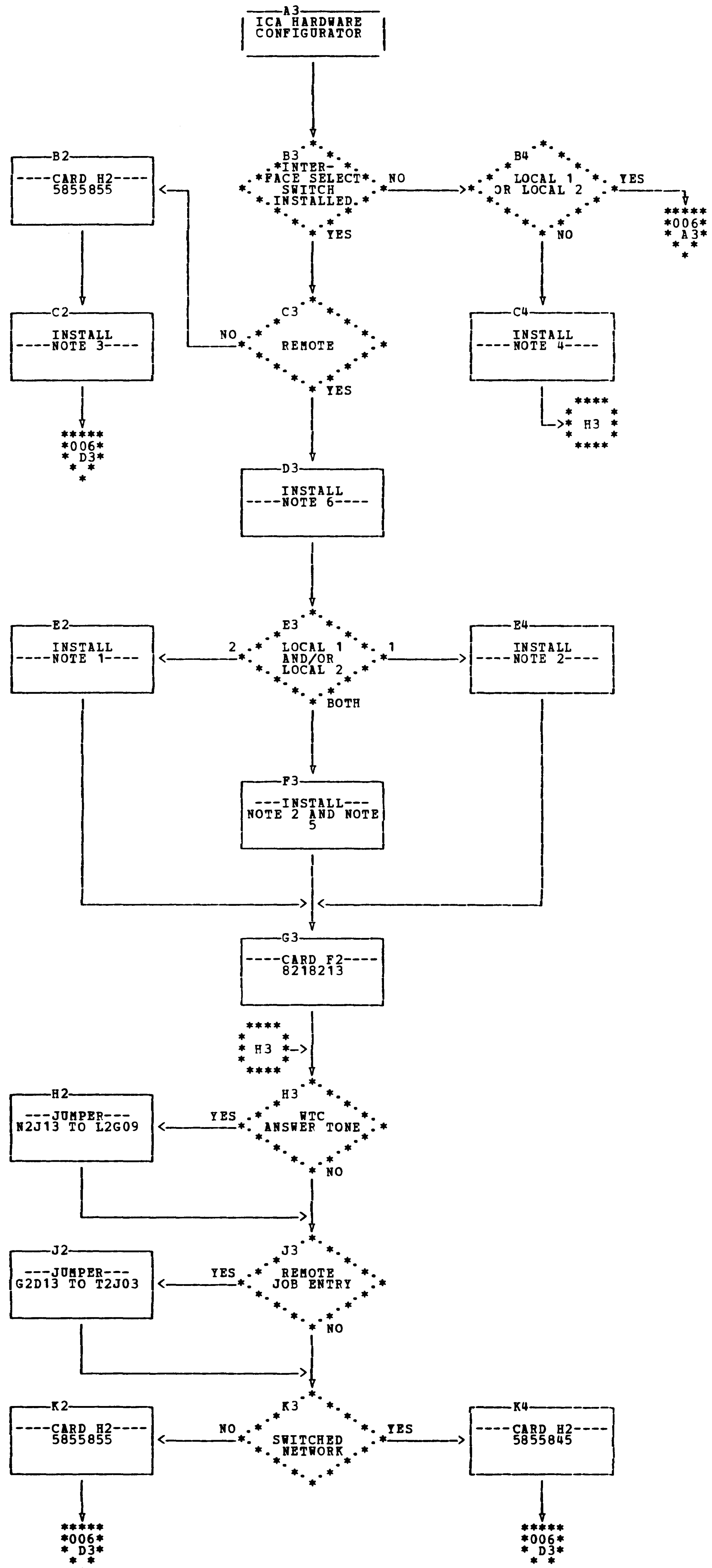
801-806 WHEN ICA IS INSTALLED IN BSCA 1 LOCATION. UDT=80

881-886 WHEN ICA IS INSTALLED IN BSCA 2 LOCATION. UDT=88

1.1.2 BSCA HARDWARE.



1.1.3 ICA HARDWARE



---NOTE 1---
REMOTE AND LOCAL 2

I/O CABLES A3, A5

CARD PN 5803576 IN B5, C5, D5

---NOTE 2---
REMOTE AND LOCAL 1

I/O CABLES A3, A4

CARD PN 5803576 IN B4, C4, D4

---NOTE 3---
LOCAL 1 AND LOCAL 2

I/O CABLES A4, A5

CARD PN 5803576 IN B4, B5, C4, C5, D4, D5

---NOTE 4---
REMOTE ONLY

I/O CABLE A2

JUMPER
H3D10 TO S5D06
H3D07 TO L4B07
H3D02 TO L2D07

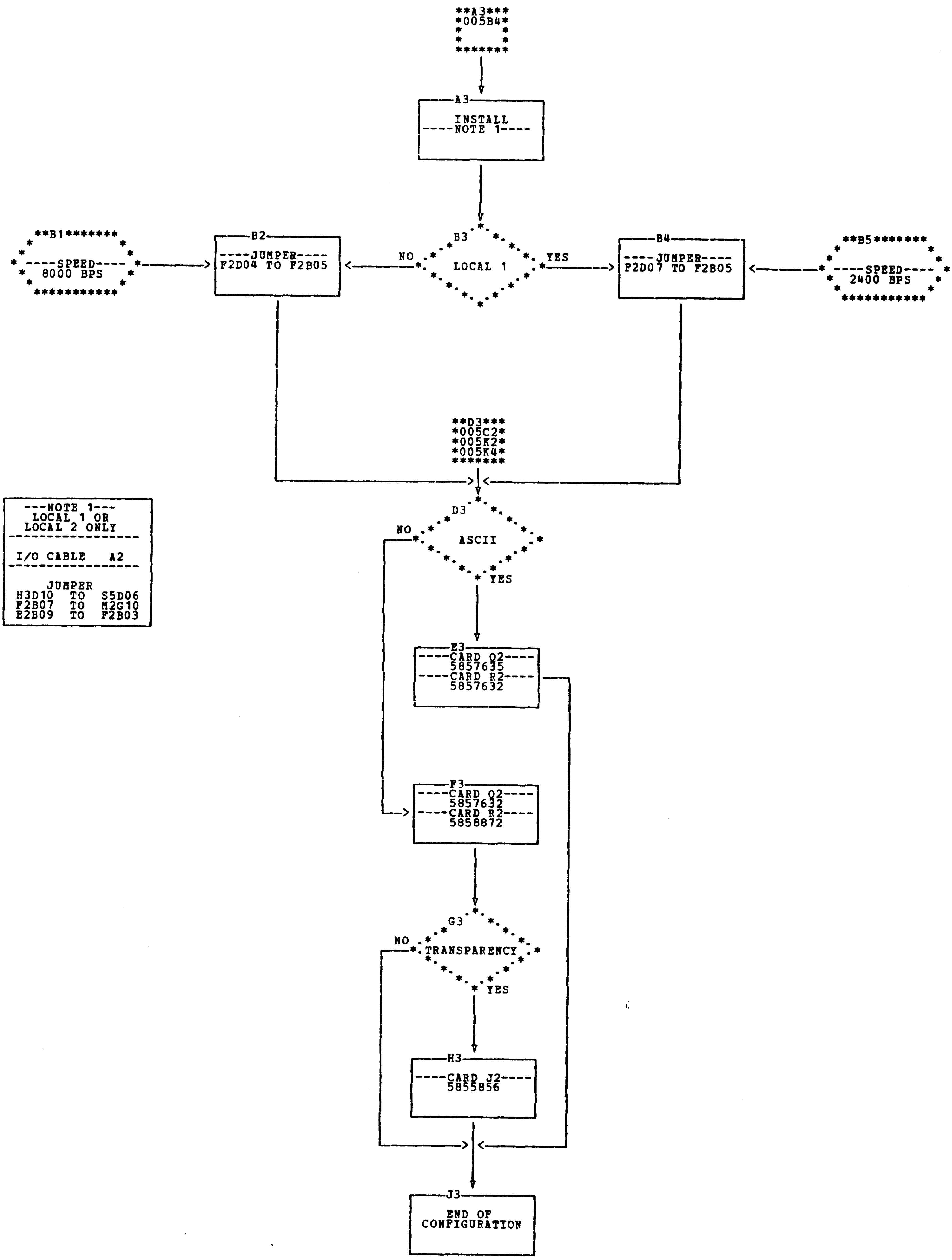
---NOTE 5---
REMOTE, LOCAL 1 AND LOCAL 2

I/O CABLE A5

CARD PN 5803576 IN B5, C5, D5

---NOTE 6---
REMOTE

CARD PN 5803576 IN B3, C3, D3


A3*
005B4
A3
INSTALL
----NOTE 1----
B1*****
----SPEED----
8000 BPS
B2
----JUMPER----
F2D04 TO F2B05
B3
LOCAL 1
NO
YES
B4
----JUMPER----
F2D07 TO F2B05
B5*****
----SPEED----
2400 BPS
D3*
005C2
005K2
005K4
---NOTE 1---
LOCAL 1 OR
LOCAL 2 ONLY
I/O CABLE A2
JUMPER
H3D10 TO S5D06
F2B07 TO M2G10
E2B09 TO F2B03
D3
ASCII
NO
YES
E3
----CARD Q2----
5857635
----CARD R2----
5857632
F3
----CARD Q2----
5857632
----CARD R2----
5858872
G3
TRANSPARENCY
NO
YES
H3
----CARD J2----
5855856
J3
END OF
CONFIGURATION

1.2 DIAGNOSTIC SECTION DESCRIPTIONS

DIAGNOSTIC SECTION	ROUTINE	ROUTINE NAME AND FUNCTION(S) TESTED	APPLICABLE SENSE SWITCHES
801 & 881 - BSCA DIAGNOSTIC	01	TIO TEST TEST ALL BSCA TEST I/O INSTRUCTIONS (EXCEPT 'NEW DATA) WHILE BSCA IS DISABLED	16
	02	ENABLE AND DISABLE BSCA TEST TEST SIO ENABLE AND DISABLE BSCA INSTRUCTION.TEST 15 - 65 MS DELAY FOR DATA SET READY LATCH. OPTIONALLY TEST 'CHECK RESET' AND 'CONNECT DATA SET TO LINE' (CDSTL).CDSTL IS TESTED IF DATA SET HAS CDSTL	16 1D
	03	LOAD AND SENSE LSR TEST LOADS AND SENSES BSCA STOP,TRANSITION AND CURRENT LSRS(LOCAL STORE REGISTERS) AND TESTS FOR CORRECT RESULTS.ALSO TESTS FOR PROPER LSR SELECTION.	16
	04	TIO,INTERRUPT AND 2 SECOND TIMEOUT TEST TESTS OCCURENCE AND DURATION OF 2 SECOND TIMEOUT. TESTS INTERRUPT OCCURING AND IF DISABLE AND RESET INTERRUPT WORK.	16
	05	BAUD RATE TEST BY USING THE TEST I/O 'NEW DATA' INSTRUCTION THE PERIOD OF THE 62 BAUD CLOCK IS CHECKED ALONG WITH PERIOD OF THE DATA SET CLOCK (OR INTERNAL CLOCK) THE CALCULATED BAUD RATE IS PRINTED.	16
	06	DISCONNECT TIMEOUT TEST (FOR SWITCHED NETWORK ONLY) TESTS OCCURRENCE AND ACCURACY OF 20 SECOND TIMEOUT BY ENABLING THE BSCA WITH TEST MODE ON. NOTE: SEE NOTES IN PARA 1.3	16
	07	ABORTIVE DISCONNECT TEST (FOR SWITCHED NETWORK ONLY) ENABLE BSCA AND TEST MODE.THEN TEST MODE IS TURNED OFF TO FORCE ABORTIVE DISCONNECT STATUS BIT TO COME ON.ALSO TESTS TIME FOR BIT TO COME ON. THIS ROUTINE IS NOT PERFORMED WHEN THE EXTERNAL CABLE SWITCH IS ON (SENSE SWITCH 16 ON). NOTE: SEE NOTES IN PARA 3.2.	
	08	BUSY AND RUNAWAY TEST A TEST LOOP INSTRUCTION IS PERFORMED WITH 62 BAUD CLOCK.'BUSY' IS CHECKED TO SEE IF ON.THE CURRENT LSR IS CONTINUALLY SENSED DURING THIS I/O OPERATION TO DETERMINE IF IT IS BEING UPDATED BY 1 AND IF IT EVER EXCEEDS THE STOP LSR (RUNAWAY). AT INTERRUPT TIME THE CURRENT LSR IS COMPARED TO THE STOP LSR TO SEE IF THEY ARE EQUAL.	16
	09	I/O ATTENTION TEST TESTS REJECTION OF I/O INSTRUCTION BECAUSE OF BSCA NOT ENABLED OR PREVIOUS I/O OPERATION ISSUED.I/O ATTENTION LIGHT WILL FLASH ON DURING THIS TEST.	16
802 & 882 - BSCA DIAGNOSTIC	01	LOOP TEST PERFORMS START I/O TEST LOOP INSTRUCTION ON DATA 7F55......55(16 BYTES).THE TRANSMIT AND RECEIVE TRIGGERS ARE SENSED DURING THE OPERATION. AT INTERRUPT TIME THE DATA IN CORE AND THE DATA FROM THE TRIGGERS ARE CHECKED.THE DATA IN THE BSCA IS SHIFTED OUT THE TRANSMIT TRIGGER TO THE CABLE AND BACK INTO THE RECEIVE TRIGGER WHEN THE EXTERNAL TEST SWITCH IS ON.THE DATA GOES INTO THE DATA SET IF IT HAS LOCAL TEST FEATURE	10 11 16
	02	TRANSMIT CYCLE STEAL TEST PERFORMS START I/O - TRANSMIT WITH 62 BAUD CLOCK. NO DATA IS CHECKED WITH THIS ROUTINE.THE CURRENT LSR IS CHECKED TO SEE IF IT IS UPDATING BY 1 FOR EACH CYCLE STEAL AND IF A RUNAWAY CONDITION EXISTS.	16
	03	COMPARE TEST PERFORMS START I/O - RECEIVE WITH THE STOP LSR SET 1 BYTE AFTER THE CURRENT LSR. TESTS IF OP-END CONDITION COMES UP FOR EACH OPERATION WHEN ALL ADDRESS COMBINATIONS IN CORE ARE TRIED.	16 10
	04	CONTINUOUS SYN TRANSMIT IF SENSE SWITCH 20 IS ON THIS ROUTINE WILL CONTINUOUSLY TRANSMIT SYNS. SENSE SWITCH 21 PUTS BSCA INTO TEST MODE DURING THIS OPERATION. ONCE THIS ROUTINE STARTS ONLY IPL OR SYSTEM RESET STOPS TRANSMISSION.THIS ROUTINE COULD BE USED IN CONJUNCTION WITH AN OSCILLOSCOPE TO DIAGNOSE FAILURES.THIS ROUTINE COULD ALSO BE USED FOR REMOTE SITE DIAGNOSTIC SUPPORT BY TRANSMITTING SYNS TO HELP ISOLATE THE FAILING STATION OR LINE. WHEN SENSE SWITCH 21 IS ON, THE EXTERNAL TEST SWITCH MUST ALSO BE ON.	20 21

1.2 DIAGNOSTIC DESCRIPTIONS (CONTINUED)

	05	AUTO CALL (PERFORMED ONLY WITH AUTO CALL FEATURE) THIS ROUTINE CALLS ANY TELEPHONE NUMBER (UP TO 11 DIGITS) THAT IS PLACED IN CORE (BY DATA SWITCHES OR BY REP CARD) BY THE FE. THE ROUTINE WILL PRINT OUT WHERE TELEPHONE NUMBER SHOULD BE LOCATED IN CORE.	
803 & 883 - BSCA DIAGNOSTIC ** EBCDIC SECTION ** THIS SECTION WILL BE IGNORED IF UDT ENTRY INDICATES AN ASCII ADAPTER.	01	RECEIVE TEST MODE TESTS BSCA SIO RECEIVE INSTRUCTION IN STEP MODE. TWELVE DIFFERENT TEST MESSAGES ARE 'RECEIVED' TO TEST PROPER BSCA OPERATION. ANY TEST MESSAGE CAN BE LOOPED ON BY SENSE SWITCH 14. SEE PAGES 14A-15 OF PROGRAM LISTING FOR THESE MESSAGES. I/O CHECK LIGHT WILL FLASH DURING THIS ROUTINE.	10 14
	02	TRANSMIT TEST MODE PERFORMS BSCA SIO TRANSMIT ONLY, ON FOUR DIFFERENT TEST MESSAGES. DATA IS SENSED AT THE TRANSMIT TRIGGER AND COMPARED TO EXPECTED DATA. INDIVIDUAL MESSAGES CAN BE LOOPED ON. MESSAGES ARE LISTED IN BACK OOF PROGRAM LISTING ON PAGE 16A. IF RUNNING ICA IN REMOTE WITH UDT BIT '1' ON, ERRORS WILL OCCUR IN THIS ROUTINE. (FIRST ERROR HALT WILL BE HALT 18).	10 14
	03	RECEIVE INITIAL TEST MODE PERFORMS BSCA SIO RECEIVE INITIAL IN TEST MODE. FOR POINT TO POINT ADAPTERS THE TEST MESSAGE IS 55 SYNSYN A 00 ETX 00. FOR MULTIPOINT, THE MESSAGE TESTS PROPER DECODING OF STATION ADDRESS. ALSO BUSY LATCH IS CHECKED TO SEE IF IT COMES UP AT PROPER TIME FOR EACH TYPE OF NETWORK.	10
804 & 884 - BSCA DIAGNOSTIC ** ASCII SECTION ** THIS SECTION WILL BE IGNORED IF UDT ENTRY INDICATES AN EBCDIC ADAPTER.	01	RECEIVE TEST MODE SAME AS ROUTINE 1 IN SECTION 803 & 883 EXCEPT ONLY ELEVEN TEST MESSAGES. MESSAGES ARE IN PROGRAM LISTING ON PAGES 13A-14. I/O CHECK LIGHT WILL FLASH.	10 14
	02	TRANSMIT TEST MODE SAME AS ROUTINE 2 IN SECTION 803 & 883 EXCEPT ONLY THREE TEST MESSAGES. MESSAGES ARE LISTED IN BACK OF PROGRAM LISTING ON PAGE 15.	10 14
	03	RECEIVE INITIAL TEST MODE SAME AS ROUTINE 3 IN SECTION 803 & 883	10
805 & 885 - BSCA DIAGNOSTIC	01	TRANSMIT AND RECEIVE TEST MODE PERFORMS BSCA TRANSMIT AND RECEIVE INSTRUCTION IN TEST MODE. FOR THE TRANSMIT PORTION THE TRANSMIT TRIGGER IS SENSED TO OBTAIN DATA BEING SENT. AT INTERRUPT BOTH TRANSMITTED AND RECEIVED DATA IS CHECKED. ALSO, ALL TIO LATCHES AND STATUS AND DIAGNOSTIC BITS ARE MONITORED. FINALLY THE CURRENT LSR IS CHECKED TO SEE IF IT EQUALS THE STOP LSR. BCC GENERATION AND COMPARISON LOGIC IS CHECKED.	10
	02	SYNC IDLE INSERTION FOR ADAPTERS WITH TRANSPARENCY AND INTERNAL CLOCK FEATURES ONLY. DOES A BSCA TRANSMIT IN TEST MODE. SENSING FROM THE TRANSMIT TRIGGER GIVES THE DATA TRANSMITTED. AFTER 64 CHARACTERS A 'DLE SYN' SHOULD BE INSERTED IN THE MESSAGE.	10
	03	LONG BCC GENERATION A LONG MESSAGE (600 BYTES) IS TRANSMITTED. THE GENERATED BCC (BLOCK CHECK CHARACTERS) OF THIS MESSAGE (BCC GOTTEN BY SENSE CRC|VRC|LRC INSTRUCTION) IS COMPARED TO KNOWN VALUE OF BCC.	10
	04	SYN-SYN INSERTION TEST PERFORMS TRANSMIT INSTRUCTION WITH STEP MODE (62 BAUD CLOCKING). TESTS IF SYN SYN IS INSERTED EVERY SECOND INTO THE TRANSMITTED DATA. THIS ALSO PROVIDES TEST OF 1 SECOND TIMEOUT.	
806 & 886 - BSCA DIAGNOSTIC	01	3 SECOND TIMEOUT TEST TESTS OCCURRENCE AND ACCURACY OF NOMINAL 3.25 SEC TIMEOUT FOR THREE CASES: 1. RECEIVING ZEROS. 2. RECEIVING ALL SYNS. 3. RECEIVING ALL ZEROS AFTER 2 SYNS RECEIVED. USES 62 BAUD CLOCK	
	02	TRANSMIT TIMEOUT TEST TESTS FOR 3 SECOND TRANSMIT OF SYNS AFTER ONE ITB BLOCK IS SENT. USES 62 BAUD CLOCK	
	03	MULTIPLE ITB TEST TESTS ISSUING ONE BSCA SIO INSTRUCTION FOR EACH ITB BLOCK TO BE SENT. THREE BLOCKS ARE TRANSMITTED. USES 62 BAUD CLOCK.	
	04	CONTINUOUS TRANSMIT (USING DATA CARD IF RUNNING FROM MFCU, USING KEYBOARD IF CARDLESS, OR USING DATA IN CORE IF RUNNING FROM DISK). SEE SECTION 4.6 FOR USAGE. TEST MODE IS TURNED ON BY SENSE SWITCH 21. ONLY A SYSTEM RESET OR IPL WILL TERMINATE THIS ROUTINE. SHOULD BE USED FOR SCOPING FAILURES OR PROVIDING REMOTE DIAGNOSTIC SUPPORT. SEE SECTION 4.6 OF THIS BLOCK FOR DATA CARD EXAMPLE IF SENSE SWITCH 21 IS ON, THE EXTERNAL TEST SWITCH MUST ALSO BE ON.	20 21

1.3 SECTION SENSE SWITCHES

SENSE SWITCH NUMBER	OPTION IN EFFECT WHEN THE SWITCH IS ON	SECTION AFFECTED BY SWITCH
10	PUTS BSCA INTO STEP MODE OPERATION (62 BAUD STEP) SEE NOTE	802 - 805 882 - 885
11	LOCAL TEST WANTED (ONLY USABLE WHEN DATA SET HAS LOCAL TEST FEATURE AND HIGH SPEED OR WITH 1200 BPS INTERGRATED MODEM.	802
12	TERMINATION OF ON-LINE TEST	809
14	LOOP ON RECEIVE OR TRANSMIT MESSAGE	803.804 883,884
15	FOR ON-LINE TEST.LOOP ON MESSAGE	809
16	MEANS EXTERNAL TEST SWITCH ON	801,802 881,882
17	DELAYS RESPONSE 10 SECONDS AFTER RECEIPT OF RFT MESSAGE USE ONLY WHEN A 2780 IS ON-LINE REQUESTER.	80A
18	WORLD TRADE ANSWER TONE GENERATED BY BSCA	80A
19	TESTING 2770	809
1A	TEST BSCA 2 OR ICA WHEN LOCATED IN BSCA-2 LOCATION. (UDT=88)	809,80A
1D	STATION HAS BAUD RATE SWITCH AND CDSTL(CONNECT DATA SET TO LINE	801
20	WANT CONTINUOUS TRANSMIT	802-4,806-4 882-4,886-4
21	TEST MODE FOR CONTINUOUS TRANSMIT ROUTINES	802-4,806-4 882-4,886-4
29	DO NOT CLEAR HISTORY OR SDR TABLE	80E
2A	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-F1 AND CLEAR UNDER SSW 29 CONTROL.	80E
2B	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-R1 AND CLEAR UNDER SSW 29 CONTROL.	80E
2C	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-F1 AND CLEAR UNDER SSW 29 CONTROL.	80E
2D	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-R1 AND CLEAR UNDER SSW 29 CONTROL.	80E
2E	ERAP DATA LOCATED ON 5444 F1.	80E
2F	ERAP DATA LOCATED ON 3340 SIMULATED F1.	80E

NOTE: 62 BAUD STEP IS AN INTERNALLY GENERATED 62 BIT PER SECOND SIMULATED MODEM CLOCKING, USED FOR TESTING AT A REDUCED RATE. STEP SWITCH MODE REQUIRES THE ADDITION OF A JUMPER FROM 50Z-W5L2G05 TO 50Z-W5L2B03 FOR BSCA OR ICA. THIS JUMPER IS NOT USED FOR NORMAL RUNNING OF THE DIAGNOSTICS.

1.4 S/3 BSCA ON-LINE TEST

PROVIDES ON-LINE TESTING CAPABILITY AS DEFINED IN SPECIFICATION CP-AR-000668-02-RAL.
TWO TEST SECTIONS ARE PROVIDED - 809 RFT(REQUEST FOR TEST) REQUESTOR AND 80A RFT RESPONDER.
EQUIVALENT PROGRAMS ARE NEEDED IN OTHER STATION SUCH AS 1130 OR S/360.IF TWO S/3'S
ARE TO BE TESTED THEN SECTION 809 WILL BE LOADED IN ONE STATION AND SECTION 80A LOADED
IN THE OTHER.BOTH SECTIONS OPERATE UNDER DCP (DIAGNOSTIC CONTROL PROGRAM).
TO RUN WITH THE RALEIGH TELEPROCESSING CENTER LOAD SECTION 809 (REQUESTOR) AND ENTER ID INFORMATION DESCRIBED IN
SECTION 1.31.CONSULT BRANCH OFFICE FOR RALEIGH TP CENTER TELEPHONE NUMBERS.

1.4.1 ON-LINE TEST OPERATING PROCEDURES (ADDITIONAL INFORMATION IS AVAILABLE IN THE BSCA ON-LINE TEST MAP CHARTS)

OPERATION OF 809 REQUESTOR

STEP 1. PREPARE 'REPLACE' CARDS AND PUT INTO 809 SECTION BEFORE END CARD. THESE CARDS ARE ONLY USED IF THE FOLLOWING INFORMATION IS NEEDED. (SEE NOTE 1 IF DISK SYSTEM)

A. IF THE BSCA HAS AUTO CALL FEATURE, PUT TELEPHONE NUMBER INTO CORE BY REPLACE CARD. (SEE NOTE 1)
TO INSURE CORRECT BILLING OF CALL DO NOT USE AUTO CALL FACILITY WHEN CONTACTING RALEIGH TEST CENTER ON TOLL CALLS.
FORMAT OF REPLACE CARD :

```
COL   1    R
      2    BLANK
    3-6    1D05
      7    BLANK
    8-9    HEXIDECIMAL LENGTH OF TELEPHONE NUMBER (MAXIMUM OF ELEVEN DIGITS)
    10-    TELEPHONE NUMBER IN FORM 0X0Y..0Z. IN OTHER WORDS,PUT A ZERO BEFORE EVERY DIGIT ON REPLACE CARD
```

EXAMPLE: IF THE TELEPHONE NUMBER IS 1-507-288-5743 THEN THE REPLACE CARD WOULD BE:

```
                             1                   2                   3
COL        1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

CHAR       R   1 D 0 5   0 B 0 1 0 5 0 0 0 7 0 2 0 8 0 8 0 5 0 7 0 4 0 3
```

B. IF BSCA HAS MULTIPOINT TRIBUTARY FEATURE,PUT POLLING AND SELECTION ADDRESSES INTO CORE BY REPLACE CARD:
FORMAT OF REPLACE CARD : (SEE NOTE 1)

```
COL   1    R
      2    BLANK
    3-6    1D00
      7    BLANK
   8-11    HEXIDECIMAL POLLING ADDRESS
  12-15    HEXIDECIMAL SELECTION ADDRESS
```

THE POLLING ADDRESS IS USED TO TELL THE S/3 BSCA TO TRANSMIT DATA. THE SELECTION ADDRESS IS USED TO TELL THE S/3 BSCA TO RECEIVE DATA. THE POLLING ADDRESS IS PUT INTO THE TRANSITION REGISTER PRIOR TO THE FIRST RECEIVE INITIAL INSTRUCTION. THE SELECTION ADDRESS IS SENT TO THE CONTROL STATION IN THE RFT MESSAGE SO THAT IT KNOWS THE S/3 SELECTION ADDRESS. SEE SECTION 1.32 FOR TRANSMISSION SEQUENCES.

C. IF THE OTHER STATION REQUIRES ID VERIFICATION, THEN PUT UP TO 15 CHARACTER ID IN CORE BY REPLACE CARD.
SEE SECTION 1.32 IF INTERESTED IN TRANSMISSION SEQUENCE.

FORMAT OF REPLACE CARD FOR EBCDIC BSCA: (SEE NOTE 1)

```
COL   1    R
      2    BLANK
    3-6    1D12
      7    BLANK
    8-9    HEXIDECIMAL NUMBER OF ID CHARACTERS (MAXIMUM OF FIFTEEN)
    10-    HEXIDECIMAL REPRESENTATION OF CHARACTERS
```

EXAMPLE: IF THE ID REQUIRED IS THE WORD 'ROCHESTER' THEN THE REPLACE CARD WOULD BE:

```
                        1                   2
COL   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9

CHAR  R   1 D 1 2   0 9 D 9 D 6 C 3 C 8 C 5 E 2 E 3 C 5 D 9
```

SAMPLE REPLACE CARD FOR EBCDIC DATA:

```
                        1                   2
COL   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
CHAR  R   1 D 1 2   0 8 6 1 F 2 F 7 F 9 F 5 F 4 F 1 F 0
```

FORMAT OF CARD FOR ASCII BSCA: (SEE NOTE 1)

```
COL   1    R
      2    BLANK
    3-6    1D12
      7    BLANK
    8-9    0D
  10-25    2F3N3N3N2FXXXXXX2F35343130          WHERE NNN IS BRANCH OFFICE NUMBER OF FE.
                                               WHERE XXXXXX IS THE BRANCH OFFICE SECURITY CODE.
```

SAMPLE REPLACE CARD FOR ASCII BSCA:

```
                        1                   2                   3
COL   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
CHAR  R   1 D 1 2   0 D 2 F 3 2 3 7 3 9 2 F X X X X X X 2 F 3 5 3 4 3 1 3 0
```

TO OPERATE WITH THE RALEIGH TELEPROCESSING CENTER THE FE MUST ENTER THE FOLLOWING ID INFORMATION BY REPLACE CARD FOR EBCDIC DATA: (SEE NOTE 1)

```
COL   1    R
      2    BLANK
    3-6    1D12
      7    BLANK
    8-9    0D
  10-25    61FNFNFN61XXXXXX61F5F4F1F0          WHERE NNN IS THE BRANCH OFFICE NUMBER OF FE.
                                               WHERE XXXXXX IS THE BRANCH OFFICE SECURITY CODE.
```

D. IF MESSAGE XX=00 OR 01 IS TO BE SELECTED THE FE MUST PUT IN CORE THE DATA (INCLUDING CONTROL CHARACTERS) HE WANTS TRANSMITTED.

FORMAT OF REPLACE CARD: (SEE NOTE 1)

```
COL   1    R
      2    BLANK
    3-6    1D37 FOR XX=00 OR 1D61 FOR XX=01
      7    BLANK
    8-9    HEXIDECIMAL LENGTH MINUS ONE OF DATA
    10-    HEXIDECIMAL DATA
```

EXAMPLE: FOR MESSAGE XX=00 STX M ETX IS TO BE TRANSMITTED:

```
                        1
COL   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7
CHAR  R   1 D 3 7   0 2 0 2 D 4 0 3
```

STEP 2. LOAD DCP AND SECTION (SEE 2.0-OPERATING PROCEDURES).

STEP 3. AT THE 'HA' HALT TURN ON SENSE SWITCH 1A IF BSCA-2 OR ICA LOCATED IN BSCA-2 POS IS BEING TESTED. (UDT=88) RESETTING FINAL 'HA' HALT ('FA5' ON CERTAIN MODELS) WILL CAUSE FOLLOWING PRINTOUT:

'S/3 ON-LINE TEST REQUESTOR SECTION 809'
'ENTER XXYY INTO SWITCHES FOR MESSAGE TYPE AND NUMBER OF TIMES REPEATED. THEN RESET HALT'

THEN AN 'E0' HALT COMES ON.

AT THIS TIME THE FE SHOULD SELECT FROM APPENDIX A THE MESSAGE NUMBER TO BE ENTERED INTO THE LEFT TWO SWITCHES. IN THE TWO RIGHTMOST SWITCHES PUT THE NUMBER OF TIMES (USE ONLY NUMERICS 01 TO 99) THE TEXT IS TO BE REPEATED. * NOTE * SELECT TEST MESSAGES CONSISTANT WITH THE SYSTEM CONFIGURATION (EBCDIC/ASCII, TRANSPARENCY/NON-TRANSPARENCY ETC.) . MAKE SURETHAT THE REMOTE BSCA BEING TESTED IS CAPABLE OF RESPONDING TO THE TEST MESSAGE BEING SELECTED.

NOTE 1 IF USING A DISK ONLY SYSTEM ENTER REPLACE CARD INFORMATION AS INDICATED IN GENERAL USERS GUIDE. PROGRAM 'FF6' IS USED TO KEY THIS INFORMATION INTO SECTION. MODEL 8 REFER TO BLOCK 20.'FB1'. IF RUNNING FROM 3340, USE PROGRAM DD6 AND USERS GUIDE BLOCK 94.

CODE TYPE	TRANSPARENCY FEATURE	APPLICABLE MESSAGES
EBCDIC	YES	00,01,02,04,14,15,16,19
EBCDIC	NO	00,01,04,14,15,16
ASCII	NOT AVAILABLE	00,01,05,06

** WARNING **
IF XX=00 OR XX=01 THEN THE FE MUST HAVE PREVIOUSLY PUT THE MESSAGE CONTENT INTO CORE BY REPLACE CARD OR MANUALLY. SEE STEP 1.D ABOVE FOR REPLACE CARD FORM.

AFTER RESETTING 'E0' HALT THE MESSAGE NUMBER (XX) AND THE NUMBER OF TIMES REPEATED (YY) VALUES ARE PRINTED.

STEP 4. RESETTING HALT 'E0' AFTER ENTERING PROPER NUMBERS WILL START TEST IF BSCA IS MULTIPOINT OR POINT-TO-POINT LEASED.
IF THE BSCA IS POINT-TO-POINT SWITCHED THE TELEPHONE NUMBER MUST BE DIALED WHEN AUTO CALL FEATURE IS NOT INSTALLED. WHEN MANUALLY DIALING KEEP 'TALK' BUTTON DEPRESSED ON DIALING UNIT UNTIL THE CALL IS ANSWERED AND A TONE APPEARS, THEN PUSH 'DATA' BUTTON AND HANG UP RECEIVER. 'DATA SET READY' INDICATOR SHOULD APPEAR A FEW SECONDS AFTER DEPRESSING BUTTON AND TEST SHOULD BEGIN.
WHEN AUTO CALL FEATURE IS INSTALLED RESETTING 'E0' WILL GIVE THE FOLLOWING PRINTOUT WITH HALT 'E1'

'ENTER TEL. NO. STARTING AT CORE LOC 1D05 WITH XX0Y..0Y XX IS NO. DIGITS AND 0Y ARE DIGITS'

'IF NUMBER IS IN CORE ALREADY RESET HALT'

IF THE FE USED THE REPLACE CARD FOR THE TELEPHONE NUMBER THEN HE SHOULD JUST RESET 'E1' HALT AND NUMBER WILL BE DIALED AND TEST STARTED WHEN CONNECTION IS ESTABLISHED. ALSO AFTER RESETTING 'E1' HALT THE TELEPHONE NUMBER BEING CALLED IS PRINTED OUT FOR VERIFICATION OF CORRECT NUMBER.

STEP 5. IF THE TEST RAN CORRECTLY THE FOLLOWING SHOULD BE THE ONLY PRINTOUT:

'NORMAL TERMINATION'

AND THE PROGRAM GOES BACK TO THE 'E0' HALT.AT THIS POINT THE FE CAN PUT IN ANOTHER MESSAGE OR TERMINATE THE TEST BY TURNING ON SENSE SWITCH 12 WHEN THE 'E0' HALT COMES UP.

IF THE FE WISHES NO MANUAL INTERVENTION HE CAN TURN ON SENSE SWITCH 15 AND LOOP CONTINUOUSLY ON A MESSAGE TIL A SYSTEM RESET IS DONE OR THE SWITCH IS TURNED OFF. THIS SWITCH SHOULD BE TURNED ON WHEN THE 'E0' HALT COMES UP AND BEFORE THE XX AND YY VALUES ARE ENTERED.

NO ERROR HALTS OCCUR. ONLY PRINTOUTS INDICATE PROBLEMS. ERROR PRINTOUTS ARE LISTED IN SECTION 1.33. TO DETERMINE NATURE OF PROBLEM RELATE THE PRINTOUT TO THE LINE CONTROL(SECTION 1.32) OF THE PARTICULAR MESSAGE FORMAT USED.

EXAMPLE 1

```
          PRINTOUT IS:
        XX IS 01 YY IS 10
        **** ERROR *****
        CURRENT YY IS 10
        SENT RFT EXP ACK1
```

LOOKING AT THE LINE CONTROL (1.32) FOR MESSAGE 01 POINT-TO-POINT AND THE PRINTOUT THAT NO ACK1 WAS RECEIVED AFTER SENDING OUR RFT (REQUEST-FOR-TEST) MESSAGE (SOH% ETC) INDICATES COMMUNICATION WAS ESTABLISHED (WE SENT ENQ AND OTHER STATION ACKNOWLEDGED WITH ACK0)BUT THEN A FAILURE OCCURED. 'CURRENT YY IS__' MEANS THE PRESENT STATE OF THE YY COUNTER SINCE IT IS DECREMENTED AFTER EACH RECEIVE OPERATION.

EXAMPLE 2

```
    PRINTOUT IS:
  XX  IS  14   YY  IS  07
  CRC/LRC/VRC CHECK
  **** ERROR  *****
  XX  IS  14   YY  IS  07
  CURRENT  YY  IS  04
  DATA COMPARE ERROR
  DATA TRANSMITTED WAS
  1061
  DATA RECEIVED WAS
  02C1C2C3C4C5C6C7C8C9D1D2D3D4D5D6
  D7D8D9E2E3E4E5E6E7E8E9F0F1F2F3F4
  F5F6F7F8FD03
```

NOTE : ALL ERROR PRINTOUTS ABOVE REFER TO LAST TRANSMIT AND RECEIVE OPERATION PERFORMED.

THE PRINTOUT 'CRC/LRC/VRC CHECK' INDICATES POSSIBLE LINE HIT. 'DATA COMPARE ERROR' INDICATES DATA RECEIVED WAS NOT AS EXPECTED.THEN THE DATA FROM THE LAST TRANSMIT AND RECEIVE INSTRUCTION IS PRINTED.DATA TRANSMITTED IS 1061(ACK1) WHICH IS AN AFFIRMATIVE RESPONSE TO THE LAST BLOCK OF RECEIVED DATA.SINCE MESSAGE 14 SHOULD BE 36 CHARACTERS (A-Z,1-9 FRAMED BY STX AND ETX) WE SEE THAT THE LAST DATA BYTE 'F9' WAS PROBABLY ALTERED TO 'FD' BY NOISE ON LINE (LINE HIT).

1.4.2 ON-LINE TEST OPERATING PROCEDURES CONTINUED

OPERATION OF 80A RESPONDER

STEP 1 PREPARE 'REPLACE' CARDS AND PUT INTO 80A SECTION BEFORE END CARD. THESE CARDS ARE ONLY USED IF THE FOLLOWING INFORMATION IS NEEDED.

A IF THE BSCA HAS MULTIPOINT TRIBUTARY FEATURE,PUT SELECTION ADDRESS INTO CORE BY REPLACE CARD: (SEE NOTE 1)

FORMAT OF REPLACE CARD:

```
COL     1  R
        2  BLANK
      3-6   1B4A
        7   BLANK
     8-15   UP TO 4 HEXIDECIMAL BYTES REPRESENTING SELECTION CHARACTERS
```

THIS SELECTION ADDRESS IS PUT INTO THE TRANSITION LSR AND USED DURING THE RECEIVE INITIAL INSTRUCTION. THE OTHER STATION MUST SEND THIS ADDRESS IN IT'S INITIAL SELECTION SEQUENCE.

B IF THE BSCA HAS MULTIPOINT MASTER FEATURE,PUT POLLING ADDRESS INTO CORE BY REPLACE CARD: (SEE NOTE 1)

FORMAT OF REPLACE CARD:

```
COL     1  R
        2  BLANK
      3-6   1B4A
        7   BLANK
     8-15   UP TO 4 HEXIDECIMAL BYTES REPRESENTING POLLING CHARACTERS.(SEE NOTE 2)
```

C IF THE OTHER STATION REQUIRES ID VERIFICATION THEN PUT UP TO 15 CHARACTER ID INTO CORE BY REPLACE CARD. SEE SECTION 1.32 IF INTERESTED IN TRANSMISSION SEQUENCE.

FORMAT OF REPLACE CARD: (SEE NOTE 1)

```
COL     1  R
        2  BLANK
      3-6  1B4F
        7  BLANK
      8-9  HEXIDECIMAL NUMBER OF ID CHARACTERS (MAXIMUM OF FIFTEEN)
      10-  HEXIDECIMAL REPRESENTATION OF CHARACTERS
```

EXAMPLE IF THE ID REQUIRED IS 'JOHNDOE' THEN THE CARD WOULD BE:

```
                           1                             2
COL      1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6
CHAR     R     1  B  4  F     0  7  D  1  D  6  C  8  D  5  C  4  D  6  C  5
```

STEP 2 LOAD DCP AND SECTION (SEE 2.0 - OPERATING PROCEDURES) WHEN THE REQUESTOR IS A 2780,SET SENSE SWITCH 17,THIS SENSE SWITCH PROVIDES THE 2780 10 SECONDS TO READY THE PUNCH AFTER REQUESTING AN ON-LINE TEST MESSAGE (PUNCH).

STEP 3 AT THE 'HA' HALT TURN ON SENSE SWITCH 1A IF BSCA-2 OR ICA LOCATED IN BSCA-2 POSITION IS BEING TESTED. (JDT=88) RESETTING FINAL 'HA' ('FA5' ON CERTAIN MODELS) HALT WILL CAUSE FOLLOWING PRINTOUT:

'ENTER ID OR SELECTION ADDRESS IF REQUIRED

THEN AN 'E2' HALT COMES ON.

THE PRINTOUT REMINDS THE FE THAT THIS INFORMATION MUST BE IN CORE BEFORE THE TEST STARTS IF ID OR SELECTION ADDRESS IS REQUIRED.

TURN ON SENSE SWITCH 18 IF WORLD TRADE ANSWER TONE IS TO BE GENERATED BY BSCA.

STEP 4 TO START TEST RESET 'E2' HALT.

IF AFTER 90 SECONDS NOTHING IS RECEIVED THERE WILL BE A PRINTOUT INDICATING THIS AND THE PROGRAM WILL GO BACK TO THE 'E2' HALT.

IF THE TEST RUNS CORRECTLY THE ONLY PRINTOUTS WOULD BE:

```
'XX IS --  YY IS --'
'NORMAL TERMINATION'
```

WHERE XX IS MESSAGE TYPE AND YY IS THE NUMBER OF TIMES REPEATED.

ANY OTHER PRINTOUTS INDICATE A PROBLEM. NO ERROR HALTS OCCUR.

AFTER A TEST MESSAGE IS DONE THE PROGRAM GOES BACK TO A RECEIVE INSTRUCTION (NO 'E2' HALT IN BETWEEN) AND WAITS FOR THE NEXT LINE BID. THE PROGRAM WILL DO UP TO 7 OF THESE RECEIVE INSTRUCTIONS (TIMEOUTS OCCUR) BEFORE PRINTING THE PROBLEM AND GOING BACK TO THE 'E2' HALT. THIS PRINTOUT COULD OCCUR IF THE FE AT THE OTHER STATION DOES NOT SELECT ANOTHER MESSAGE WITHIN APPROXIMATELY 23 SECONDS AFTER COMPLETION OF THE LAST MESSAGE.

IF AN ERROR OCCURS THERE WILL BE PRINTOUTS INDICATING THE NATURE OF THE PROBLEM. FOR INSTANCE, WHAT EXPECTED RESPONSE WASN'T RECEIVED OR WHAT DATA RECEIVED WASN'T CORRECT OR IF A BCC CHECK OCCURED ETC. ALSO PRINTED IS THE DATA FROM THE LAST TRANSMIT AND RECEIVE INSTRUCTION (OR THE LAST RECEIVE ONLY INSTRUCTION) IN THE FORM:

```
'DATA TRANSMITTED WAS'
'XXXX  . . . . . .XXXX'
'XXXX  . . . . . .XXXX'
'DATA RECEIVED WAS'
'XXXX  . . . . . .XXXX'
'XXXX  . . . . . .XXXX'
```

THE OTHER STATION (REQUESTOR) SHOULD ONLY REQUEST THE FOLLOWING VALID XX VALUES:

FEATURE OR CODE		TRANS-PARENCY	APPLICABLE MESSAGE(S)
MULTIPOINT TRIBUTARY		YES/NO	00
MULTIPOINT MASTER	EBCDIC	YES	00,01,02,04,12,13,14,15,16,19,20,21,22,99
OR	EBCDIC	NO	00,01,04,12,13,14,15,16,99
POINT TO POINT	ASCII	NO	00,01,05,06,07,08,99

ERROR PRINTOUTS ARE LISTED IN SECTION 1.33. TO DETERMINE NATURE OF PROBLEM RELATE THE PRINTOUT TO THE LINE CONTROL (SECTION 1.32) FOR THE PARTICULAR MESSAGE FORMAT USED.

NOTE 1 IF USING A DISK ONLY SYSTEM ENTER REPLACE CARD INFORMATION AS SHOWN IN GENERAL USERS GUIDE. PROGRAM 'FF6' ('FB1' ON 5408, 'DD6' IF RUNNING FROM 3340), IS USED TO KEY THIS INFORMATION INTO SECTION.

NOTE 2 MOST BSCA TERMINALS HAVE A TWO BYTE POLLING ADDRESS, FOR EXAMPLE C1C1(POLLING CHARACTERS ARE AA). HOWEVER THE 2972/2980 BANKING TERMINAL REQUIRES A THIRD BYTE, F0. THEREFORE THE REPLACE CARD FOR THE 2972/2980 SHOULD BE C1C1F0. THE F0 BYTE DOES NOT CHANGE EVEN THOUGH THE FIRST TWO BYTES WILL CHANGE TO REFLECT THE PROPER POLLING ADDRESS (I.E. C2C2F0, C3C3F0, ETC).

1.4.3 LINE CONTROL FOR ON-LINE TEST

```
XX = 00 POINT TO POINT
              *SEE NOTE 1*                     *--SEE NOTE 2--*
                    E         S         S E    (D) S        (D) E     TEXT AND CONTROL              E
REQUESTOR     (I)   N         O % 0 YY 0 T T   (L) T TEXT   (L) T     CHARACTERS REPEATED           O
              (D)   Q         H          X X   (E) X        (E) X     YY-1 TIMES                    T

                        A                 A                  A                         A
RESPONDER         (I)   C                 C                  C                         C REPEATED
                  (D)   K                 K                  K                         K YY-1 TIMES
                        0                 1                  0                         0
                                                                                       /
                                                                                       1

XX = 01 POINT TO POINT
              *SEE NOTE 1*              *--SEE NOTE 2 --*           A                  A                   A
                    E         S         (D) S        (D) E    E     C                  C                   C REPEATED
REQUESTOR     (I)   N         O % 1 YY 0 (L) T TEXT  (L) T    O     K                  K                   K YY-1 TIMES
              (D)   Q         H         (E) X        (E) X    T     0                  1                   0
                                                                                                           /
                                                                 *--SEE NOTE 2--*                          1
                        A                               A    E   (D) S        (D) E  TEXT AND CONTROL           E
RESPONDER         (I)   C                               C    N   (L) T TEXT   (L) T  CHARACTERS                 O
                  (D)   K                               K    Q   (E) X        (E) X  REPEATED YY-1 TIMES        T
                        0                               1

XX = 01 MULTIPOINT
                                    *--SEE NOTE 2--*                A                  A                   A
                        S         A (D) S       (D) E      E        C                  C                   C REPEATED
REQUESTOR               O % 1 YY N D (L) T TEXT (L) T      O        K                  K                   K YY-1 TIMES
                        H         D (E) X       (E) X      T        0                  1                   0
                                  R                                                                        /
                                                                 *--SEE FOTE 2--*                          1
                E P E                                   A  E A E (D) S        (D) E  TEXT AND CONTROL                E
RESPONDER       O O N                                   C  O D N (L) T TEXT   (L) T  CHARACTERS                      O
                T L Q                                   K  T D Q (E) X        (E) X  REPEATED YY-1 TIMES             T
                  L                                     1    R

XX = 02-22 POINT TO POINT
              *SEE NOTE 1*
                    E         S          A S E    E    A                  A
REQUESTOR     (I)   N         O % XX YYN D T T    O    C                  C REPEATED
              (D)   Q         H          D X X    T    K                  K YY TIMES
                                         R             0                  0
                                                                          /
                        A                A    E    S        E             1                E
RESPONDER         (I)   C                C    N    T TEXT   T  REPEATED                    O
                  (D)   K                K    Q    X        X   YY TIMES                   T
                        0                1
TEXT  IS SPECIFIED BY 'XX' (SEE APPENDIX A)

XX = 02-22 MULTIPOINT
                                                                          A
                                                                          C
                        S          A S E     E        A                   K
REQUESTOR               O % XX YY N D T T    O        C                   0 REPEATED
                        H          D X X     T        K                   /  YY TIMES
                                   R                  0                   1
                E P E                   A   E A E  (D) S        (D) E                   E
RESPONDER       O O N                   C   O D N  (L) T TEXT   (L) T REPEATED          O
                T L Q                   K   T D Q  (E) X        (E) X  YY TIMES         T
                  L                     1     R
TEXT IS SPECIFIED BY 'XX' (SEE APPENDIX A)

XX = 99 POINT TO POINT (SEE NOTE 4)
              *SEE NOTE 1*
                    E         S                (D) S        (D) E   E TIME DELAY DUE
REQUESTOR     (I)   N         O  %  99  YY 0   (L) T TEXT   (L) T   O TO OPERATOR
              (D)   Q         H                (E) X        (E) X   T INTERVENTION

                        A                                        A
RESPONDER         (I)   C                                        C
                  (D)   K                                        K
                        0                                        1

              *SEE NOTE 1*
                    E          (D) S        (D) E                                       E
REQUESTOR     (I)   N          (L) T TEXT   (L) T                    REPEATED           O
(CONTINUED)   (D)   Q          (E) X        (E) X                    FOR EACH RECORD    T

                        A                 A                                         A
RESPONDER         (I)   C                 C                                         C
(CONTINUED)       (D)   K                 K                                         K
                        0                 1                                         0
                                                                                    /
                                                                                    1
```

** NOTE 1 IF ID VERIFICATION IS USED OR IF TRANSMITTING TO THE RALEIGH TP TEST CENTER THEN ID CHARACTERS ARE PRESENT AT THIS STAGE.

** NOTE 2 IF THE S/3 IS THE REQUESTOR,THE MESSAGE(CHARACTERS INSIDE THE ASTERISKS INCLUDING THE DLE'S IF TRANPARENT MESSAGE WANTED AND THAT FEATURE PRESENT) MUST HAVE BEEN PREVIOUSLY PUT IN CORE AS WWYY....YY WHERE WW IS THE NUMBER OF HEX CHARACTERS MINUS ONE TO BE ENTERED AND YY ARE THE HEX CHARACTERS(UP TO 40 CHARACTERS). THIS IS PUT IN CORE STARTING AT LOCATION 1D37 WHEN XX=00 AND LOCATION 1D61 WHEN XX=01,BY REPLACE CARD (SEE NOTE 3) (SEE EXAMPLE BELOW) OR MANUALLY.

USE OF REPLACE (REP) CARD FOR LOADING MESSAGE:

```
                    1         2
COLUMN     12345678901234567890
CHARACTER  R 1D37 02024103
```

RESULT IS THAT FOR MESSAGE 00 REQUESTOR WILL SEND STX 41 ETX.

** NOTE 3 IF USING A DISK SYSTEM ENTER REPLACE CARDS AS SHOWN IN GENERAL USERS GUIDE. PROGRAM 'PF6' ('PB1' ON 5408, 'DD6' IF RUNNING FROM 3340), IS USED TO KEY THIS INFORMATION INTO SECTION.

** NOTE 4 SYSTEM 3 WILL BE THE RESPONDER ONLY FOR THIS MESSAGE.

1.4.4 ERROR MESSAGES FOR ON-LINE TEST

MESSAGES IN BOTH SECTION 809 AND 80A

'OP-END ERROR'	OP-END INTERRUPT LATCH NOT ON.HARDWARE ERROR
'INTERRUPT REQUEST PENDING ERROR'	INT REQ PENDING LATCH NOT ON .HARDWARE ERROR
'TIMEOUT'	3.25 SECOND TIMEOUT OCCURRED.
'CRC/LRC/VRC CHECK'	BCC CHECK
'ADAPTER CHECK ON TRANSMIT'	HARDWARE FAILURE
'ADAPTER CHECK ON RECEIVE'	HARDWARE FAILURE
'INVALID ASCII'	BYTE RECEIVED OR TRANSMITTED WAS NOT CHARACTER 00 - 7F
'ABORTIVE DISCONNECT'	DATA SET READY WAS DROPPED
'DISCONNECT TIMEOUT'	20 SECOND TIMEOUT OCCURRED
'DATA SET READY'	DATA SET READY LATCH WAS NOT ON
'BLOCK CYCLE STEAL REQUEST'	HARDWARE ERROR
'LSR OR S-REG CHECK'	HARDWARE ERROR
'OVERRUN/UNDERFLOW'	HARDWARE ERROR
'DBI PARITY CHECK'	HARDWARE ERROR

MESSAGES FOR SECTION 809

'NO RESPONSE AFTER 90 SECONDS'	INITIAL RECEIVE INSTRUCTION(MULTIPOINT) RECEIVED NO POLL AFTER 90 SEC
'CALL ABORTED'	AUTO CALL TERMINATED BECAUSE OF NO ANSWER
'TEL NUM EXCDS 11 DIGITS'	TELEPHONE NO. IN CORE TOO LARGE
'WRONG POLL SEQ'	EITHER POLL ADDRESS OR ENQ WAS NOT PRESENT DURING MULTIPOINT REC INITIAL
'ITB INT BUT NO ITB CHAR'	AN ITB INTERRUPT OCCURRED BUT NO ITB CHARACTER WAS FOUND IN CORE
'XX OR YY INVALID'	XX OR YY VALUES PUT INTO SWITCHES ARE NOT APPLICABLE
'DATA COMPARE ERROR'	EXPECTED DATA MESSAGE DID NOT COMPARE WITH ACTUAL RECEIVED
'SENT RFT EXP ACK1'	SENT RFT MESSAGE(SOH % ETC) BUT ACK1 WAS NOT REPLIED
'SENT 10 RFTS RCVD 10 NAKS'	10 RFT MESSAGES WERE SENT BUT NAK WAS REPLIED EACH TIME
'WRONG SELECTION SEQ'	EITHER SELECTION ADDRESS OR ENQ WAS NOT PRESENT (MULTIPOINT SELECTION)
'SENT ENQ NO ACK0'	NO ACK0 REPLY WAS RECEIVED AFTER ENQ WAS SENT
'RCVD NAK EXPTD ACK0/1'	SENT MESSAGE AND RECEIVED NAK
'EXP ACK0/1'	SENT MESSAGE BUT RECEIVED INVALID RESPONSE
'GOT EOT BUT YY NOT YET 0'	RECEIVED EOT BUT MESSAGE COUNT IS NOT YET ZERO
'NO EOT RCVD BUT YY IS 0'	MESSAGE COUNT IS ZERO BUT NO EOT WAS RECEIVED
'SENT EOT EXP ENQ'	SENT EOT BUT NO ENQ WAS SENT TO START LINE BID

MESSAGES FOR SECTION 80A

'NO RESPONSE AFTER 90 SECONDS'	INITIAL RECEIVE INSTRUCTION HAD NO RESPONSE AFTER 90 SECONDS
'YY IS ZERO BUT NO EOT RECEIVED'	MESSAGE COUNT IS ZERO BUT NO EOT WAS RECEIVED
'INVALID XX VALUE'	THE MESSAGE NUMBER OBTAINED FROM THE RFT MESSAGE WAS INVALID
'INVALID YY VALUE'	THE MESSAGE COUNT OBTAINED FROM THE RFT MESSAGE WAS INVALID
'SENT ACK1 RECEIVED NO EOT'	AFTER SENDING ACK1 IN REPLY TO RFT NO EOT WAS RECEIVED
'SENT MESSAGE RECEIVED NAK'	A NAK WAS RECEIVED AFTER TRANSMITTING MESSAGE
'SENT ENQ RECEIVED NO ACK0'	AFTER RECEIVING RFT AND EOT SENT ENQ BUT NO ACK0 WAS RECEIVED
'DATA COMPARE ERROR'	EXPECTED DATA MESSAGE DID NOT COMPARE WITH ACTUAL RECEIVED
'WRONG SELECTION SEQUENCE'	EITHER SELECTION ADDRESS OR ENQ WAS NOT PRESENT (MULTIPOINT SELECTION)
'NO ENQ DURING RECEIVE'	DURING FIRST RECEIVE OPERATION NO ENQ WAS RECEIVED
'NO RESPONSE AFTER SENDING ACK0'	AFTER REPLYING ACK0 TO INITIAL ENQ NOTHING WAS RECEIVED
'INVALID RFT RECEIVED'	THE RFT MESSAGE RECEIVED CONTAINED INVALID FORMAT
'SENT MESSAGE EXP ACK0/1'	AFTER SENDING MESSAGE AN INVALID RESPONSE WAS DETECTED
'25 WACKS RECEIVED'	A DELAY AT THE OTHER STATION HAS CAUSED WACKS TO BE SENT
'TERMINATED AFTER 3 TIMEOUTS'	THIS STATION SENT EOT AFTER GETTING 3 TIMEOUTS(MESSAGE 99)
'EXP ENQ NOT RECD AFTER DELAY'	SOMETHING OTHER THAN ENQ WAS RECEIVED(MESSAGE 99) AFTER DELAY INTERVAL
'MAX WAIT EXCEEDED FOR LINE BID'	NOTHING WAS RECEIVED(MESSAGE 99) AFTER DELAY INTERVAL
'NO EOT AFTER RFT'	AN EOT WAS EXPECTED AFTER THE OTHER STATION SENT RFT

1.5 DIAGNOSTIC SECTION 80E - TERMINAL STATISTICS

A. SUMMARY

DIAGNOSTIC SECTION 80E DUMPS THE TERMINAL STATISTICS ACCUMULATED ON A CUSTOMER SYSTEM PACK. SINCE IT IS POSSIBLE TO IPL FROM EITHER DRIVE 1 OR DRIVE 3 ON A 5415 MODEL D WITH 3344'S ATTACHED, THERE ARE FOUR POSSIBLE SIMULATION AREAS WHERE THE TERMINAL HISTORY AND SDR CAN BE LOCATED.

B. OPERATION OF SECTION 80E

1. CALL IN SECTION 80P.

2. SENSE SWITCH OPTIONS. (TO BE TURNED ON BEFORE SETTING 'HA' HALT)

   SSW 29 - PREVENT CLEARING OF TERMINAL STATISTICS AFTER PRINTOUT.

3. SENSE SWITCH OPTIONS. (TO BE TURNED ON AT THE 'F9' HALT)

   SSW 2A - PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-F1
   SSW 2B - PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-R1.
   SSW 2C - PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-F1
   SSW 2D - PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-R1.
   SSW 2E - ERAP DATA LOCATED ON 5444 F1.
   SSW 2F - ERAP DATA LOCATED ON 3340 SIMULATED F1.

4. SAMPLE PRINTOUT:

```
*---BSCA 1 TERM STATISTICS----*

TERMINAL   UNSUCCESSFUL    SUCCESSFUL
ADDRESS  I/O OPERATIONS I/O OPERATIONS

4040C1C1         1                 9
4040C2C2       256              4096
4040C3C3      4096             65536
4040C4C4     65535         429467295

TERMINAL STATISTICS DUMP COMPLETE


*---BSCA 2 TERM STATISTICS----*

TERMINAL   UNSUCCESSFUL    SUCCESSFUL
ADDRESS  I/O OPERATIONS I/O OPERATIONS

TERMINAL STATISTICS DUMP COMPLETE
```

5. TERMINAL UNSUCCESSFUL I/O OPERATIONS ARE DECIMAL NUMBERS FROM 0 THROUGH 65,535 (HEX 'FFFF').

   TERMINAL SUCCESSFUL I/O OPERATIONS ARE DECIMAL NUMBERS FROM 0 THROUGH 4,294,967,295 (HEX 'FFFFFFFF').

6. IF NO ERRORS ARE ENCOUNTERED, SECTION 80E TERMINATES WITH A HALT 'HE'.

3.0 HALT INDEX TABLE OF BSCA DIAGNOSTIC SECTIONS. (IF NECESSARY CONVERT DISPLAY LIGHTS ABCD1234 INTO HEX TO GET HALT ID)

3.1 PROGRAM OPERATOR HALTS. -A0- TO -FF-

HALT ID	HALT MEANING	MAP CHART REF	SECTION	ROUTINE
08	ERROR PRINTOUT. SEE PRINTOUT.		80E	1
E0	THE OPERATOR SHOULD ENTER XX AND YY VALUES INTO ADDRESS SWITCHES FOR ON-LINE TEST MESSAGE SELECTION		809	1
E1	THE OPERATOR SHOULD PUT TELEPHONE NUMBER IN CORE FOR AUTO CALL		809	1
E2	RESET HALT TO BEGIN ON-LINE TEST		80A	1
E4	TELLS OPERATOR TO DEPRESS AND HOLD CHECK RESET THEN RELEASE IT		801 881	2
E5	TELLS OPERATOR TO RESET HALT E4 AND SWITCH BAUD RATE SW 4 TIMES		801 881	2
E6	HALT IDENTIFIED ABOVE TO BE RESET AFTER INDICATED OPERATION IS DONE		802 882	2
E7	INTERMEDIATE HALT TO ALLOW OPERATION TO COMPLETE BEFORE GOING ON		801 881	2
E8	REMINDS OPERATOR THAT BEFORE AUTO CALL NUMBER MUST BE IN CORE		802 882	5
EE	RESET HALT TO READ DATA CARD (NOT APPLICABLE FOR CARDLESS SYSTEM)		806 886	4
F0	ENTER RECEIVE MESSAGE NUMBER INTO DATA SWITCHES		803,804 883,884	1
F1	ENTER TRANSMIT MESSAGE NUMBER INTO DATA SWITCHES		803,804 883,884	2
F2	HALT AFTER TRANSMIT OR RECEIVE MESSAGE IS DONE WHEN STEP MODE ON		803,804 883,884	1,2
F3	HALT AFTER AUTO CALL OPERATION IS PERFORMED		805 885	5
F8	MANUAL INPUT NEEDED. SEE PRINTOUT.		80E	1
F9	SET SSW 2A FOR D1-F1, 2B FOR D1-R1, 2C FOR D3-F1, OR 2D FOR D3-R1		80E	1
FA	HALT BEFORE ENTERING DATA FOR CONTINUOUS TRANSMIT ROUTINE.		806 886	4
FD	DISK NOT READY, MAKE DRIVE 1 READY AND RESET HALT		80E	1
FE	DISK ERROR, RESET HALT TO RETRY		80E	1
FF	COULD NOT FIND BSCA X FILE TERMINAL STATISTICS (X = 1 OR 2)		80E	1

3.2 PROGRAM ERROR HALTS. -01- TO -9F-

PROGRAM SECTION	HALT	MAP CHART REF	DESCRIPTION OF ERROR	APPLICABLE ROUTINES
801 - 806 881 - 886	01		STATUS OR DIAGNOSTIC OR TIO CONDITION NOT AS EXPECTED	ALL
801 & 881	02		DATA INCORRECT AFTER LOADING AND SENSING STOP LSR	3
801 & 881	03		DATA INCORRECT AFTER LOADING AND SENSING TRANSITION LSR	3
801 & 881	04		DATA INCORRECT AFTER LOADING AND SENSING CURRENT LSR	3
801 & 881	05		AN LIO LSR INSTRUCTION SELECTED THE WRONG LSR	3
801 & 881	06		2 SECOND TIMEOUT OR INTERRUPT FAILED TO OCCUR	4
801 & 881	07		DISABLE INTERRUPT INSTRUCTION FAILED	4
801 & 881	08		2 SECOND TIMEOUT IS TOO SHORT	4
801 & 881	09		2 SECOND TIMEOUT IS TOO LONG	4
801 & 881	0A		20 SECOND TIMEOUT FAILED TO OCCUR. SEE NOTE1/2	6
801 & 881	0C		20 SECOND TIMEOUT OCCURED TOO SOON	6
801 & 881	0E		LOST CONNECTION FAILED TO OCCUR. SEE NOTE 2.	7
801 & 881	0F		LOST CONNECTION OCCURED TOO SOON	7
801 & 881	10		NO DATA SET PULSES GOING TO BSCA	5
801 & 881	11		NO STEP MODE CLOCK PULSES	5
802 & 882	12		DATA SENSED FROM TRANSMIT TRIGGER NOT AS EXPECTED	1
802 & 882	13		DATA IN CORE NOT AS EXPECTED AFTER TEST LOOP INSTRUCTION	1
802 & 882	14		CURRENT LSR IS NOT EQUAL TO STOP LSR AFTER A TEST LOOP INSTRUCTION	1
802,803,804 882,883,884	15		BUSY LINE WAS NOT UP FOR RECEIVE INSTRUCTION	802-3,882-3 803-1,883-1 804-1,884-1
803,804 883,884	16		CURRENT LSR WAS NOT AS EXPECTED AFTER RECEIVE INSTRUCTION	1
803,804 883,884	17		RECEIVED DATA NOT AS EXPECTED AFTER RECEIVE INSTRUCTION	1
803,804 883,884	18		TRANSMITTED DATA NOT AS EXPECTED AFTER TRANSMIT ONLY INSTRUCTION. SEE NOTE 3.	2
802 & 882	19		NO TELEPHONE NUMBER IS IN CORE FOR AUTO CALL INSTRUCTION	5
802 & 882	1A		TOO MANY DIGITS ARE IN TELEPHONE NUMBER MUST BE LESS THAN 12 DECIMAL	5
801 & 881	1E		SIO ENABLE BSCA FAILED	2
801 & 881	1F		SIO DISABLE BSCA FAILED	2
801 & 881	20		BSCA WAS NOT DISABLED AFTER SYSTEM RESET	2
802 & 882	21		LOOP TEST TRANSMIT TRIGGER DATA INCORRECT (LOCAL TEST)	1
802 & 882	22		LOOP TEST DATA IN CORE INCORRECT (LOCAL TEST)	1
801 & 881	23		DATA SET CLOCK PULSES ARE ALWAYS UP	5
803,804 883,884	25		DATA COMPARE ERROR AFTER RECEIVE INITIAL INSTRUCTION	3
803,804 883,884	26		TOO MANY ITB INTERRUPTS OCCURRED WHILE RECEIVING ITB MESSAGE	1
803,804 883,884	27		ITB TRANSITION ADDRESS WRONG DURING ITB INTERRUPT	1
805 & 885	29		CURRENT LSR NOT EQUAL STOP LSR AFTER TRANSMIT AND RECEIVE OPERATION	1
805 & 885	2A		SENSED DATA FROM TRANSMIT TRIGGER WAS WRONG DURING TRANSMIT AND RECEIVE OPERATION	1
805 & 885	2C		RECEIVED DATA IS INCORRECT AFTER SIO TRANSMIT AND RECEIVE	1
803,804 883,884	2E		BUSY LATCH WAS NOT UP DURING ITB INTERRUPT	1
803,804 883,884	2F		BUSY LATCH WAS UP BEFORE EXPECTED DURING RECEIVE INITIAL INSTRUCTION	3
803,804 883,884	30		BUSY LATCH DID NOT COME UP WHEN EXPECTED DURING RECEIVE INITIAL INSTRUCTION	3
806 & 886	31		INTERRUPT DID NOT OCCUR AFTER RECEIVE INSTRUCTION DURING 3.25 SECOND TIMEOUT TEST	1
806 &886	32		3.25 SECOND TIMEOUT WAS ACTUALLY LESS THAN 2.6 SECONDS	1

NOTE 1: SYSTEMS WHICH USE THE REMOTE JOB ENTRY PROGRAM HAVE THE DISCONNECT TIMEOUT DISABLED BY JUMPERING 50Z-W5G2D13 TO W5T2J03(TIE-UP),IGNORE THE 0A HALT WHEN THE DISCONNECT TIMEOUT IS DISABLED.RESET THE HALT TO CONTINUE.

NOTE 2: WITH ICA
WITH UDT BIT 7 ON, THESE HALTS WILL ALWAYS OCCUR WHILE IN LOCAL MODE, WITH EXTERNAL SWITCH IN OPERATE POSITION. '0E' HALTS WILL NOT OCCUR IF EXTERNAL SWITCH IS IN TEST POSITION.

NOTE 3: WITH ICA
WITH UDT BIT 1 ON, THIS ERROR WILL OCCUR IN REMOTE MODE.

3.2 PROGRAM ERROR HALTS CONTINUED

805 & 885	34			DLE SYN WAS NOT INSERTED IN TRANSMITTED DATA AFTER 64 CHARACTERS TRANSMITTED	2
802 & 882	35			SENSED DATA FROM TRANSMIT TRIGGER CONTAINED NO BIT TIME 7	1
802 & 882	37			RECEIVE TRIGGER DATA INCORRECT DURING LOOP TEST	1
802 & 882	38			RECEIVE TRIGGER DATA INCORRECT DURING LOOP TEST (LOCAL TEST)	1
805 & 885	39			NO SYN SYN WAS ENCODED AFTER 1 SECOND OF TRANSMIT	3
805 & 885	3A			WRONG BCC CHARACTER(S) WAS TRANSMITTED DURING LONG TRANSMISSION OF DATA.	3
801 & 881	3C			DATA SET READY LATCH WAS OFF WHEN EXPECTED ON	2
801 & 881	3E			DATA SET READY LATCH CAME UP TOO SOON AFTER BSCA WAS ENABLED	2
801 & 881	40			TESTED BAUD RATE IS NOT 600,1200,1800,2000,2400 3600,4800,7200,8000,9600,19.2K,40.8K OR 50K BD	5
803,804 883,884	41			BUSY CAME UP AFTER EXPECTED	3
805 & 885	42			1 SECOND TIMEOUT FAILED	4
801 & 881	43			SIO NON-CONTROL NOT REJECTED WHEN BSCA DISABLED	9
801 & 881	44			LIO NOT REJECTED WHEN BSCA BUSY	9
801 & 881	45			SIO RECEIVE NOT REJECTED WHEN BSCA BUSY	9
801 & 881	46			SIO T&R NOT REJECTED WHEN DATA SET READY OFF	9
801 & 881	47			DATA LINE OCCUPIED AND PWI OFF	9
801 & 881	48			SIO RECEIVE NOT REJECTED WHEN DSR OFF	9
801 & 881	49			SIO RECEIVE INITIAL NOT REJECTED WHEN DSR OFF	9
801 & 881	4A			SIO NON-CONTROL NOT REJECTED WHEN EXTERNAL TEST SWITCH AND TEST MODE ARE ON	9
801 & 881	4C			NOT BUSY DURING SIO TEST LOOP INSTRUCTION	8
801 & 881	4E			CURRENT LSR RUNAWAY CONDITION PRESENT	8
806 & 886	4F			3 SECOND TIMEOUT FAILED	1
801-806,881-886	50			UNIT CHECK CONDITION BEFORE START OF ROUTINE	ANY
801-806,881-886	51			DATA SET READY FAILED TO COME UP	ANY
806 & 886	52			TRANSMIT TIMEOUT FAILED	2
806 & 886	53			NO SYNS WERE SENT AFTER ITB BLOCK	2
801 & 881	54			CURRENT LSR NOT BEING UPDATED DURING SIO TEST LOOP	8
801 & 881	55			NO INTERRUPT AFTER SIO TEST LOOP	8
801 & 881	56			CHECK RESET FAILED	2
801 & 881	57			CDSTL (CONNECT DATA SET TO LINE) FAILED	2
801 & 881	58			DISABLE CDSTL FAILED	2
801 & 881	59			NO ITB CHARACTER TRANSMITTED	2
801 & 881	5A			UNIT CHECK/NOT-READY NOT ON WHEN EXPECTED (20 SEC T.O. DIDNT DROP READY)	2
801 & 881	5C			CURRENT LSR NOT EQUAL STOP AFTER SIO TEST LOOP	8
801 & 881	5E			OP-END INTTERUPT DID NOT OCCUR FOR RECIEVE INSTRUCTION	3
802 & 882	5F			NO CYCLE STEALS WERE TAKEN AFTER TRANSMIT INSTRUCTION ISSUED	2
806 & 886	60			SINGLE ITB TRANSMIT ERR	3
801 & 881	61			IAR OR ARR2 SWAP ERR	4
802 & 882	63			TRANSMIT RUNAWAY CONDITION	2
806 & 886	64			BUSY CONDITION AFTER ITB BLOCK TRANSMITTED	3

4. BSCA DIAGNOSTICS DETAILED DESCRIPTIONS.

4.1 SECTION 801 & 881

ROUTINE 01 - TIO TEST

NO BSCA SIO INSTRUCTIONS ARE ISSUED HERE. THE BSCA IS EXPECTED TO BE DISABLED PRIOR TO ROUTINE ENTRY. THE BSCA TIO INSTRUCTIONS ARE EXECUTED TO DETERMINE THAT NONE OF THE CONDITIONS ARE MET EXCEPT UNIT CHECK/NOT READY (THIS CONDITION SHOULD BE MET BECAUSE THE BSCA IS DISABLED OR NOT READY). THE BSCA DIAGNOSTIC AND STATUS SENSE INSTRUCTIONS ARE THEN PERFORMED. THESE BITS ARE CHECKED TO SEE IF ALL ARE OFF EXCEPT THE CE SENSE BIT WHICH WOULD NORMALLY BE FLOATING (ON).

02 - ENABLE AND DISABLE BSCA TEST

BSCA IS EXPECTED TO BE DISABLED PRIOR TO ROUTINE ENTRY. THE BSCA IS FIRST TESTED FOR NOT READY. IF IT IS READY THEN AN ERROR IS PRINTED. NEXT THE BSCA IS ENABLED WITH TEST MODE ON. A TIMING LOOP TESTS IF THE 'DATA SET READY' STATUS BIT CAME ON WITHIN 60MS BUT NOT BEFORE 15MS. WHEN DSR DOES COME ON A TIO NOT READY INSTRUCTION IS PERFORMED TO ENSURE IT RECOGNIZES THAT THE BSCA IS NOW ENABLED. IF ENABLED OK, IT IS THEN DISABLED AND TESTED FOR BEING NOT READY AND THAT THE DATA SET READY STATUS BIT GOES OFF. THE CHECK RESET BUTTON IS TESTED BY ENABLING THE BSCA, PUSHING THE CHECK RESET KEY AND TESTING THAT DATA SET READY IS OFF. LAST, CDSTL (CONNECT DATA SET TO LINE) FEATURE IS TESTED BY TOGGLING THE BAUD RATE SWITCH, ENABLING THE BSCA WITHOUT TEST MODE AND TESTING TO SEE THAT 'DATA SET READY' STATUS BIT CAME ON. FINALLY THE BSCA IS DISABLED AND IF 'DSR' ISN'T OFF THEN A DISABLE CDSTL ERROR IS INDICATED.

03 - LIO AND SNS

THE CURRENT, TRANSITION AND STOP LSR (LOCAL STORE REGISTERS) ARE LOADED (LIO) AND THEN SENSED (SNS) FOR CORRECT RESULT. BETWEEN EACH TEST THE STATUS AND DIAGNOSTIC BITS ARE MONITORED FOR POSSIBLE ERRORS. FINALLY ALL LSRS ARE LOADED AND THEN SENSED TO CHECK FOR PROPER LSR SELECTION. AS BEFORE THE STATUS AND DIAGNOSTIC BITS ARE CHECKED BETWEEN EACH TEST.

04 - TIO,INTERRUPT AND 2 SEC T.O.

THE STATUS AND DIAGNOSTIC BITS ARE CHECKED PRIOR TO ANY OPERATION. THE BSCA IS NEVER ENABLED DURING THIS TEST. AN SIO WITH INTERRUPT ENABLED AND 2-SECOND TIMEOUT ENABLED IS ISSUED. A PROGRAM LOOP WAITS UP TO 3 SECONDS FOR THE INTERRUPT TO OCCUR. IF THE INTERRUPT DOES NOT OCCUR THEN THE STATUS AND DIAGNOSTIC BITS ARE CHECKED. IN THE INTERRUPT ROUTINE THE SWAPPING OF IAR2 AND ARR2 IS TESTED BY BRANCHING UNCONDITIONALLY. NEXT SIO DISABLE INTERRUPT IS TESTED. THE ACCURACY OF THE 2 SEC T.O.IS TESTED BY COMPARING THE PROGRAM LOOP COUNTER AGAINST THE KNOWN TIME MARGIN 1.5 TO 2.5 SECONDS. FINALLY THE STATUS AND DIAGNOSTIC BITS ARE AGAIN CHECKED.

05 - BAUD RATE TEST

THE BSCA TIO INSTRUCTION 'NEW DATA' IS TESTED WHILE THE BSCA IS ENABLED IN TEST MODE AND STEP MODE. IT IS TESTED BY CHECKING THAT 'NEW DATA' COMES ON AND GOES OFF WHEN RESET BY THE SENSE DIAGNOSTIC INSTRUCTION. 'NEW DATA' REPRESENTS THE CLOCKING FROM THE DATA SET (OR INTERNAL CLOCK OR STEP MODE CLOCK). NEXT THE SAME TIO INSTRUCTION IS TESTED SIMILARLY WHEN THE BSCA IS ENABLED WITH TEST MODE ONLY. THIS TESTS THE DATA SET CLOCKING WHEREAS THE PREVIOUS TEST CHECKED THE STEP MODE (62 BAUD) CLOCKING. IN THE LAST TEST THE ACTUAL BAUD RATE IS DETERMINED AND PRINTED OUT. THIS IS DONE BY ENABLING THE BSCA IN TEST MODE THEN INCREMENTING A PROGRAM COUNTER AFTER TIO 'NEW DATA' COMES UP AND WAITING TIL THE NEXT 'NEW DATA' COMES UP. THIS COUNTER IS THEN COMPARED TO A TABLE OF KNOWN VALUES FOR EACH OF THE BAUD RATES. THE ACCEPTABLE BAUD RATES ARE 600,1200,1800,2000,2400,3600,4800,7200, 8000,9600,19.2K,40.8K AND 50K BAUD.
IF THE CALCULATED VALUE DOESN'T EQUAL ANY IN THE TABLE AN ERROR MESSAGE IS PRINTED.NOTE THAT THIS BAUD RATE DETERMINATION CAN ONLY DETECT GROSS ERRORS IN CLOCKING RATES(2% OFF ACCEPTABLE RATE).YET SMALLER PERCENTAGE ERRORS CAN CAUSE FAILURE TO COMMUNICATE.

06 - DISCONNECT TIMEOUT(FOR SWITCHED NETWORK ONLY)

IF THE BSCA IS NOT SWITCHED THIS ROUTINE IS SKIPPED. THE DISCONNECT TIMEOUT(20 SECOND TIMEOUT) IS TESTED BY ENABLING THE BSCA WITH TEST MODE ON THEN WAITING IN A LOOP TIL THE DISCONNECT TIMEOUT BIT COMES ON. A TIMER IN THE LOOP IS USED TO DETERMINE PROPER DURATION OF THIS TIMEOUT. SINCE THE DISCONNECT TIMEOUT SHOULD CAUSE A UNIT CHECK CONDITION, A TIO UNIT CHECK/NOT READY IS ISSUED TO VERIFY THIS FUNCTION.
SYSTEMS WHICH USE THE REMOTE JOB ENTRY PROGRAM HAVE THE DISCONNECT TIMEOUT DISABLED BY JUMPERING 50Z-W5S2D13 TO 50Z-W5T2J03(TIE-UP),IGNORE THE 0A HALT WHEN THE DISCONNECT TIMEOUT IS DISABLED.RESET THE HALT TO CONTINUE.

07 - ABORTIVE DISCONNECT (FOR SWITCHED NETWORK ONLY)

IF THE BSCA IS NOT SWITCHED OR IF THE EXTERNAL CABLE SWITCH IS ON (SENSE SWITCH 16 ON) THIS ROUTINE IS SKIPPED. THE BSCA IS ENABLED WITH TEST MODE ON THEN THERE IS A DELAY OF 75 MS BEFORE TEST MODE IS TURNED OFF CAUSING THE ABORTIVE DISCONNECT TIMEOUT STATUS BIT TO COME ON AFTER 20 TO 70 MS.

08 - BUSY AND RUNAWAY TEST

THIS ROUTINE CHECKS THE BSCA SIO 'TEST LOOP' INSTRUCTION(A DIAGNOSTIC INSTRUCTION) WITHOUT ANALYZING DATA. THE BSCA IS ENABLED IN TEST AND STEP MODE(62 BAUD CLOCK). THE LSRS ARE LOADED TO A 4 BYTE DATA AREA. A 'TEST LOOP' INSTRUCTION IS ISSUED AND 'OP-END INTERRUPT' IS TESTED BY A TIO INSTRUCTION. IF BUSY IS NOT UP AT THIS TIME AN ERROR IS PRINTED.IF AN OP-END INTERRUPT OCCURRED IMMEDIATELY AFTER THE SIO 'TEST LOOP' AN ERROR IS PRINTED. DURING THE SIO OPERATION THE CURRENT LSR IS SENSED AND COMPARED TO THE STOP LSR.IF IT EVER EXCEEDS THE STOP LSR THE BSCA IS DISABLED AND AN ERROR IS PRINTED.ALSO THE CURRENT LSR IS CHECKED TO SEE THAT IT IS UPDATED BY AT LEAST ONE.IN THE INTERRUPT ROUTINE THE STATUS AND DIAGNOSTIC BITS ARE CHECKED.ALSO THE CURRENT LSR IS CHECKED TO SEE THAT IT EQUALS THE STOP LSR.

09 - I/O ATTENTION TEST

THIS ROUTINE TESTS INSTRUCTION REJECTION AND 'I/O ATTENTION ' COMING UP FOR VARIOUS CASES:

CASE 1 SIO WITH TEST MODE ONLY(BSCA NOT ENABLED)
SIO TEST LOOP WITH INTERRUPT AND 2-SECOND TIMEOUT ENABLED(BSCA SHOULD REJECT)
IF THE NEXT INSTRUCTION WAS EXECUTED(SIO DISABLE BSCA) THEN REJECTION FAILED AND AN ERROR PRINTED.
FOR PROPER OPERATION AN INTERRUPT OCCURS BECAUSE OF A 2 SECOND TIMEOUT.

CASE 2 SIO ENABLE BSCA WITH TEST AND STEP MODE
SIO TEST LOOP WITH INTERRUPT ENABLED
LIO TRANSITION LSR(BSCA SHOULD REJECT THIS)
IF THE NEXT INSTRUCTION IS EXECUTED THEN AN ERROR IS PRINTED.AN INTERRUPT IS THE NORMAL EXIT.

CASE 3 SAME AS CASE 2 EXCEPT THAT INSTEAD OF AN LIO TRANSITION INSTRUCTION A SIO TEST LOOP IS USED FOR THE REJECTION STATE.

CASE 4 SIO ENABLE BSCA WITH TEST AND STEP MODE
SIO TRANSMIT AND RECEIVE
SNS STATUS
NOW THE SIO TRANSMIT AND RECEIVE INSTRUCTION SHOULD BE REJECTED FOR 20-60 MS SINCE THIS IS THE TIME IT TAKES FOR 'DATA SET READY' TO COME UP AFTER THE SIO ENABLE INSTRUCTION.SO IF THE T&R INSTRUCTION WAS NOT REJECTED FOR THIS TIME THE SNS STATUS INSTRUCTION WOULD SHOW THE 'DSR' BIT STILL OFF.THEREFORE THIS BIT IS TESTED TO MAKE SURE ITS ON,OTHERWISE AN ERROR PRINT.AN ERROR ALSO IS PRINTED IF AN INTERRUPT OCCURS.

CASE 5 SAME AS CASE 4 EXCEPT THAT A SIO RECEIVE INSTRUCTION IS USED INSTEAD OF A TRANSMIT AND RECEIVE .

CASE 6 SAME AS CASE 5 EXCEPT THAT A SIO RECEIVE INITIAL INSTRUCTION IS USED INSTEAD OF A RECEIVE INSTRUCTION. HOWEVER,FOR A SWITCHED NETWORK 'DATA SET READY' STATUS BIT IS IGNORED SINCE IT IS NOT REQUIRED ON FOR THIS OPERATION.

CASE 7 THIS CASE IS CHECKED ONLY IF THE EXTERNAL TEST SWITCH IS ON(SENSE SWITCH 16 ON).
SIO ENABLE BSCA WITHOUT TEST MODE BUT WITH STEP MODE
SIO TEST LOOP WITH INTERRUPT AND 2 SECOND TIMEOUT ENABLED(INSTRUCTION SHOULD BE REJECTED BECAUSE TEST MODE IS OFF)
IF THE NEXT INSTRUCTION IS EXECUTED(BSCA DISABLE) AN ERROR IS PRINTED. AN INTERRUPT BECAUSE OF THE 2 SECOND TIMEOUT IS THE NORMAL EXIT.

4.0 DIAGNOSTIC DETAILED DESCRIPTIONS CONTINUED

4.2 SECTION 802 & 882

ROUTINE 01 - THE BSCA SIO 'TEST LOOP' INSTRUCTION IS TESTED.

THE BSCA IS FIRST ENABLED WITH TEST MODE AND OPTIONALLY WITH STEP MODE. READY CONDITION IS CHECKED ALONG WITH STATUS AND DIAGNOSTIC CONDITIONS. THE CURRENT AND STOP LSRS POINT TO BEGINNING AND ENDING ADDRESSES OF CORE CONTAINING 7F5555...55(16 BYTES).THE SIO TEST LOOP INSTRUCTION WITH INTERRUPT ENABLED IS ISSUED. DURING THIS OPERATION DIAGNOSTIC SENSES ARE STORED IN CORE EVERYTIME 'NEW DATA' COMES ON. FROM THIS SENSE INFORMATION WILL COME THE TRIGGER INFORMATION. IN THE INTERRUPT ROUTINE FIRST, THE INTERRUPT LEVEL IS DISABLED (SO THAT HALTS CAN BE DISPLAYED). NEXT, THE SENSE DIAGNOSTIC BYTES PREVIOUSLY STORED IN CORE ARE STRIPPED OF THE TRANSMIT AND RECEIVE TRIGGER BITS AND ASSEMBLED IN BYTES OF DATA, THAT IS, 8 BITS FROM 8 BYTES OF SENSES ARE PUT INTO 1 BYTE. THE DATA IN CORE IS THEN CHECKED TO SEE IF IT CHANGED FROM ITS ORGINAL VALUE INTO THE EXPECTED. THIS EXPECTED DATA IS DIFFERENT FOR EBCDIC AND ASCII ADAPTERS AND IF THE HIGH SPEED TEST LOOP IS RUN. NEXT, THE TRANSMIT AND RECEIVE TRIGGER DATA IS COMPARED TO EXPECTED DATA. AGAIN, FOR HIGH SPEED TEST LOOP THE DATA WILL BE DIFFERENT THAN FOR NORMAL OPERATION. THE EXTERNAL CABLE SWITCH WILL NOT AFFECT DATA IE DATA WILL BE SAME IN EITHER SWITCH POSITION. IN OPERATION THE DATA IN THE SHIFT REGISTER SAY 7F IS SHIFTED 8 BIT POSITIONS TO THE RIGHT WITH THE TRANSMIT TRIGGER NEXT TO BIT 7, THE RECEIVER TRIGGER NEXT TO THE TRANSMIT TRIGGER AND BIT 0 NEXT TO THE RECEIVE TRIGGER (IT ACTS LIKE A 10 BIT CIRCULAR REGISTER). NOW IF THE EXTERNAL CABLE SWITCH IS ON THE BITS GO FROM THE TRANSMIT TRIGGER OUT AND BACK IN THE CABLE AND INTO THE RECEIVE TRIGGER BUT THIS OPERATION STILL DOES NOT ADD ENOUGH DELAY FOR 1 BIT TIME SO THAT THE DATA IS STILL THE SAME. FOR THE HIGH SPEED TEST LOOP THOUGH THE DATA GOES INTO DATA SET WHERE IT IS DELAYED A FEW BIT TIMES AND THEN BACK INTO BIT 0 POSITION. THIS EXPLAINS WHY THE DATA WILL BE DIFFERENT FOR THIS TEST. THE CURRENT LSR IS COMPARED TO STOP LSR TO MAKE SURE THEY'RE EQUAL. FINALLY THE STATUS AND DIAGNOSTIC CONDITIONS ARE CHECKED.

02 - TRANSMIT CYCLE STEAL TEST

THE BSCA IS ENABLED IN TEST AND STEP MODE.THE CURRENT AND STOP LSR'S POINT TO A 2 BYTE TRANSMIT FIELD. AN SIO TRANSMIT ONLY INSTRUCTION IS ISSUED.THEN WHEN 'NEW DATA' COMES ON THE CURRENT LSR IS SENSED AND CHECKED TO SEE IF IT WAS UPDATED BY ONE.IF IT WAS'NT UPDATED AN ERROR PRINT OCCURS(TRANSMIT CYCLE STEAL ERROR). NEXT,THE CURRENT LSR IS SENSED IN A TIMING LOOP AT THE SAME TIME AS A TEST FOR OP-END IS PERFORMED. A NORMAL COMPLETION OF ROUTINE IS FOR 'OP-END' TO OCCUR. IF THE TIMING LOOP EXCEEDED 2.5 SECONDS OR THE CURRENT LSR EXCEEDED THE STOP LSR ,THEN THE ERROR 'TRANSMIT RUNAWAY' IS PRINTED

03 - COMPARE TEST

USING A RECEIVE INSTRUCTION THIS ROUTINE TESTS THE LOGIC THAT INVOLVES THE CURRENT LSR EQUALING STOP LSR CAUSING AN INTERRUPT.
THE BSCA IS ENABLED WITH TEST MODE AND OPTIONALLY WITH STEP MODE(SENSE SWITCH 10). THE STOP LSR IS LOADED 1 BYTE PAST THE CURRENT LSR ADDRESS .THE INITIAL CURRENT LSR ADDRESS IS 0000. AFTER THE RECEIVE INSTRUCTION IS ISSUED 'BUSY' IS CHECKED FOR BEING UP. WHEN 'NEW DATA' COMES ON THE CURRENT LSR IS SENSED AND CHECKED THAT IT UPDATED BY ONE. NEXT 'OP-END' IS CHECKED FOR BEING ON AND IF NOT ,AN ERROR IS PRINTED.NOW THE STOP LSR IS INCREMENTED BY ONE AND THE OPERATION REPEATED UNTIL THE STOP LSR EQUALS THE ADDRESS 1FF0.

04 - CONTINUOUS SYN TRANSMIT

THIS ROUTINE IS TO BE USED AS A CE SCOPING LOOP OR AS A REMOTE ASSIST ROUTINE.IT WILL ONLY BE RUN IF SENSE SWITCH 20 ON . SYNS (HEX 32 EBCDIC OR 16 ASCII) ARE CONTINUOUSLY TRANSMITTED WITHOUT OPERATOR INTERVENTION. THE LIO 'CURRENT BUSY' INSTRUCTION IS USED TO RESET THE CURRENT ADDRESS BEFORE IT REACHES THE STOP ADDRESS AND CAUSES AN INTERRUPT. IN NORMAL OPERATION THE BSCA IS ENABLED WITHOUT TEST MODE IN THIS ROUTINE.SENSE SWITCH 21 TURNS ON TEST MODE. IF THE EXT TEST SW IS ON, SENSE SWITCH 21 MUST BE ON.

05 - AUTO CALL

PERFORMED ONLY IF BSCA IS SWITCHED AND HAS AUTO CALL FEATURE AND IF SENSE SWITCH 16 IS OFF.THIS ROUTINE USES THE TELEPHONE NUMBER PUT INTO CORE BY THE C.E.TO DIAL AND RING THE PHONE USING THE BSCA AUTO CALL INSTRUCTION. THE BSCA IS ENABLED WITH TEST MODE ON. THE STATUS AND DIAGNOSTIC BITS ARE CHECKED BEFORE THE SIO AUTO CALL IS ISSUED.AFTER THE SIO,A PROGRAM LOOP WAITS UP TO 2 MINUTES FOR THE PHONE TO RING.THEN THE STATUS AND DIAGNOSTIC BITS ARE CHECKED AGAIN.

4.3 SECTION 803 & 883

01 - RECEIVE (TEST MODE)

THIS ROUTINE USES THE RECEIVE (TEST MODE) INSTRUCTION ON 12 DIFFERENT SETS OF DATA TO TEST PROPER BSCA RESPONSES. FUNCTIONS SUCH AS BCC GENERATION AND CHECKING ,SYN-SYN RECOGNITION,STARTING DATA MODE,STARTING TRANSPARENCY MODE, ITB INTERRUPTS AND CHARACTERS CAUSING INTERRUPTS(C.O.D. CHARACTERS) ARE TESTED IN THIS ROUTINE.ANY OF THESE 12 MESSAGES CAN BE LOOPED ON BY SENSE SWITCH 14.THE SEQUENCE OF EVENTS ARE:

- ENABLE BSCA WITH TEST MODE
- LOAD BSCA LSRS
- SIO RECEIVE

(INTERRUPT) IF A ITB INTERRUPT,STORE TRANSITION ADDRESS AND RESET INTERRUPT. IF NOT AN ITB INTERRUPT THEN THE CURRENT LSR IS CHECKED FOR PROPER ADDRESS.IF THIS WAS AN ITB MESSAGE THE STORED TRANSITION ADDRESSES ARE CHECKED AT THIS TIME.THE DATA IN CORE IS COMPARED TO EXPECTED.FINALLY THE STATUS AND DIAGNOSTIC CONDITIONS ARE CHECKED.THESE STEPS ARE REPEATED FOR THE NEXT TEST MESSAGES UNTIL ALL 12 ARE DONE.SEE PAGES 14A-15 OF PROGRAM LISTING FOR TEST MESSAGES.

02 - TRANSMIT (TEST MODE)

THIS ROUTINE USES THE TRANSMIT (TEST MODE ONLY) INSTRUCTION ON 4 DIFFERENT TEST MESSAGES TO TEST BSCA TRANSMISSION OF DATA.FUNCTIONS TESTED ARE:LEADING AND ENDING PAD GENERATION ,SYN-SYN GENERATION AND BCC GENERATION .EACH OF THE TEST MESSAGES CAN BE LOOPED ON BY SENSE SWITCH 14. SEQUENCE OF EVENTS:

- ENABLE BSCA WITH TEST MODE
- LOAD BSCA LSRS
- SIO TRANSMIT ONLY
- SENSE DIAGNOSTIC BYTES INTO CORE FOR USE IN THE INTERRUPT ROUTINE.EACH DIAGNOSTIC SENSE CONTAINS ONE BIT OF TRANSMIT TRIGGER DATA.

(INTERRUPT) THE TRANSMIT TRIGGER BITS ARE PACKED INTO BYTES.THE CURRENT LSR IS CHECKED FOR PROPER ADDRESS. THE TRANSMITTED DATA IS THEN COMPARED TO EXPECTED DATA.FINALLY THE STATUS AND DIAGNOSTIC CONDITIONS ARE CHECKED. THESE STEPS ARE REPEATED FOR EACH OF THE 4 TEST MESSAGES.SEE PAGE 16A OF PROGRAM LISTING FOR MESSAGES

03 - RECEIVE INITIAL (TEST MODE)

THE BSCA RECEIVE INITIAL INSTRUCTION IS TESTED IN THIS ROUTINE.SEQUENCE OF EVENTS:

- ENABLE BSCA IN TEST MODE
- LOAD BSCA LSRS
- SIO RECEIVE INITIAL
- TEST WHEN 'BUSY' COMES UP(AT WHICH DATA BYTE)

(INTERRUPT) THE DATA IN CORE IS CHECKED FIRST THEN THE STATUS AND DIAGNOSTIC CONDITIONS.THE MULTIPOINT TEST MESSAGE IS DIFFERENT FROM THE SWITCHED AND POINT-TO-POINT LEASED MESSAGE.FOR MULTIPOINT TRIB, PRIOR TO THE SIO THE TRANSITION LSR IS LOADED WITH A STATION ADDRESS.

4.0 DIAGNOSTIC DETAILED DESCRIPTIONS (CONTINUED)

4.4 SECTION 804 & 884 THIS SECTION IS THE SAME AS SECTION 803 & 883 EXCEPT THIS IS ONLY FOR ASCII ADAPTERS. THE TEST MESSAGES FOR ROUTINES 1 AND 2 ARE ON PAGES 13A-14 AND 15 RESPECTIVELY OF PROGRAM LISTING.

4.5 SECTION 805

01 - TRANSMIT AND RECEIVE (TEST MODE)

THIS ROUTINE USES THE BSCA TRANSMIT AND RECEIVE INSTRUCTION IN TEST MODE. FIRST,THE BSCA IS ENABLED IN TEST MODE AND OPTIONALLY IN STEP MODE.THE CURRENT,TRANSITION AND STOP LSR ARE LOADED WITH THE START OF THE TRANSMIT AREA ,THE START OF THE RECEIVE AREA AND THE END OF OF THE RECEIVE AREA RESPECTIVELY.AFTER THE SIO TRANSMIT AND RECEIVE IS ISSUED ,SENSE DIAGNOSTIC INSTRUCTIONS ARE REPEATEDLY DONE SO THAT THE TRANSMITTED DATA CAN BE RECOVERED FROM THE 'TRANSMIT TRIGGER'. IN THE INTERRUPT ROUTINE THE CURRENT LSR IS CHECKED TO SEE IF IT EQUALS THE STOP LSR.THEN THE 'TRANSMIT TRIGGER' BITS ARE PACKED INTO BYTES. THIS TRANSMITTED INFORMATION IS THEN COMPARED TO THE EXPECTED DATA.NEXT THE DATA FROM THE RECEIVE PORTION OF THE TEST IS COMPARED TO EXPECTED. FINALLY, THE STATUS AND DIAGNOSTIC BITS ARE CHECKED.

02 - SYNC IDLE INSERTION TEST

TESTS THAT FOR A TRANSPARENT AND INTERNAL CLOCK ADAPTER DLE SYNS ARE TRANSMITTED EVERY 64 CHARACTERS. THE BSCA IS ENABLED IN STEP MODE AND OPTIONALLY IN STEP MODE. AFTER THE SIO TRANSMIT INSTRUCTION IS ISSUED SENSE DIAGNOSTICS ARE PERFORMED TO OBTAIN THE TRANSMITTED DATA FROM THE TRANSMIT TRIGGER. WHEN THE INTERRUPT OCCURS THE TRANSMITTED DATA IS ANALYZED FOR A DLE SYN IN THE 64TH BYTE POSITION.THE STATUS AND DIAGNOSTIC BITS ARE ALSO CHECKED FOR ANY ABNORMAL INDICATIONS.

03 - LONG BCC GENERATION

TRANSMITS 600 BYTES OF DATA AND GENERATES BCC FOR THIS DATA.A SENSE CRC/LRC/VRC INSTRUCTION IS USED TO VERIFY THAT THE GENERATED BCC MATCHES THE EXPECTED VALUE. SEQUENCE OF EVENTS:
LOAD BSCA LSRS
ENABLE BSCA WITH TEST MODE
SIO TRANSMIT ONLY,INTERRUPT ENABLED
LOOP ON BUSY
(INTERRUPT) SENSE CRC/LRC/VRC AND COMPARE TO EXPECT EXPECTED VALUE.CHECK STATUS AND DIAGNOSTIC CONDITIONS.

04 - SYN-SYN INSERTION AND 1 SECOND TIMEOUT TEST

TESTS THE INSERTION OF 2 SYNS AT 1 SECOND INTERVALS WHILE TRANSMITTING DATA. THIS ALSO TESTS THE 1 SECOND TIMEOUT LOGIC. SEQUENCE OF EVENTS:
LOAD BSCA LSRS
SIO TRANSMIT ONLY WITH INT ENABLED
SENSE DIAGNOSTIC LOOP
(INTERRUPT) PACK 'TRANSMIT TRIGGER' BITS OF DATA INTO BYTES. TEST IF THE SYNS ARE INSERTED IN THIS DATA AT THE PROPER LOCATION.DIAGNOSTIC AND STATUS BITS ARE CHECKED.

4.6 SECTION 806 & 886

01 - 3 SECOND TIMEOUT TEST

TESTS THE 3.25 RECEIVE TIMEOUT FOR 3 CASES: 1 NO CHARACTER MODE .2 ONLY SYNS RECEIVED. 3 IN CHARACTER PHASE BUT NO SYNS AFTER 3.25 SECONDS .
SEQUENCE OF EVENTS:
ENABLE BSCA WITH TEST AND STEP MODE
LOAD BSCA LSRS
SIO RECEIVE WITH INTERRUPT ENABLED
WAIT UP TO 4.5 SEC BEFORE ERROR PRINT
(INTERRUPT) TEST IF RECEIVE TIMEOUT STATUS BIT ON - IF NOT ERROR PRINT.COMPARE ACTUAL DURATION OF TIMEOUT WITH EXPECTED.

02 - TRANSMIT TIMEOUT TEST

TESTS THE 3.25 SEC TIMEOUT DURING TRANSMISSION OF SYNS AFTER AN ITB BLOCK WAS SENT. SEQUENCE OF EVENTS:
ENABLE BSCA WITH TEST AND STEP MODE
LOAD LSRS
SIO TRANSMIT ONLY
SENSE DIAGNOSTIC 300 TIMES
RESET OP-END INTERRUPT
PACK TRANSMIT TRIGGER BITS INTO BYTES
COUNT NUMBER OF SYNS TRANSMITTED AND COMPARE WITH EXPECTED NUMBER TO DETERMINE APPROXIMATE TIME.

03 - MULTIPLE ITB TEST

TRANSMITS 1 ITB BLOCK FOR EACH OF THE BSCA SIO TRANSMIT INSTRUCTIONS ISSUED(3 INSTRUCTIONS).SEQUENCE OF EVENTS:
ENABLE BSCA IN TEST AND STEP MODE
LOAD BSCA LSRS
SIO TRANSMIT ONLY
SENSE DIAGNOSTIC TIL 'OP-END' COMES ON
WHEN OP-END COMES ON TRANSMIT AGAIN (2 MORE)
WHEN 3 TRANSMISSIONS DONE PACK TRANSMIT TRIGGER BITS INTO BYTES.
THEN TEST IF THIS DATA IS CORRECT.

04 CONTINUOUS TRANSMIT (USING DATA CARDS OR KEYBOARD FOR CARDLESS SYSTEM OR FROM CORE WHEN OPERATING FROM DISK)

INSTRUCTIONS WHEN OPERATING FROM MFCU.

THIS ROUTINE CAN BE USED FOR SCOPING PROBLEMS OR PROVIDING REMOTE ASSIST.WITH IT THE CE CAN TRANSMIT UP TO 40 BYTES OF ANY DATA CONTINUOUSLY.THE LIO CURRENT INSTRUCTION (BUSY) IS USED SO THAT ONLY ONE SIO COMMAND IS ISSUED THE DATA CARD FORMAT :B1 XXYYYY...YY WHERE B STARTS IN COLUMN 1, XX IS THE MESSAGE LENGTH IN HEX ,AND YY ARE THE HEX BYTES.THE DATA CARDS ARE PUT RIGHT AFTER THE END CARD OF SECTION 806 OR 886. SENSE SWITCH 21 TURNS ON TEST MODE. SENSE SWITCH 20 MUST BE ON TO RUN THIS ROUTINE. IF THE EXT TEST SW IS ON, SENSE SW 21 MUST BE ON.

EXAMPLE OF CONTINOUS TRANSMIT DATA CARD:

```
             1
COL  123456789012345
CHAR B1  0402404003
```

THIS CARD TRANSMITS STX 40 40 ETX

INSTRUCTIONS WHEN OPERATING FROM DISK.

A 'FA' HALT COMES ON INDICATING:
'ENTER MANUALLY INTO CORE HEX DATA UP TO 10 BYTES STARTING AT ----'
'RESET THIS HALT IF DATA IS ALREADY IN CORE'
SO IF DATA IS NOT IN CORE DO SYSTEM RESET ALTER SAR TO INDICATED ADDRESS,ALTER CORE TO DESIRED CHARACTERS THEN DO SYSTEM RESET,GO TO ROUTINE 4 AND RESET HALT 'FA' TO BEGIN TRANSMISSION.

INSTRUCTIONS WHEN OPERATING FROM CARDLESS SYSTEM.

THE KEYBOARD IS USED TO ENTER THE DATA TO BE CONTINUOUSLY TRANSMITTED.AFTER STARTING ROUTINE(SSW 20 MUST BE ON) THE PROGRAM PRINTS:
'ENTER HEX DATA VIA KEYBOARD'
'MAXIMUM OF 40 BYTES'
'IF AN ERROR IS MADE DO BACKSPACE AND RETYPE'
'DEPRESS START KEY TO BEGIN TRANSMIT ROUTINE'
THE FE SHOULD ENTER ONLY HEX DATA THAT HE WANTS TRANSMITTED.

5.0 BINARY SYNCHRONOUS COMMUNICATIONS ADAPTER (BSCA) INFORMATION.

5.1 BSCA COMMANDS.

ASSEMBLER INSTRUCTION	CORE IMAGE	DEFINITION
TIO	C1 8N XXXX	THE BSCA TEST I/O COMMAND CHECKS FOR A CONDITION,AS SPECIFIED BY THE N CODE. IF THE CONDITION DOES EXIST A BRANCH TO CORE LOCATION XXXX OCCURS. IF THE CONDITION DOES NOT EXIST THEN THE INSTRUCTION IMMEDIATELY FOLLOWING THE TIO IS EXECUTED.
	N = 0	NOT READY OR UNIT CHECK CONDITION
	N = 1	OP-END INTERRUPT
	N = 2	BUSY
	N = 3	ITB INTERRUPT
	N = 4	INTERRUPT REQUEST PENDING
	N = 6	NEW DATA (COMES ON WHEN DATA SET CLOCKING PULSE OCCURS)
SNS	30 8N XXXX	THE BSCA SENSE COMMAND TRANSFERS THE CONTENTS OF A BSCA REGISTER OR LATCH DETERMINED BY THE N CODE, TO CORE. THE TWO BYTES ARE TRANSFERED DURING TWO EB CYCLES. DURING THE EB1 CYCLE BYTE 1 IS PLACED INTO CORE AT LOCATION -XXXX-. BYTE 2 IS TRANSFERRED DURING THE EB2 CYCLE AND PLACED INTO CORE AT LOCATTION -XXXX-1-.
	N = 0	DIAGNOSTIC (INFORMATION)
	N = 1	STOP REGISTER
	N = 2	TRANSITION REGISTER
	N = 3	STATUS (INFORMATION)
	N = 4	CURRENT REGISTER
	N = 6	CRC/LRC REGISTER
LIO	31 8N XXXX	THE BSCA LOAD I/O COMMAND LOADS THE REGISTER AS SPECIFIED BY THE N CODE WITH DATA FROM CORE LOCATION -XXXX-. DATA IS TRANSFERRED DURING TWO EB CYCLES.DURING THE EB1 CYCLE THE BYTE OF DATA AT LOCATION -XXXX- IS LOADED INTO THE REGISTER AS BYTE 1. DATA FROM LOCATION -XXXX-1- IS LOADED INTO THE REGISTER AS BYTE 2 DURING EB2 CYCLE.
	N = 1	STOP REGISTER
	N = 2	TRANSITION REGISTER
	N = 4	CURRENT REGISTER
	N = 6	CURRENT REGISTER (WHILE ADAPTER IS BUSY)
SIO	F3 8N RR	THE BSCA START I/O COMMAND CONTROLS TYPE OF BSCA OPERATION PERFORMED
	N = 0	CONTROL (NO DATA TRANSFER TAKES PLACE)
	N = 1	RECEIVE (DATA IS RECEIVED AND PUT INTO CORE BEGINNING AT CURRENT REGISTER ADDRESS.CURRENT REG IS UPDATED AT EACH CYCLE STEAL TIL IT EQUALS STOP REGISTER.)
	N = 2	TRANSMIT AND RECEIVE (TRANSMITS DATA AND RECEIVES REPLY.THE CURRENT, TRANSITION AND STOP REGISTERS ARE USED TO INDICATE THE START OF THE TRANSMIT DATA,THE START OF THE RECEIVE AREA AND THE END OF THE RECEIVE AREA RESPECTIVELY.)
	N = 3	RECEIVE INITIAL (A RECEIVE DATA OPERATION USED TO ESTABLISH CONTACT WITH OTHER STATION)
	N = 4	AUTO CALL (CALLS NUMBER LOCATED IN CORE, CURRENT REGISTER POINTS TO FIRST DIGIT AND THE STOP REGISTER POINTS TO THE BYTE PAST THE LAST DIGIT.)
	N = 6	TEST LOOP (DIAGNOSTIC OPERATION WITH A BYTE BEING CYCLE STEALED OUT OF CORE BROUGHT INTO THE SHIFT REGISTER,SHIFTED EIGHT BIT TIMES WITH THE TRANSMIT AND RECEIVE TRIGGERS AND THEN PUT BACK IN COPE AT A LOCATION OF ONE PLUS THE LOCATION WHERE IT WAS FETCHED.ONLY THE FIRST BYTE IS FETCHED FROM CORE.THE DATA IN THE SHIFT REGISTER IS CONTINUALLY SHIFTED AND PUT BACK IN CORE UNTIL THE CURRENT REGISTER EQUALS THE STOP REGISTER.)

RR BYTE CONTROL CODE

BIT	CONDITION ENABLED IF BIT IS ON
0	MASK
1	ENABLE BSCA
2	TEST MODE
3	STEP MODE
4	
5	2 SECOND TIMEOUT
6	INTERRUPT
7	RESET INTERRUPT REQUEST

** NOTE ** IF MASK BIT IS OFF BITS 1,2 AND 3 WILL BE IGNORED

5.2 BSCA STATUS AND DIAGNOSTIC BIT MEANINGS

```
         BYTE 2 (EB2)       BYTE 1 (EB1)
BIT    0 1 2 3 4 5 6 7    0 1 2 3 4 5 6 7      CORE IMAGE
```

5.21 STATUS BYTES

```
BYTE 2
    BIT  0  TIMEOUT
         1  CRC/LRC/VRC
         2  ADAPTER CHECK ON TRANSMIT
         3  ADAPTER CHECK ON RECEIVE
         4  INVALID ASCII
         5  ABORTIVE TIMEOUT
         6  DISCONNECT TIMEOUT
BYTE 1
    BIT  6  DATA SET READY
         7  DATA LINE IN USE
```

5.22 DIAGNOSTIC BYTES

```
BYTE 2
    BIT  1  BIT TIME 4
         2  BIT TIME 2
         3  BIT TIME 1
         5  TRANSMIT TRIGGER
         6  RECEIVE TRIGGER
         7  CE SENSE BIT
BYTE 1
    BIT  4  BLOCK CYCLE STEAL REQUEST
         5  LSR OR SHIFT REGISTER PARITY CHECK
         6  OVERRUN/UNDERFLOW
         7  DBI(DATA BUSS IN) PARITY CHECK
```

APPENDIX A - MESSAGE NUMBERS FOR ON-LINE TEST
(NUMBERS ASSIGNED BY CP-AR-000668-02-RAL)

XX VALUE	CONTENT OF MESSAGE
00	REQUESTOR SENDS MESSAGE FROM CORE (FE MUST PUT MESSAGE IN CORE)
01	REQUESTOR RECEIVES MESSAGE FROM CORE (FE MUST PUT MESSAGE IN CORE)
02	256 EBCDIC CHARACTERS(TRANSPARENT)
04	245 EBCDIC CHARACTERS(ALL EBCDIC EXCEPT DLC)
05	117 ASCII CHARACTERS(ALL ASCII EXCEPT DLC)
06	36 ASCII CHARACTERS A-Z,0-9
07	ESC Q 36 ASCII CHARACTERS A-Z,0-9(2780 PRINTER MESSAGE)
08	ESC 4 36 ASCII CHARACTERS A-Z,0-9(2780 PUNCH MESSAGE)
12	ESC / 36 EBCDIC CHARACTERS A-Z,0-9(2780 PRINTER MESSAGE)
13	ESC 4 36 EBCDIC CHARACTERS A-Z,0-9(2780 PUNCH MESSAGE)
14	36 EBCDIC CHARACTERS A-Z,0-9
15	84 EBCDIC CHARACTERS 74 00'S AND 6 SYNS
16	80 EBCDIC CHARACTERS 40 'AA' AND 40 '55'
19	290 EBCDIC CHARACTERS 280 '00' AND 10 SYNS (TRANSPARENT)
20	80 EBCDIC CHARACTERS U-Z,0-9,'00'-'3F'(TRANSPARENT)
21	120 EBCDIC CHARACTERS A-Z,0-9,'00'-'53'(TRANSPARENT)
22	144 EBCDIC CHARACTERS A-Z,0-9,'00'-'6B'(TRANSPARENT)
99	REQUESTOR SENDS MESSAGE(2770/2780 USE)

APPENDIX B - COMMUNICATION CONTROL CHARACTERS

NAME OF FUNCTION	FUNCTIONAL MNEMONIC	EBCDIC CODE	ASCII CODE
START OF HEADING	SOH	01	01
START OF TEXT	STX	02	02
END OF TRANSMISSION BLOCK	ETB	26	17
END OF TEXT	ETX	03	03
END OF TRANSMISSION	EOT	37 PAD *	04 PAD *
ENQUIRY	ENQ	2D	05
NEGATIVE ACKNOWLEDGE	NAK	3D PAD *	15 PAD *
SYNCHRONOUS IDLE	SYN	32	16
DATA LINK ESCAPE	DLE	10	10
END OF INTERMEDIATE TRANSMISSION BLOCK	ITB	1F	1F
EVEN ACKNOWLEDGE	ACK0	1070	1030
ODD ACKNOWLEDGE	ACK1	1061	1031
WAIT BEFORE TRANSMIT POSITIVE ACKNOWLEDGE	WACK	106B	103B
MANDATORY DISCONNECT	DISC	1037	1004
REVERSE INTERRUPT	RVI	107C	103C
TEMPORARY TEXT DELAY	TTD	022D	0205
TRANSPARENT START OF TEXT	XSTX	1002	
TRANSPARENT INTERMEDIATE BLOCK	XITB	101F	
TRANSPARENT END OF TEXT	XETX	1003	
TRANSPARENT END OF TRANSMISSION BLOCK	XETB	1026	
TRANSPARENT SYNCHRONOUS IDLE	XSYN	1032	
TRANSPARENT BLOCK CANCEL	XENQ	102D	
TRANSPARENT TTD	XTTD	1002102D	
DATA DLE IN TRANSPARENT MODE	XDLE	1010	

** NOTE ** PAD IS 4 LOW-ORDER BITS OF 1'S (MORE BITS MAY OPTIONALLY BE ON)

APPENDIX C - EBCDIC AND ASCII TABLE

CHARACTER	EBCDIC	ASCII	CHARACTER	EBCDIC	ASCII	CHARACTER	EBCDIC	ASCII
A	C1	41	M	D4	4D	Y	E8	59
B	C2	42	N	D5	4E	Z	E9	5A
C	C3	43	O	D6	4F	0	F0	30
D	C4	44	P	D7	50	1	F1	31
E	C5	45	Q	D8	51	2	F2	32
F	C6	46	R	D9	52	3	F3	33
G	C7	47	S	E2	53	4	F4	34
H	C8	48	T	E3	54	5	F5	35
I	C9	49	U	E4	55	6	F6	36
J	D1	4A	V	E5	56	7	F7	37
K	D2	4B	W	E6	57	8	F8	38
L	D3	4C	X	E7	58	9	F9	39

APPENDIX D - SPECIFIC TERMINAL SUPPORT

USE THIS APPENDIX IN CONJUNCTION WITH APPENDIX A TO DETERMINE THE APPLICABLE OLT MESSAGES TO USE WHEN SYSTEM/3 ACTS AS THE RESPONDER (80A IS LOADED) TO A BSCA TERMINAL.
FOR SYSTEM/3 TO SYSTEM/3 OPERATION, REFER TO SECTION 1.3 OF THIS GUIDE FOR APPLICABLE OLT MESSAGES.

TERMINAL	APPLICABLE OLT MESSAGES THAT CAN BE REQUESTED
2972/2980	01
3270	NONE
3735	01,06,14
2780	01,02,04,05,06,07,08,12,13,14,15,16,19,20,21,22,99
2770	01,02,04,05,06,14,15,16,99
3741	01,05,06,14,15,20,21

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1. PROGRAM SUMMARY

1.1 OVERVIEW AND PURPOSE - 1403 PRINTER DIAGNOSTIC MODE PROGRAM

OVERVIEW --

E11 IS THE ATTACHMENT TESTING SECTION. IT BASICALLY PUTS THE ATTACHMENT INTO DIAGNOSTIC MODE AND TESTS THE ATTACHMENT FUNCTIONS AS THOROUGHLY AS POSSIBLE. IF SOME ERRONEOUS CONDITION IS FOUND, IT PRINTS AN ERROR MESSAGE AND HALTS. THE HALT CODE ITSELF, WHEN REFERRED TO IN THE HALT CHARTS IN THIS USER'S GUIDE, TELLS AT LEAST AS MUCH AS THE PRINTOUT-- SO THE PRINTCUT IS MERELY A CONVENIENCE. (6C HALT IS THE ONE EXCEPTION TO THIS).

SSW03, SSW05, AND HALT 'F5' --

'F5' INDICATES THAT SSW05 OR SSW03 SHOULD BE TURNED ON TO PROPERLY HANDLE MESSAGE PRINTING.
SINCE THE 1403 CAN'T PRINT IN DIAGNOSTIC MODE, ERROR PRINTOUTS MUST COME OUT ON AN ALTERNATE PRINTER. IF E11 TRIES TO PRINT AND IT FINDS THAT NEITHER SSW05 NOR SSW03 IS ON, IT WILL HALT 'F5'.

HALT '90' --

MANY HALT CODES USED IN E11 ARE USED IN OTHER 1403 SECTIONS AND HAVE DIFFERENT MEANINGS. THEREFORE, A SPECIAL HALT TABLE IN THIS USER'S GUIDE IS DESIGNATED FOR E11 HALTS. THE STANDARD HEADING ON ALL PRINTOUTS GIVES THE SECTION NUMBER, E11. HOWEVER, WITH SSW03 ON, NO PRINTOUT OCCURS. THEREFORE, WITH SSW03 ON, A '90' HALT PRECEDES ANY ERROR HALT. '90' HALT INDICATES --

1) ERROR HAS OCCURRED.
2) SECTION IS E11.
3) RESET '90' HALT TO GET REAL ERROR HALT AND LOOK UP ITS MEANING IN 'E11' HALT TABLE OF USER'S GUIDE.

INDIVIDUAL ROUTINE SELECTION (F2XX) --

THE NORMAL CAPABILITY OF BEING ABLE TO SELECT ROUTINES ('F2XX') IS NOT ADVISED FOR E11. EACH ROUTINE, WHILE ABLE TO RUN BY ITSELF, DEPENDS ON PREVIOUS ROUTINES HAVING RUN SUCCESSFULLY. 'LOOP ON ROUTINE', SSW01, SHOULD NOT BE USED FOR E11-- INVALID ERROR INDICATIONS MAY RESULT.

SECTION	ROUTINE DESCRIPTIONS	SENSE SWITCH OPTIONS
E11 - DIAGNOSTIC MODE TEST.	01 - CHECKS DIAGNOSTIC MODE COMMANDS AND SENSE COMMANDS.	
	02 - LOADS AND SENSES PATTERNS (AA,55,01) INTO LSRS, AND BMT TO CHECK BIT INTEGRITY, ADDRESSING AND SELECTION.	
	03 - OPTION STEPS THROUGH A PRINT COMMAND CHECKING LSRS AND SIGNALS SUCH AS CYCLE STEAL, BUFFER BUSY.	
	04 - GENERATES HAMMER ECHO CHECKS OF THE SET ADDRESS AND RESET ADDRESS. CHECKS H.E.C. SENSE BITS AND DIAGNOSTIC CHECK RESET.	
	05 - STEPS BY SUBSCAN THROUGH ENTIRE PRINT COMMAND. CHECKS SCR INCREMENTING, CARRIAGE INHIBIT SIGNAL.	
	06 - CHECKS CARRIAGE COMMANDS TO SPACE AND SKIP. MONITORS CARRIAGE BUSY AND LINE COUNTER. ALSO, CHECKS END OF FORMS SIGNAL.	
	07 - CHECKS THAT INTERRUPT LEVEL 6 COMES ON WHEN THE 1403 GOES FROM NOT READY TO READY.	
E17 - SPECIAL DIAGNOSTIC MODE TEST.	01 - PERFORMS 3 TESTS: LSR BIT INTEGRITY (AA,55,01 PATTERNS), BMT BIT INTEGRITY, AND DATA TRANSFER TO BMT AFTER SIO TO PRINT. RESULTS ARE TABULATED AND SPECIAL TESTS PERFORMED TO ISOLATE THE ERROR.	

1.2 PURPOSE - 1403 PRINTER FUNCTION TESTS AND FAULT ISOLATION PROGRAMS.

SECTION	ROUTINE DESCRIPTIONS	SENSE SWITCH OPTIONS
E12 - FUNCTION AND PERFORMANCE TEST.	01 - CHECKS TO MAKE SURE THAT THE CHAIN IMAGE STORED IN CORE CORRESPONDS TO THE PRINTER CHAIN MOUNTED.	
*NOTE - THESE ROUTINES ARE RUN ONLY WHEN SELECTED VIA CONSOLE SWITCH OPTION 'F2XX'.	02 - CHECKS THE RESPONSE TO A TEST I/O NOT READY,WHILE THE PRINTER IS NOT READY.	
	03 - CHECKS THE RESPONSE TO A TEST I/O PRINTER BUSY, WHILE THE PRINTER IS NOT READY.	
	04 - CHECKS THE RESPONSE TO A TEST I/O NOT READY WHILE THE PRINTER IS READY.	
	05 - CHECKS THE RESPONSE TO A TEST I/O PRINTER BUSY, WHILE THE PRINTER IS READY.	
	06 - DATA TRANSFER & UPC TEST. CHECKS PRINTER RESPONSE TO A PRINT COMMAND WITH UNPRINTABLE CHAR.S IN DATA FIELD. ALSO DATA TRANSFER FROM THE DATA ADDR.IN MEMORY TO THE PRINTER DATA BUFFER AND RETURN.	11,12, 16
	07 - SIO COMMANDS TEST. ALL VALID START I/O COMMANDS ARE ISSUED TO THE PRINTER AND CHECKED FOR PROPER EX- ECUTION. THE PRINTOUT SHOULD BE EXAMINED FOR UN- DETECTED ERRORS.	11,12, 16
	08 - CARRIAGE SPACE-SKIP TEST. SOME PARTICULAR SPACE AND SKIP COMMANDS ARE ISSUED TO THE PRINTER AND CHECKED FOR PROPER CARRIAGE OPERATION. THE PRINTOUT SHOULD BE EXAMINED FOR UNDETECTED ERRORS.	11,12, 16
	09 - H & T PRINT TEST. LINES OF H'S AND T'S ARE PRINTED FOR CHECKING PRINT QUALITY.	11,12, 16
	0A - PAPER SETTLING TEST. A PRINT COMMAND IS ISSUED IMM- EDIATLY AFTER THE CARRIAGE DROPS BUSY FROM A SPACE COMMAND. VERTICAL MISALIGNMENT INDICATES EXCESSIVE SETTLING TIME.	
	0B - WORSE CASE PRINT TEST. CHECKS THE PRINTERS RESPONSE TO FIRING THE 1ST 10 HAMMERS IN 3 SUCCESSIVE PRINT SUB-SCANS .	11,12, 16
	0C - RIPPLE PRINT TEST. THE CHAIN IMAGE IS PRINTED IN A LEFT TO RIGHT RIPPLE PATTERN. THE PRINTOUT SHOULD BE EXAMINED FOR ERRORS ON ANY CHARACTER OR PRINT POSITION. IF USED FOR CHAIN CLEANING,DISENGAGE THE CARR.CLUTCH AND ADVANCE FORMS MANUALLY.	11,12, 16
	*0D - THRU-PUT TEST . CHECKS THAT THE SPEED OF EXECUTION OF PRINT AND SPACE 1 CMDS.ARE WITHIN THE MAXIMUM TIME ALLOWABLE FOR THE RATED LPM THRU-PUT.	
	*0E OPERATOR ENTRY COMMANDS TEST. ANY COMMAND OR SERIES OF COMMANDS,UP TO 20,ENTERED THRU CONSOLE SWITCHES WILL BE EXECUTED,AND ANY DETECTED ERRORS INDICATED. PRINTOUT SHOULD BE EXAMINED FOR UNDETECTED ERRORS.	11,12, 16
E13 - CHAIN CHARACTER COUNTER TEST.	01 - SAMPLES OF THE PRINTER TIMING BYTES AND THE CHAIN CHARACTER COUNTER ARE SAVED AND ANALYZED FOR THE PROPER CHAIN EMITTER PULSES, HOME PULSES AND THE CHAIN CHARACTER COUNTER INCREMENTING AND RESETTING.	
E14 - CHAIN EMITTER TIMING TEST.	01 - CHAIN EMITTER PULSES ARE SAMPLED AND CHECKED FOR PROPER PULSE WIDTH AND TIMING. HOME PULSE TIMING IS ALSO CHECKED.	
E15 - SYSTEM CARRIAGE DIAGNOSTIC I	01 - CARR.CMD. TIMING ANALYSIS. ISSUES 6 CARR. CMDS. WHILE SENSING THE CARR.TIMING. THE SAMPLES ARE THEN ANALYZED FOR ANY ERRONEOUS TIMING CONDITIONS.	
* NOTE - THESE ROUTINES ARE RUN ONLY WHEN SELECTED VIA CONSOLE SWITCH OPTION 'F2XX'	*02 - RATE LIMITER TEST. MOVES THE CARRIAGE AT MAXIMUM SPEED,THEN CHECKS THE TIME TO SEE IF RATE LIMITER HAS SLOWED IT DOWN.	
	*03 - CONTINUOUS SKIP TEST. CAUSES CONTINUOUS CARRIAGE MOVEMENT IN EITHER HI OR LO SPEED . USED FOR HYD- RAULIC ADJUSTMENT.	
	*04 - CARR.EMITTERS TEST . SAMPLES AND CHECKS THE TIMING OF THE MECHANICALLY GENERATED CARR.EMITTERS. (NOT THE 1ST CARR. EMITTER SS)	
	*05 - PRINT & SPACE LOOP . USED FOR CHECKING SINGLE CYCLE .	
E16 - HAMMER ADDRESSING ANALYSIS & SENSE CMD.ANALYSIS TESTS.	01 - HAMMER ADDRESS ANALYSIS. ANALYZES THE RESULTS OF HAMMER ECHO CHKS AFTER ADDRESSING EACH HAMMER INDIVIDUALLY. IT INDICATES FAILING HMR. NUMBERS AND FAILING HMR. ADDRESS LINES .	
* NOTE - THESE ROUTINES ARE RUN ONLY WHEN SELECTED VIA CONSOLE SWITCH OPTION 'F2XX'	*02 - SENSE ANALYSIS TEST.THREE SENSE COMMANDS ARE ISSUED AND THEIR RESPONSES ANALYZED TO CHECK FOR PROPER SENSE COMMAND DECODE AND DATA TRANSFER.	
	*03 - SENSE TIMING BITS TEST. A PRINT AND SPACE COMMAND IS ISSUED AND ALL BITS OF SENSE CODE 'E2' ARE CHECKED TO BE SURE THEY GO UP AND DOWN DURING THE COMMAND.	
E18 - SYSTEM CARRIAGE DIAGNOSTIC II	01 - CARR. SINGLE SHOT TIMING CHECK . TIMES & PRINTS THE RESULTS OF THE 6 CARR. SINGLE SHOTS.	
* NOTE - THESE ROUTINES ARE RUN ONLY WHEN SELECTED VIA CONSOLE SWITCH OPTION 'F2XX'	*02 - CARR.SINGLE SHOT ADJUSTMENT TEST . THE TEST WILL TIME AND GIVE AN AUDIBLE RESPONSE TO ANY OF 6 CARR. SINGLE SHOTS SELECTED BY THE OPERATOR .	
	*03 - PRINT IN-FLIGHT. PRINTS WHILE THE CARR.IS MOVING . USED TO CHECK AND ADJUST SPACE 1,2,AND 3 SINGLE SHOTS .	

OPTIONS - 1403 PRINTER FUNCTION TEST AND FAULT ISOLATION PROGRAMS (FIP).
SENSE SWITCHES MAY BE SET BY PUTTING 'F1XX' IN CONSOLE ADDRESS SWITCHES,
THEN RESETTING THE HALT. 'F0XX' TURNS IT OFF. 'XX'IS THE SSW NUMBER.

SENSE SW. NUMBER	OPTION IN EFFECT WHEN THE SWITCH IS ON	PROGRAM CONTROLLING THE SWITCH
11	HALT BEFORE ISSUING EACH START I/O COMMAND	E12
12	DELAY BEFORE ISSUING EACH START I/O COMMAND. THE HEX VALUE IN THE THREE RIGHT-MOST CONSOLE ADDRESS SWITCHES DETERMINES THE NUMBER OF MILLISECONDS TO DELAY.	E12
16	WAIT FOR NEXT CHAIN HOME BEFORE ISSUING EACH SIO CMD. TO THE PRINTER.	E12

1.3 PURPOSE - 1403 TAPS

THE FOLLOWING CONTROL MODULES RUN UNDER CONTROL OF MTAP (FF4)

TAP ID.	TITLE	PURPOSE
015	1403 CARRIAGE TAP	CAUSES LO-SPEED SKIP. USED TO ANALYZE DURATION OF E1 EMITTER
016	1403 CARRIAGE TAP	CAUSES SPACE 2 OPERATION. TO CHK. TIMING BETWEEN SPACE 2 SS & E1 EMITTER.
017	1403 CARRIAGE TAP	CAUSES SPACE 3 OPERATION. TO CHK. TIMING BETWEEN SPACE 3 SS & E1 EMITTER.

1.4 PURPOSE - 1403 STAND-ALONE PROGRAMS

1.4.1 LOADING FROM CARD READER -

1) REMOVE HEADER CARD.
2) PLACE DECK IN PRIMARY HOPPER.
3) MAKE CARD READER READY.
4) SET IPL SELECTOR SWITCH TO 'ALTERNATE' POSITION.
5) PRESS 'PROGRAM LOAD'.

1.4.2 LOADING FROM DISKETTE -

1) INSERT STAND ALONE DISKETTE #2 (P/N 1607739) INTO 3741.
2) 'REC ADV' TO PROGRAM E0A.
3) PLACE 3741 ON-LINE, OUTPUT MODE.
(TYPE '41' IN COL 1 & 2, PRESS UPPER 'FUNCT SEL' AND 'OUTPUT FROM 3741')
4) SET IPL SELECTOR SWITCH TO 'ALTERNATE' POSITION.
5) PRESS 'PROGRAM LOAD'.

STAND ALONE TEST	TEST DESCRIPTION
E0A - 1 CARD RIPPLE PRINT (CHAIN CLEANER)	THIS TEST PRINTS THE CHAIN IMAGE IN A LEFT TO RIGHT RIPPLE PATTERN.

OPTIONS - 1403 STAND-ALONE PROGRAMS

NONE

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****        EEEEEEEE    111    111          HH       HH        AA        LL             TTTTTTTTTTTT      SSSSSSSS
******      EE           11     11          HH       HH      AA  AA      LL                  TT           SS
*********   EEEEEE       11     11          HHHHHHHHHH      AAAAAAAA     LL                  TT           SSSSSSSS
******      EE           11     11          HH       HH    AA      AA    LL                  TT                 SS
****        EEEEEEEEE   1111   1111         HH       HH    AA      AA    LLLLLLLLL           TT           SSSSSSSS
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HALT IDENTIFIER TABLE

HALT ID	MEANING	MAP CHART REFERENCE OR CARDS TO REPLACE
30	COMMAND DECODE ERROR (LINE COUNTER = 00 OR GREATER THAN 112)	A-B1B2, H2, F2
31	CHARACTER COUNTER NOT X'7F' AFTER A SIO TO PRINT (CHARACTER COUNTER = 00)	A-B1G2
32	HAMMER RESET SENSE BIT NOT ON AFTER EXECUTION OF SIO TO PRINT IN DIAGNOSTIC MODE. ACTION: RUN SECTION E12. IF NO ERROR HALT OCCURS, REPLACE A-B1H2, J2, G2. IF AN ERROR HALT DOES OCCUR, REPLACE A-B1L2, P2	SEE 'ACTION' AT LEFT
33	SCR ERROR DURING EXECUTION OF PRINT COMMAND (BUT SCR IS CHANGING)	A-B1N2, L2
34	VALUE SENSED IN LPDAR NOT SAME AS VALUE LOADED (BUT LPIAR IS OK)	A-B1G2, J2, B2
35	PSS1 SENSE BIT WAS UP OR CARRIAGE INHIBIT WAS DOWN DURING PRINT SUBSCAN 2 (PSS2) OF A PRINT COMMAND	CHART 28, ENTRY 2
36	CARRIAGE INHIBIT SENSE BIT DID NOT COME UP AT PROPER TIME DURING SIO TO PRINT. (BUT CARRIAGE WORKS IN NORMAL MODE)	CHART 30, ENTRY 2
37	CARRIAGE NOT BUSY DURING CARRIAGE COMMAND TO SKIP OR SPACE. (ANALYSIS SHOWS LINE COUNTER CANNOT BE INCREMENTED BEYOND 63).	A-B1D2, H2, G2
38	CARRIAGE NOT BUSY DURING CARRIAGE COMMAND (TO SKIP OR SPACE)	CHART 24, ENTRY 1
39	DIAGNOSTIC MODE WILL NOT GO OFF (BECAUSE DIAGNOSTIC MODE SYSTEM RESET IS NOT WORKING).	A-B1C2, B2, J2
3A	VALUE SENSED IN LPIAR NOT SAME AS VALUE LOADED (BUTLPDAR IS OK)	A-B1G2, B2, F2
3C	VALUES SENSES IN LPDAR AND LPIAR NOT SAME AS VALUES LOADED.	A-B1U2 ** ,G2,B2,M2
3E	READY DID NOT DROP WITH END OF FORMS CONDITION AND LINE COUNTER = 01	A-B1D2, G2, C2
3F	LINE COUNTER FAILS TO REACH VALUE OF ONE, AFTER 128 CARRIAGE EMITTERS WERE GENERATED. (BUT IT IS CHANGING VALUES)	CHART 29, ENTRY 3
41	HOME LATCH NOT UP AFTER HOME GENERATED (BUT PSS1 WILL COME UP)	A-B1K4, M2, K2
42	AFTER SENSE TO HAMMER ADDRESS LINES (X OR Y) EITHER NO X OR NO Y LINES WERE UP	A-B1T2, H2, G2
43	AFTER SENSE TO HAMMER ADDRESS LINES (X OR Y) EITHER X OR Y HAD MORE THAN ONE LINE ON.	A-B1T2, H2, G2
44	HAMMER RESET BIT STUCK ON. ACTION: RUN E12, IF AN 09 HALT OCCURS, REPLACE A-B1L2, M2, OTHERWISE REPLACE A-B1J2, H2.	SEE 'ACTION' AT LEFT
45	READY DROPPED DUE TO END OF FORMS CONDITION WHEN LINE COUNTER REACHED 112 RATHER THAN 01 (FORMS LENGTH = 112)	A-B1D2, G2
46	CARRIAGE SYNC CHECK BIT NOT ACTIVE AFTER LOADING FORMS LENGTH TO A VALUE LESS THAN THE LINE COUNTER.	A-B1E2, H2, J2
47	READY DID NOT DROP, FORMS JAM SNS BIT NOT ON, WHEN FORMS JAM CHECK GENERATED.	A-B1C2, J2
48	LINE COUNTER DOES NOT CHANGE VALUES WHEN CARRIAGE EMITTERS ARE GENERATED.	CHART 20, ENTRY 4
4A	CANNOT FORCE PRINTER READY BECAUSE NO-OP STATUS BIT IS ALWAYS ACTIVE.	A-B1J2, F2, E2
4C	SIO TO FORCE PRINTER READY CAUSES DIAGNOSTIC MODE TO TO OFF.	A-B1C2, U2
4E	PRINTER ALWAYS READY, CANNOT BE MADE NOT READY IN DIAGNOSTIC MODE.	CHART 30, ENTRY 1
4F	READY DID NOT DROP AFTER FORMS JAM CHECK GENERATED. (BUT FORMS JAM CHECK SENSE BIT WAS ON)	A-B1J2, G2

** SWAP U2 AND U4 CARDS, AND RE-RUN E11. IF A DIFFERENT HALT OCCURS, REPLACE THE U CARD IN THE CALLOUT. IF THE SAME HALT OCCURS, REPLACE THE OTHER CARDS IN THE CALLOUT.

E11 HALTS

HALT IDENTIFIER TABLE

HALT ID	MEANING	MAP CHART REFERENCE OR CARDS TO REPLACE
50	AFTER SIO TO PRINT, LPIAR NOT INITIALIZED PROPERLY IN PREPARATION FOR CHAIN IMAGE TRANSFERRAL TO BMT.	CHART 27, ENTRY 1
51	NEITHER CHAIN EMITTERS OR PSS1 SNS BITS ARE ACTIVE. (IN OR OUT OF DIAGNOSTIC MODE)	CHART 04, ENTRY 4
52	AFTER SIO TO PRINT, LPIAR NOT INCREMENTING DURING CHAIN IMAGE TRANSFERRAL TO BMT	A-B1B2, H2
53	AFTER SIO TO PRINT, IAR NOT INCREMENTING DURING CHAIN IMAGE TRANSFERRAL TO BMT	CHART 39, ENTRY 1
54	AFTER SIO TO PRINT, IAR IS INCREMENTING BUT NOT PROPERLY DURING CHAIN IMAGE TRANSFERRAL TO BMT	CHART 27, ENTRY 2
55	AFTER SIO TO PRINT, LPIAR INCREMENTS TOO FAR DURING CHAIN IMAGE TRANSFERRAL TO BMT	A-B1B2, G2
56	AFTER SIO TO PRINT, IAR INCREMENTS TOO FAR DURING CHAIN IMAGE TRANSFERRAL TO BMT	A-B1B2
57	AFTER SIO TO PRINT, CHAIN IMAGE TRANSFERRED OK BUT LPDAR NOT INITIALIZED PROPERLY FOR DATA TRANSFER	A-B1B2, H2
58	FORMS JAM BIT CANNOT BE FORCED ON	A-B1C2, B2
59	AFTER SIO TO PRINT, CHAIN IMAGE TRANSFERRED OK BUT LPDAR NOT= XXFF AFTER PROPER NUMBER OF CYCLE STEALS	A-B1B2
5A	AFTER SIO TO PRINT, CHAIN IMAGE AND DATA TRANSFER OK BUT DAR NOT TRANSLATED FROM X'FF' TO X'7C'	A-B1N2, P2, M2
5C	AFTER SIO TO PRINT, IAR NOT INITIALIZED TO 00 TO BEGIN CHAIN IMAGE TRANSFERRAL TO BMT	CHART 28, ENTRY 1
5E	AFTER SIO TO PRINT, CHAIN IMAGE AND DATA TRANSFER OK BUT REGISTERS CONTINUED TO INCREMENT AFTER TRANSFERRAL COMPLETE	A-B1B2
5F	CARRIAGE INHIBIT FAILED TO GO DOWN AT PROPER TIME DURING SIO TO PRINT.	A-B1M2, E2
60	FALSE STATUS CHECK INDICATED DUE TO HAMMER ADDRESS LINE ALWAYS ACTIVE.	A-B1H2, G2, T2
63	DURING SIO TO PRINT, SCR DOES NOT INCREMENT	A-B1K2, M2, P2
65	PRINT TIME SNS BIT IS STILL UP, AFTER 31/36 (1100LPM/600LPM) PRINT SCANS.	A-B1K2, H2
66	CYCLE STEAL SNS BIT NOT UP AFTER 31/36 (1100LPM/600LPM) PRINT SCANS	A-B1B2, K2
67	PRINT DATA BUFFER NOT FOUND TO BE BLANK AT CONCLUSION OF SIO TO PRINT	A-B1B2, H2, M2
6A	IAR, DAR, RAR, AND SCR (ATTACHMENT REGISTERS) ALL FAILED THE LOAD AND SNS TEST. ACTION: RUN E17	RUN E17
6C	HAMMER(S) WERE FOUND ON DURING EXECUTION OF PRINT COMMAND IN DIAGNOSTIC MODE. HAMMERS FOUND ON ARE NORMALLY LISTED IN THE PRINTOUT. IF THE PRINTOUT IS UNAVAILABLE, THE FAILING HAMMERS MAY BE OBTAINED THROUGH SUCCESSIVE HALTS. RESETTING THE '6C' HALT WILL CAUSE THE FIRST FAILING HAMMER TO BE DISPLAYED (IN HEX). SUCCESSIVE DEPRESSION OF CPU START KEY CAUSES EACH FAILING HAMMER TO BE DISPLAYED IN SEQUENCE. HALT 'FF' SIGNALS THE END. (THE USER SHOULD WRITE DOWN THE HAMMERS IN HEX AND CONVERT TO DECIMAL USING THE TABLE IN THE MAPS).	CHART 6A ENTRY 2
6F	READY DID NOT DROP WITH END OF FORMS CONDITION AND LINE COUNTER = 01	A-B1G2, C2, D2

** SWAP U2 AND U4 CARDS, AND RE-RUN E11. IF A DIFFERENT HALT OCCURS, REPLACE THE U CARD IN THE CALLOUT. IF THE SAME HALT OCCURS, REPLACE THE OTHER CARDS IN THE CALLOUT.

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****       EEEEEEEE    111    111                HH       HH         AA          LL             TTTTTTTTTTT       SSSSSSSS
******     EE           11     11                HH       HH       AA  AA        LL                 TT            SS
*********  EEEEEE       11     11                HHHHHHHHHH       AAAAAAAA       LL                 TT            SSSSSSSS
******     EE           11     11                HH       HH    AA        AA     LL                 TT                  SS
****       EEEEEEEEE   1111   1111               HH       HH    AA        AA     LLLLLLLLL          TT            SSSSSSSS
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HALT IDENTIFIER TABLE

HALT ID	MEANING	MAP CHART REFERENCE OR CARDS TO REPLACE
71	HOME SNS BIT NOT UP WHEN HOME PULSE GENERATED (ALSO PSS1 WILL NOT COME UP)	CHART 32, ENTRY 1
72	CYCLE STEAL SNS BIT NOT UP AFTER SIO TO PRINT	A-B1J2, G2, H2
73	CHARACTER COUNTER WAS NOT INITIALIZED TO 7F AFTER A SIO TO PRINT AND SPACE.	CHART 27, ENTRY 3
74	IAR NOT PROPERLY INITIALIZED IN PREPARATION FOR HAMMER OPTIONING DURING SIO TO PRINT	CHART 23, ENTRY 1
75	DAR NOT PROPERLY INITIALIZED IN PREPARATION FOR HAMMER OPTIONING DURING SIO TO PRINT	A-B1K2, M2, C2
77	RAR NOT PROPERLY INITIALIZED IN PREPARATION FOR HAMMER OPTIONING DURING SIO TO PRINT	A-B1M2, N2, K2
78	IAR ERROR DURING HAMMER OPTIONING OF A SIO TO PRINT	CHART 37, ENTRY 2
79	DAR ERROR DURING HAMMER OPTIONING OF A SIO TO PRINT	CHART 39, ENTRY 2
7A	HAR ERROR DURING HAMMER OPTIONING OF A SIO TO PRINT	A-B1T2, M2, P2
7C	RAR ERROR DURING HAMMER OPTIONING OF A SIO TO PRINT	A-B1K2, M2
7E	DIAGNOSTIC MODE CANNOT BE TURNED OFF	A-B1C2, J2
7F	LINE COUNTER NOT = 01 AFTER FORMS LENGTH LOADED TO 35 WITH LINE COUNTER ORIGINALLY = 40.	A-B1D2, E2, M2
81	1403 DID NOT INTERRUPT WHEN GOING FROM NOT READY TO READY.	A-B1C4, A-B1B2
82	AN INTERRUPT WAS PENDING WHILE NOT IN THE INTERRUPT LEVEL.	
86	FORMS JAM CHECK STATUS BIT WILL NOT COME ON WHEN FORMS JAM IS FORCED. (BUT HAMMER ECHO CHECK CAN BE FORCED)	A-B1C2
88	CARRIAGE EMITTER SNS BIT UP WHEN IT SHOULD NOT BE	A-B1C2, D2, H2
89	EA GATE ALWAYS ACTIVE	A-B1C2, G2
8A	E9 GATE ALWAYS ACTIVE	A-B1G2, C2, F2
8C	EA GATE WILL NOT GO ACTIVE	CHART 29, ENTRY 1
8E	CARRIAGE EMITTER SNS BIT NOT ACTIVE AFTER GENERATING CARRIAGE EMITTER IN DIAGNOSTIC MODE NOR AFTER SPACE COMMAND IN NORMAL MODE.	A-B1D2, H2
8F	CANNOT GENERATE CHAIN EMITTER IN DIAGNOSTIC MODE (BUT CHAIN EMITTER AND PSS1 BOTH WORK OK IN NORMAL MODE)	CHART 32, ENTRY 2
90	E11 HAS FOUND AN ERROR. NO PRINTOUT WILL OCCUR (SSW03 IS ON) SO THIS HALT SIMPLY REMINDS THE USER TO USE THE 'E11' HALT TABLE. RESET HALT TO OBTAIN APPROPRIATE ERROR HALT.	
91	SNS COMMAND IS NOT RESETTING STATUS BITS	CHART 40, ENTRY 1
93	HAMMER ECHO CHECK SNS BIT NOT ON OR 'SET ADDRESS BIT NOT OFF, AFTER GENERATING A HAMMER ECHO CHECK OF THE RESET ADDRESS	A-B1J2, C2, L2
95	SPECIAL FLAGS NOT OPERATING PROPERLY IN BMT DURING OPTIONING OF HAMMERS DURING SIO TO PRINT	CHART 40, ENTRY 2
97	AFTER DIAGNOSTIC MODE HAS FUNCTIONED PROPERLY, IT NOW CANNOT BE TURNED ON DUE TO INTERMITTENT BUG. (PROGRAM TRIES 255 TIMES TO TURN ON D.M. BEFORE GIVING THIS HALT).	RE-RUN E11
99	CHAIN READY SNS BIT NOT ON WITHIN 7.5 SECONDS AFTER DIAGNOSTIC MODE TURNED ON.	CHART 37, ENTRY 1
9A	LINE COUNTER VALUE INCORRECT DURING SPACE ONLY SIO.	CHART 20, ENTRY 1
9C	CARRIAGE NOT BUSY DURING CARRIAGE COMMAND (TO SKIP OR SPACE) (END OF FORMS SIGNAL ALWAYS ON)	A-B1C2
9E	LINE COUNTER ERROR DURING SKIP SIO	CHART 20, ENTRY 2
9F	CARRIAGE IS STILL BUSY AT END OF A SPACE OR SKIP CARRIAGE COMMAND.	CHART 20, ENTRY 3
E1	MAKE 1403 READY. (PROGRAM FINDS 1403 NOT READY. IT CANNOT BE MADE READY IN DIAGNOSTIC MODE UNTIL THE 1403 START KEY HAS BEEN DEPRESSED ONCE.	MAKE 1403 READY
F5	PROGRAM IS TRYING TO PRINT A MESSAGE BUT SSW05 IS NOT ON. TURN ON SSW05 TO PRINT ON ALTERNATE DEVICE. 3 RESET HALT.	TURN ON SSW05 OR 03 AND RESET HALT
FF	END OF HALT DISPLAY OF HAMMERS FOUND ON. THE HEX NUMBERS SHOULD BE CONVERTED TO DECIMAL. SEE HALT '6C' .	

** SWAP U2 AND U4 CARDS, AND RE-RUN E11. IF A DIFFERENT HALT OCCURS, REPLACE THE U CARD IN THE CALLOUT. IF THE SAME HALT OCCURS, REPLACE THE OTHER CARDS IN THE CALLOUT.

3.2 HALTS FOR SECTIONS E12, E13, E14, E15, E16, E17, E18 *** DO NOT USE FOR HALTS IN SECTION E11***

HALT IDENTIFIER TABLE

HALT ID	MEANING	MAP CHART REFERENCE OR CARDS TO REPLACE	TEST SECTION REFERENCE
01	CARRIAGE SYNC CHECK.	CHT 8,ENT 4	E12,E15 E16,E18
02	CARRIAGE SETTLING NOT ON IMMEDIATELY ON A SPACE 0 COMMAND.	CHART 8	E15
03	FORMS JAM CHECK.	CHART 5	E12,E15 E16, E18
04	CHAIN SYNC CHECK.	CHT 4,ENT 3	E12,E16
05	LO-SPEED DRIVE NOT ON, ON ANY CARRIAGE COMMANDS.	CHART 8	E15
06	LO-SPEED DRIVE NOT ON,ON SPACE 1 ONLY.	CHART 8	E15
07	LO-SPEED DRIVE NOT ON, ON ANY SPACE COMMANDS.	CHART 8	E15
08	PRINT DATA CHECK. SEE PRINTOUT FOR CAUSE. IF NO ALTERNATE PRINTER,CHECK MEMORY ADDRESS X'1EA4'(IN E12 ONLY).IF IT CONTAINS A X'C9', IT WAS AN INTERLOCK CHECK, IF IT CONTAINS A X'D7', IT WAS A PARITY CHECK.	CHT 44 ENT 1	E12,E16
09	HAMMER ECHO CHECK. SEE PRINTOUT FOR HMR. NO. & SET OR RESET ADDRESS. IF NO ALTERNATE PRINTER,CHECK MEMORY ADDRESS X'1FFF' FOR THE HMR.NO. (IN HEX),THAT FAILED. CHECK MEMORY ADDRESS X'1E9B' ALSO. IF IT CONTAINS A X'C5',IT WAS A RESET CHECK, IF IT CONTAINS A X'40',IT WAS A SET CHECK. (SECTION E12 ONLY)	CHT 6A,ENT 1	E12,E16
0A	ANY HAMMER ON CHECK.	CHART 6B	E12,E16
0C	UNPRINTABLE CHARACTER IN DATA FIELD OF LAST PRINT COMMAND.	A-B1K2,J2,L2	E12,E16
0d	CARRIAGE EMITTER NOT ON, ON A SPACE 1 COMMAND.	CHART 8	E15
0E	CHAIN CHECK, CHAIN IMAGE IN MEMORY DOES NOT MATCH THE CHAIN MOUNTED.	CHT 35,ENT 3	E12,E13
0F	CARRIAGE SETTLING NOT ON ON A SPACE 1 COMMAND.	CHART 8	E15
10	1403 IS NOT READY. (TO CONTINUE, PRESS PRINTER START, RESET HALT)	CHT 10,ENT 1	E12,E15, E16, E18
11	1403 IS BUSY BUT NO SIO ISSUED.	A-B1F2,E2,K2	E12,E15, E16,E18
12	PRINTER BUFFER WAS BUSY TOO LONG.	A-B1F2,B2,K2	E12,E16
13	PRINTER CARRIAGE WAS BUSY TOO LONG.	CHT 8,ENT 4	E12,E16
14	PRINTER WAS BUSY TOO LONG. (ON E15 ROUTINE 1, PRESS SYS RESET & START)	CHT 8 ENT 4	E12,E15, E16,E18
15	CARRIAGE EMITTER NOT ON,ON A SPACE 3 COMMAND.	CHART 8	E15
16	PRINTER NOT BUSY AFTER ACCEPTING A COMMAND.	A-B1G2,B2,F2	E12,E16
17	LO-SPEED DRIVE NOT ON,ON A SPACE 2 COMMAND.	CHART 8	E15
18	LO-SPEED DRIVE NOT ON, OR WENT OFF TOO SOON, ON A SPACE 3 COMMAND.	CHART 8	E15
19	LO-SPEED DRIVE NOT ON,ON A LO-SPEED SKIP COMMAND.	CHART 8	E15
1A	HI-SPEED NOT ON ON A HI-SPEED SKIP COMMAND.	CHART 8	E15
1C	CARRIAGE SYNC CHECK ON A CARRIAGE MOVE COMMAND, BUT ALL CARR. TIMINGS APPEAR CORRECT.	CHART 8	E15

HALT IDENTIFIER TABLE

HALT ID	MEANING	MAP CHART REFERENCE OR CARDS TO REPLACE	TEST SECTION REFERENCE
1d	CARRIAGE SYNC CHECK ON A CARRIAGE MOVE COMMAND, BUT ALL CARR. TIMINGS APPEAR CORRECT.	CHART 8	E15
1E	LINE COUNTER WRONG AFTER A COMMAND EXECUTED, BUT ALL CARR. TIMINGS APPEAR CORRECT.	CHART 8	E15
1F	CARRIAGE FAILED ON MANUAL OPERATIONS ONLY.	CHART 8	E15
20	LO-SPEED DRIVE ON AND OFF INTERMITTENTLY ON CARRIAGE COMMANDS.	CHART 8	E15
21	HI-SPEED DRIVE ON, DURING 1 OR MORE LO-SPEED COMMANDS.	CHART 8	E15
22	HI-SPEED DRIVE ON ALL THE TIME.	CHART 8	E15
23	HI-SPEED DRIVE WAS SENSED ON DURING A HI-SPEED SKIP COMMAND, BUT ACTUAL SKIP WAS DONE AT LO-SPEED.	CHART 8	E15
2d	LO-SPEED DRIVE NOT ON, ON A SPACE 1 COMMAND. BUT DOES NOT FAIL MANUALLY.	CHART 8	E15
31	PRINTER INDICATES READY TO A TIO WHILE NOT READY.	A-B1G2,C2	E12
32	PRINTER INDICATES BUSY TO A TIO WHILE NOT READY.	A-B1F2,E2,K2	E12
33	CARRIAGE LINE COUNTER IN ERROR AFTER A CARRIAGE COMMAND.	A-B1E2,D2,M2	E12
35	1403 THROUGHPUT SLOWER THAN RATED BY .5% OR MORE. (597 LPM (MOD.2), 1094.5 LPM (N-1), 463 LPM (MOD.5))	CHART 41, ENTRY 1	E12
36	LO-SPEED DRIVE NOT ON,ON A LO-SPEED SKIP, BUT DOES NOT FAIL MANUALLY.	CHART 8	E15
37	PRINTER BUFFER IS BUSY, BUT NO SIO ISSUED.	A-B1B2,K2,F2	E12
38	PRINTER CARRIAGE IS BUSY, BUT NO SIO ISSUED.	A-B1E2,F2	E12
3C	LO-SPEED DRIVE WENT OFF WITH HI-SPEED DRIVE DURING A HI-SPEED SKIP.	CHART 8	E15
3d	HI-SPEED DRIVE IS MECHANICALLY ACTIVE	CHART 8	E15
3E	UPC STATUS BIT NOT SET AFTER PRINT WITH UNPRINTABLE DATA.	A-B1K2,L2,M2	E12
3F	PRINT DATA DID NOT TRANSFER TO PRINTER MEMORY AND RETURN CORRECTLY. (SEE PRINTOUT FOR FAILING POSITIONS).	A-B1P2,S4	E12
40	FIRST CARR. E1 PULSE NOT MASKED COMPLETELY BY THE HI-SPEED FIRST CARR. EMITTER S.S. (TRAILING EDGE APPARENTLY BREAKING UP)	CHART 8	E15
41	DATA XFERED BY ALL 3 SENSE COMMANDS WAS IN ERROR.(SEE PRINTOUT FOR ACT. AND EXPECTED DATA).	CHT 36,ENT 3	E16
42	EB1 OR EB2 BYTE IN ERROR ON ALL SENSE COMMANDS. (SEE PRINTOUT).	A-B1G2,H2	E16
43	SENSE N CODE (XX) IS IN ERROR. (SEE PRINTOUT).	CHT 36,ENT 1	E16
44	INVALID I/O COMMAND WAS ENTERED. RESET HALT TO TRY AGAIN.		E12
45	BIT (X) OF EB(1 OR 2) FAILED. THIS TIMING BIT DID NOT FUNCTION ON A PRINT & SPACE 1.	CHT 36,ENT 2	E16
49	ONE OF THE THREE SPACE SS'S IS MARGINAL. NOTE: IF NO ERROR HALT IS OCCURING IN ANY OF THE CUSTOMER PROGRAMS, THE PRINTER IS FUNCTIONING NORMALLY, AND THE PROCEDURES SPECIFIED IN THE MAP CHARTS DO NOT ELIMINATE THE '49' HALT, REGARD THE HALT ONLY AS A WARNING OF A POTENTIAL CONDITION THAT MAY CAUSE A PROBLEM AS MACHINE CHARACTERISTICS DEGRADE	CHART 8	E15

HALT IDENTIFIER TABLE

HALT ID	MEANING	MAP CHART REFERENCE OR CARDS TO REPLACE	TEST SECTION REFERENCE
4A	HAMMER SET ADDRESS ECHO CHECK. (SEE PRINTOUT FOR HAMMER NO.S ETC.) IF NO ALTERNATE PRINTER, HAMMER NUMBERS CONTAINED IN MEMORY CAN BE DISPLAYED STARTING AT X'1DEA'. EACH HMR.NO.IS IN PRINTABLE DECIMAL FORM, 4 BYTES TO A HMR.NO.,FOR EXAMPLE, X'40,F1,F0,F7'= HMR.NO. 107. THE END OF FAILING HMR.NO.INFORMATION IS REACHED WHEN (4) X'40'S IN A ROW ARE DISPLAYED.	CHART 6A	E16
4D	2ND CARR EMITTER E1 PULSE MISSING BUT NO CARR SYNC. CHK. OCCURED	CHART 8	E15
50	TOTAL CARRIAGE TIME IS NOT BETWEEN 20.3 - 20.55 MSEC.,CORRECTED FOR DATA XFER. (SUM OF SPACE 1 & CARR.SETTLING) NOTE-IF TOTAL CARRIAGE TIME WAS REDUCED BELOW 20.3 MSEC TO MEET THRU-PUT, YOU MAY IGNORE THIS HALT IF THE PRINTER IS FUNCTIONING NORMALLY.	CHART 8	E15
51	NO CHAIN EMITTERS OCCURRED FOR 1.94 MSECS.	CHT 4, ENT 4	E12,E13, E14,E15, E16,E18
52	MORE THAN 559 USEC BETWEEN 2 EMITTERS (267 USEC (N1), 253 USEC (MOD.5)	CHT 35 ENT 2	E13
53	MORE THAN 80.4 MSEC BETWEEN HOMES. (35.33 MSEC (N1),(107.16 MSEC (MOD.5))	RUN SECT.E16 ROUT.3	E12,E13, E14,E15, E18
54	LESS THAN 79.5 MSEC BETWEEN HOMES. (34.7 MSEC (N1), (106.25 MSEC (MOD.5). POSSIBLY NOISY CHAIN EMITTERS.		E13
55	CHAIN CHARACTER COUNTER NOT RESET.	A-B1K4	E13
56	CHAIN CHARACTER COUNTER IN ERROR.	A-B1K4	E13
57	PSS-1 DID NOT OCCUR.	A-B1K4,J2	E13
58	CHAIN CHARACTER COUNTER DID NOT SHIFT.	A-B1K4	E13
59	EXTRA CHAIN EMITTERS CAUSED CHARACTER COUNTER ERROR.	A-B1K4,N2,C2	E13
5A	HAMMER RESET ADDRESS ECHO CHECK. (SEE PRINTOUT FOR HAMMER NO.S ETC.) IF NO ALTERNATE PRINTER, HAMMER NUMBERS CONTAINED IN MEMORY CAN BE DISPLAYED STARTING AT X'1DEA'. EACH HMR.NO.IS IN PRINTABLE DECIMAL FORM, 4 BYTES TO A HMR.NO.,FOR EXAMPLE, X'40,F1,F0,F7'= HMR.NO. 107. THE END OF FAILING HMR.NO.INFORMATION IS REACHED WHEN (4) X'40'S IN A ROW ARE DISPLAYED.	CHART 6A	E16
5C	RATE LIMITER IS NOT LIMITING CARR.SPEED	CHT 9,ENT 3	E15
5D	CARRIAGE EMITTER TIMING IS MARGINAL. NOTE: IF NO ERROR HALT IS OCCURING IN ANY OF THE CUSTOMER PROGRAMS, THE PRINTER IS FUNCTIONING NORMALLY, AND THE PROCEDURES SPECIFIED IN THE MAP CHARTS DO NOT ELIMINATE THE '5D' HALT, REGARD THE HALT ONLY AS A WARNING OF A POTENTIAL CONDITION THAT MAY CAUSE A PROBLEM AS MACHINE CHARACTERISTICS DEGRADE.	CHART 8	E15
5F	CARR.INHIBIT DID NOT GO OFF AFTER THE PRINT OPERATION OF A PRINT & SPACE.	CHART 8	E15
60	PARITY BIT OF BMT IN ERROR	CHT 33,ENT 1	E17
61	BMT ALWAYS X'40'	CHT 33,ENT 2	E17
62	SINGLE BIT FAILED IN BMT	CHT 31,ENT 2	E17
63	MULTIPLE BITS FAILED IN LOAD AND SENSE TESTS TO BMT	CHT 34,ENT 1	E17
64	MULTIPLE BITS FAILED IN LOAD AND SENSE TESTS TO BMT ACTION: JUMPER A-B1J2D07(+CE TIE-UP BUFFER) TO A-B1J2J12(+TIE-UP BUFFER). (SEE 1403/5421 TMD DIAGRAM 7-030) RERUN E17. IF NO ERROR HALT,WIRE IN JUMPER,END OF CALL. IF ERROR HALT OCCURS, ENTER CHART NAMED AT RIGHT.	SEE ACTION, THEN, CHT 34,ENT 2	E17
65	BMT LOAD AND SNS TEST FAILS BUT IMAGE AND DATA TRANSFER OK FOR PRINT COMMAND.	CHT 33,ENT 4	E17
66	IAR, RAR, DAR, SCR REGISTERS FAILED LOAD AND SNS TEST (BUT BMT AND PRINT COMMANDS OK)	A-B1G2	E17
67	IAR, RAR, DAR, SCR REGISTERS FAILED LOAD AND SNS TEST (BUT BMT AND PRINT COMMANDS OK)	A-B1G2,M2	E17
68	ZERO BIT ONLY FAILED IN BMT AND LSRS.	CHT 34,ENT 5	E17
69	SEVEN BIT ONLY FAILED IN BMT AND LSR'S.	CHT 34,ENT 3	E17

HALT IDENTIFIER TABLE

HALT ID	MEANING	MAP CHART REFERENCE OR CARDS TO REPLACE	TEST SECTION REFERENCE
6C	CONTENTS SENSED IN BMT AND REGISTERS (ATTACHMENT) IN ERROR DUE TO SINGLE BIT ONLY.	CHT 34,ENT 4	E17
6E	BMT SENSE ALWAYS YIELDS 00 RESULT	A-B1H2, M2	E17
6F	BMT AND REGISTER SENSE ALWAYS GIVES 00 RESULT	A-B1G2, P2 M2	E17
70	VALUE SENSED IN ATTACHMENT REGISTERS (IAR,RAR,DAR,SCR) ALWAYS 00 (BUT BMT NOT 00)	CHT 33,ENT 3	E17
71	ATTACHMENT REGISTERS AND BMT DO NOT RETURN PATTERN LOADED (MULTIPLE BITS IN ERROR)	CHT 33,ENT 3	E17
74	BMT FAILED TO RETURN PATTERN LOADED INTO IT. ALSO IMAGE AND DATA DID NOT TRANSFER AFTER SIO TO PRINT.	CHT 33,ENT 5	E17
76	CHAIN READY BIT NOT UP AFTER DIAGNOSTIC MODE TURNED ON.	A-B1G2	E17
77	NO CHAIN HOME PULSE	A-B1K4	E16
80	TIME BETWEEN CHAIN EMITTERS NOT 538-565 USEC (228-255 USEC ON N1), (730-757 USEC ON MOD.5)	CHT 35,ENT 1	E14
81	CHAIN EMITTER PULSES ARE LESS THAN 18 USEC WIDE OR LESS THAN 9 USEC BETWEEN THEM).	CHT 35,ENT 2	E14
82	TIME FROM 144TH EMITTER TO 145TH IS NOT 255-292 USEC (91-146 USEC ON N1), (356-372 USEC ON MOD.5)	CHT 35,ENT 2	E14
90	E11 HAS FOUND AN ERROR. NO PRINTOUT WILL OCCUR (SSW03 IS ON). THE HALT CHART FOR E11 HALTS (STARTING ON PAGE 7) MUST BE USED. RESET HALT TO OBTAIN APPROPRIATE ERROR HALT.		E11
99	CHAIN/TRAIN WON'T COME READY.	CHT 37,ENT 1	E14,E15, E16,E18
9d	CARRIAGE SETTLING DID NOT COME ON.	CHART 8	E15

HALT IDENTIFIER TABLE

HALT ID	MEANING	MAP CHART REFERENCE OR CARDS TO REPLACE	TEST SECTION REFERENCE
AA	RESET AA HALT. IF PROCESSOR CHECK OCCURS REPLACE THESE CARDS: P.C. INVALID ADDRESS: A-B1H2,B2,G2 P.C. DBI: A-B1G2		E17
E0	MAKE 1403 NOT READY.		E12
E1	MAKE 1403 READY.		E12,E14, E15,E16, E17
E2	RESTORE CARRIAGE, JUMPER A-B1K4G02(-PSS1) TO A-B1E2U10(+ CE TIE-UP),PRESS CHECK RESET ,THEN RESET HALT.		E16
E3	REMOVE JUMPER PUT ON AT START OF TEST. NOTE - IF A CHECK OCCURS WHEN THE JUMPER IS REMOVED, RESET THE CHECK AND CONTINUE.		E16
E4	HALT BEFORE ISSUING A SIO COMMAND TO THE PRINTER (SSW-11 OPTION).		E12
E5	SET CONSOLE SWITCHES TO XX25 FOR MANUAL SPACE ERR, XX35 FOR MANUAL RESTORE ERROR, AND 0000 FOR NO MANUAL ERROR.		E15
E6	SET CONSOLE SWITCHES TO SELECT DESIRED S.S. ADJUSTMENTS AS FOLLOWS: 10XX = SPACE 1 S.S. 0XX EQUALS TIME FROM 03.1 TO 07.8 MSECS. 2XXX = SPACE 2 S.S. XXX EQUALS TIME FROM 08.1 TO 12.3 MSECS. 3XXX = SPACE 3 S.S. XXX EQUALS TIME FROM 12.4 TO 19.8 MSECS. 40XX = CARR. SETTLING SS.IS ADJUSTED SO THAT CARR.SETTLING PLUS SPACE 1 SS. EQUALS 20.4 MSEC. 50XX - HI-SPEED 1ST CARR. EMITTER SS. (0XX = VALUE TO WHICH SPACE 1 SS. HAS BEEN ADJUSTED) 60XX - LO-SPEED 1ST CARR. EMITTER SS. (0XX = VALUE TO WHICH SPACE 1 SS. HAS BEEN ADJUSTED) NOTE - CARR. MUST BE IN NEUTRAL TO ADJUST BOTH 1ST CARR. EMITTER SS'S.		E18
E7	JUMPER A-B1U4B03 (-UCS EMITTER -1.8) TO A-B1H2J06 (-CE SENSE TAP BIT) SO UCS HOME CAN BE DETERMINED.		E13
E8	JUMPER A-B1L2B03 (+ DIAG HEC TIE-UP) TO A-B1E2U10 (+CE TIE-UP) BEFORE STARTING HAMMER ADDRESS TEST.		E16
E9	JUMPER PEB A-A1G5D02 (-CE CARR HI-LO TIE-DOWN) TO PEB A-A1G5D08 (GND), PUT CARR. IN NEUTRAL AND RESET THE HALT. THE CARRIAGE WILL RUN AWAY IN A CONTINOUS SKIP. IF A SEQUENCE, CONSISTING OF DEPRESSING THE CARRIAGE STOP KEY, CHECK RESET, THEN THE PRINTER START KEY, IS REPEATED 3 TIMES, THE CARRIAGE WILL BEGIN SKIPPING AT THE OTHER SPEED. * CAUTION - BE SURE THAT THE JUMPER IS PLACED FROM A-A1G5D08 TO A-A1G5D02, NOT A-A1G5D03. A-A1G5D03 IS +6VDC AND IF SHORTED TO A-A1G5D08, MAY CAUSE DAMAGE TO HAMMER DRIVER CARDS. *		E15
EA	ENTER A PRINTER SIO COMMAND(SEE 5.0 GENERAL PRINTER INFORMATION) -EXXX-, OR A TIME DELAY -0XXX- (XXX=ANY HEX NUMBER OF MSECS FROM FFF TO 001) , IN THE CONSOLE SWITCHES AND RESET THIS HALT.		E12
EC	ENTER ANOTHER COMMAND OR DELAY, AND RESET HALT, OR ENTER -0000- ANYTIME TO START EXECUTION OF ENTRIES. EXECUTION WILL ALSO BEGIN AFTER 20 ENTRIES.		E12
:::: : : : ::: :::: : : : :::: ::::	JUMPER A-B1E2J13 (+CE TIE-UP PRINT WHEN BUSY) TO A-B1L2D12 (+TIE-UP UNLIMITED SYNC CHK.) THIS ALLOWS IN-FLIGHT PRINTING. TO CONTINOUSLY LOOP ON ONLY 1 FO THE SPACE CMDS, SET THE LEFT-MOST CONSOLE SWITCH TO A 1 FOR A SPACE 1, 2 FOR A SPACE 2, OR 3 FOR A SPACE 3. FOR EXAMPLES CF THE OUTPUT OF THIS TEST SEE THE 1403/5421 TMD.		E18
EE	CARRIAGE INTERLOCK OR END OF FORMS.	CHART 8	E15
EF	FORMS JAM.	CHART 8	E15
F5	TURN ON SSW03 OR 05 TO HANDLE ERROR PRINTOUT. RESET HALT.		E11,E17
FA	PUT CARR. IN NEUTRAL TO MEASURE SINGLE SHOT DURATIONS.		E18

4. DETAILED DESCRIPTION OF TESTS

4.1 SECTION E11

THE DETAILED ROUTINE DESCRIPTIONS LIST THE FUNCTIONS OR TESTS WHICH ARE PERFORMED BY EACH ROUTINE. IT IS IMPLIED THAT EACH OPERATION IS CHECKED FOR SUCCESSFUL OPERATION AND IF FOUND UNSUCCESSFUL, A HALT IS GIVEN TO INDICATE AN ERROR.

4.1.1 ROUTINE 1 - SIMPLE DIAGNOSTIC COMMANDS TEST

CHECK LINE COUNTER. IF ZERO OR GREATER THAN 112, INDICATE COMMAND DECODE ERROR.
CHECK FOR 1403 BUSY WHEN NO SIO ISSUED.
TURN ON DIAGNOSTIC MODE AND CHECK THAT IT CAME ON.
ISSUE SYSTEM RESET, D.M. SHOULD GO OFF.
TURN ON D.M.
GENERATE PRINTER READY AND PRINTER NOT READY WITH DIAGNOSTIC MODE COMMANDS.
GENERATE DIAGNOSTIC FORMS JAM AND CHECK 'FORMS JAM' STATUS BIT.
ISSUE CHECK RESET AND CHECK THAT 'FORMS JAM' STATUS BIT IS RESET.
ISSUE -E9- DIAGNOSTIC COMMANDS AND SEE IF THEY ARE DECODED AS -EA- COMMANDS.
CHECK DIAGNOSTIC GENERATION OF CARRIAGE EMITTER AND CHAIN EMITTER.
MAKE SURE SNS COMMAND RESETS CHAIN EMITTER AND CARRIAGE EMITTER SENSE LATCHES.

4.1.2 ROUTINE 2 - LSR AND BMT TEST.

TURN ON DIAGNOSTIC MODE, ISSUE CHECK RESET, MAKE PRINTER READY.
CHECK LSR'S AND BMT WITH A'S AND 5'S AND 01'S. THAT IS, LOAD REGISTERS RAR, SCR, IAR, DAR, LPDAR, AND LPIAR WITH PATTERNS OF TWO A'S, THEN TWO 5'S, THEN 01'S. EACH LSR IS SENSED AND CHECKED WITH THE PATTERN LOADED. THIS ASSURES THAT EACH BIT IN EACH REGISTER IS CHECKED.
THE ENTIRE BMT IS CHECKED WITH THE SAME PATTERN, A'S, 5'S, AND 01'S. CORRECT PARITY IN THE BMT IS ALSO CHECKED.
LSR SELECTION TEST IS PERFORMED BY LOADING X'08', X'04', X'02', AND X'01' INTO IAR, DAR, SCR, AND RAR RESPECTIVELY. THEN APPROPRIATE LSRS ARE SENSED AND CHECKED FOR PROPER VALUE.
BMT ADDRESSING IS CHECKED BY LOADING X'00', X'01', X'02', ... X'FF' INTO BMT LOCATIONS X'00' - X'FF'. EACH LOCATION IS THEN SENSED AND CHECKED FOR CORRECT VALUE.

4.1.3 ROUTINE 3 - OPTION STEP PRINT COMMAND TEST

TURN ON DIAGNOSTIC MODE, ISSUE CHECK RESET, MAKE PRINTER READY.
GENERATE WORSE CASE PRINT PATTERN IN BUFFER.
MAKE SURE HOME BIT AND HAMMER RESET BIT ARE OFF.
ISSUE HOME PULSE (DIAGNOSTIC INSTRUCTIONS). THEN TURN ON 'OPTION STEP MODE'.
ISSUE SIO TO PRINT AND SPACE.
STEP THROUGH ALL CYCLE STEALING, CHECKING ALL KNOWN REGISTER VALUES. (THIS CHECKS THE TRANSFERRAL OF CHAIN IMAGE AND PRINT DATA TO THE BMT BUFFER.)
CHECK THAT PRINT BUFFER IS BUSY, CYCLE STEAL SENSE BIT IS ON, AND CHARACTER COUNTER = X'7F'.
ISSUE 135 OPTION STEPS (132 HAMMER OPTIONS + 1 INITIALIZE CYCLE FOR EACH OF THE 3 SUBSCANS -- THIS CONSTITUTES ONE FULL 'PRINT SCAN', EACH HAMMER SHOULD BE OPTIONED AND SINCE WE HAVE A WORSE CASE PRINT PATTERN, EACH HAMMER WILL BE SET).
FOR EACH OPTION, CHECK DAR, IAR, HAR, RAR FOR PROPER VALUES.
MAKE SURE 'HAMMER OFF ECHO' SENSE BIT IS ON (IF OFF, RECORD HAR IN TABLE TO BE PRINTED OUT LATER AS AN ERROR AFTER ALL OPTIONS ARE COMPLETE).
TURN OFF OPTION STEP MODE.
CHECK THAT DATA AREA OF BMT BUFFER CONTAINS X'40' WITHOUT P BIT.
ISSUE 3 CHAIN EMITTERS TO ALLOW PRINT SCAN 2 TO OCCUR.
MAKE SURE 'HAMMER RESET' BIT IS UP.
CHECK THAT BMT BUFFER (PRINT DATA BUFFER) CONTAINS ALL X'40' WITH EVEN PARITY (CORRECT PARITY)

4.1.4 ROUTINE 4 - HAMMER ECHO CHECK

TURN ON DIAGNOSTIC MODE, ISSUE CHECK RESET, MAKE PRINTER READY.
ISSUE INSTRUCTIONS TO FORCE 'HAMMER ECHO CHECK' OF THE SET ADDRESS.
CHECK FOR H.E.C. (HAMMER ECHO CHECK) STATUS BIT AND 'SET ADDRESS' BIT ON.
ISSUE CHECK RESET (BEFORE POWER DROPS DUE TO CHECK).
ISSUE INSTRUCTIONS TO FORCE H.E.C. OF THE RESET ADDRESS.
AGAIN CHECK H.E.C. SENSE BIT AND SET ADDRESS BIT FOR PROPER VALUE (H.E.C. BIT ON, SET ADDRESS BIT OFF).
ISSUE CHECK RESET.

4.1.5 ROUTINE 5 - PERFORM FULL PRINT COMMAND, CHECKING PRINT TIMING SIGNALS, CARRIAGE SIGNALS, AND SCR INCREMENTING.

TURN ON DIAGNOSTIC MODE, ISSUE CHECK RESET, MAKE PRINTER READY.
ISSUE SIO TO PRINT AND SPACE.
MAKE SURE IMAGE DOES NOT TRANSFER TO BMT.
ISSUE CHAIN EMITTERS FOR 29 PRINT SCANS. (34 FOR 600 LPM, MOD 2), (36 FOR 465 LPM, MOD.5). DURING THESE PRINT SCANS, CHECK 'PSS1' SENSE BIT AND SCR FOR PROPER VALUE.
ISSUE CHAIN EMITTER TO BEGIN ONE MORE PRINTSCAN (THIS CAUSES END OF DATA)
PSS1 BIT SHOULD BE DOWN, CARRIAGE INHIBIT BIT SHOULD BE UP.
ALLOW TWO MORE PRINT SCANS (ISSUE 6 MORE CHAIN EMITTERS).
CHECK THAT 'PRINT TIME' BIT IS DOWN THAT BUFFER NOT BUSY INTERRUPT OCCURRED (MODEL 15 ONLY) AND 'CYCLE STEAL' BIT IS UP.

4.1.6 ROUTINE 6 - CARRIAGE COMMAND TEST.

TURN ON DIAGNOSTIC MODE, ISSUE CHECK RESET, MAKE PRINTER READY.
SIO'S TO SPACE 0,1,2,3,4, AND 5 LINES ARE ISSUED.
AFTER EACH SIO, BUSY IS CHECKED, APPROPRIATE CARRIAGE EMITTERS ARE GENERATED, AND THE LINE COUNTER IS CHECKED.
SIO'S ARE ISSUED TO SKIP TO LINE 42 AND 85. (THIS CHECKS EACH BIT IN THE 'UP/DOWN COUNTER'.)
BUSY IS CHECKED AND LINE COUNTER CHECKED AS CARRIAGE EMITTERS ARE ISSUED. OP END INTERRUPT IS CHECKED (MODEL 15 ONLY) AFTER ALL EMITTERS ARE ISSUED.
A DIAGNOSTIC E.O.F. (END OF FORMS) IS GENERATED AND CARRIAGE EMITTERS ARE ISSUED TO STEP THE LINE COUNTER TO X'01'.
PRINTER SHOULD DROP READY.
FINALLY, LOAD FORMS LENGTH TO NUMBER LESS THAN LINE COUNTER VALUE, ISSUE AN SIO TO SKIP. CHECK THAT LINE COUNTER GOES TO ONE AND 'CARRIAGE SYNC CHECK' STATUS BIT IS ON.

4.1.7 ROUTINE 7 - NOT READY TO READY INTERRUPT TEST.

TURN ON DIAGNOSTIC MODE, GENERATE NOT READY CONDITION.
T10 FOR INTERRUPT PENDING, ENABLE INTERRUPT LEVEL 6, LOAD IAR 6 TO GOOD INTERRUPT ROUTINE. GENERATE READY CONDITION. INTERRUPT LEVEL 6 COMES ON AT THIS TIME AND THE PROGRAM BRANCHES TO AN INTERRUPT HANDLING ROUTINE WHOSE ADDRESS HAD BEEN PREVIOUSLY LOADED INTO IAR 6. TEST FOR INTERRUPT PENDING, LOAD PIAR TO RETURN TO MAIN PROGRAM. DISABLE INTERRUPT LEVEL 6. GENERATE NOT READY CONDITION THEN GENERATE READY CONDITION.

4.2 SECTION E12

4.2.1 ROUTINE 1 - CHAIN AND IMAGE TEST .
THE PRINTER MUST BE DEFINED CORRECTLY ON THE UDT CARD BEFORE RUNNING THIS TEST . THIS ROUTINE CHECKS TO SEE IF THE CHAIN IMAGE LOADED BY DCP MATCHES THE CHAIN CURRENTLY MOUNTED ON THE PRINTER.

4.2.2 ROUTINE 2 - TIO NOT READY TO NOT READY PRINTER
IF THE PRINTER INDICATES READY TO A TEST I/O FOR NOT READY,A MESSAGE AND /OR HALT 'E0' WILL OCCUR ASKING FOR THE 1403 TO BE MADE NOT READY. AFTER HALT 'E0' IS RESET AND THE PRINTER STILL INDICATES READY TO A TIO FOR NOT READY, AN ERROR IS DISPLAYED.

4.2.3 ROUTINE 3 - TIO BUSY TO NOT BUSY PRINTER.
IF THE 1403 INDICATES PRINTER BUSY TO A TEST I/O FOR BUSY,WHILE THE 1403 IS NOT READY, AN ERROR IS DISPLAYED.

4.2.4 ROUTINE 4 - TIO NOT READY TO A READY PRINTER.
IF THE 1403 INDICATES NOT READY TO A TEST I/O FOR NOT READY, A MESSAGE AND/OR HALT 'E1' WILL OCCUR ASKING FOR THE 1403 TO BE MADE READY. WHEN HALT 'E1' IS RESET AND THE PRINTER STILL INDICATES NOT READY TO A TEST I/O FOR NOT READY, AN ERROR IS DISPLAYED.

4.2.5 ROUTINE 5 - TIO BUSY TO READY PRINTER.
THE 1403 IS READY, AND NO START I/O COMMAND ISSUED. IF THE 1403 INDICATES PRINTER BUSY TO A TIO FOR BUSY, AN ERROR IS DISPLAYED. THE ERROR MESSAGE AND/OR HALT WILL SPECIFY WHETHER THE ERROR IS PRINTER BUFFER BUSY, CARRIAGE BUSY, OR SIMPLY PRINTER BUSY .

4.2.6 ROUTINE 6 - DATA TRANSFER & UNPRINTABLE CHAR. TEST .
FIRST,THE PRINT IMAGE AREA IS FILLED WITH A HEX CHAR.UNLIKE THE 132 CHARACTERS IN THE DATA FIELD, SO EVERY PRINT POSITION IS UNPRINTABLE . A PRINT CMD. IS ISSUED SO EACH CHAR. WILL TRANSFER TO THE PRINTER MEMORY AND THEN SHOULD RETURN , UNCHANGED, WHEN THE CMD. ENDS. BEFORE AND AFTER DATA FIELDS ARE THEN COMPARED,AND ANY ERRONEOUS PRINT POSITIONS INDICATED . UPC STATUS BIT IS ALSO CHECKED TO MAKE SURE IT CAME ON .

4.2.7 ROUTINE 7 - START I/O COMMANDS TEST.
THE TEST FIRST SKIPS THE CARRIAGE TO LINE 1, THEN BEGINS EXECUTION OF EACH COMMAND IN THE FOLLOWING TABLE:

C O M M A N D	C O D E (H E X)
PRINT	E200
SPACE 0	E000
PRINT	E200
SPACE 1	E001
PRINT	E200
SPACE 2	E002
PRINT	E200
SPACE 3	E003
PRINT AND SPACE 1	E201
PRINT AND SPACE 2	E202
PRINT AND SPACE 3	E203
PRINT	E200
SKIP TO LINE 17	E411
PRINT AND SKIP TO LINE 22	E616
PRINT AND SKIP TO LINE 1	E601

DURING AND AFTER EXECUTION OF EACH COMMAND, ALL POSSIBLE ERROR CONDITIONS (BUSY ERRORS, STATUS ERRORS, ETC.) ARE CHECKED.ANY ERRORS FOUND WILL PRINT OUT WITH ALL PERTINENT INFORMATION ABOUT THE CONDITION, AND THE APPROPRIATE HALT ID DISPLAYED. THE DATA PRINTED DURING EXECUTION CONTAINS THE LINE NUMBER AND THE NAME OF EACH COMMAND EXECUTED.
FOR EXAMPLE:

```
LINE 001/ PRINT / SPACE 0/ PRINT  / SPACE 1
LINE 002/ PRINT / SPACE 2

LINE 004/ PRINT / SPACE 3
         |             |
         |             |
LINE 013/ PRINT / SKIP TO 017


LINE 017/ PRINT & SKIP TO 022
ETC.
```

THE CARRIAGE MOVEMENT COMMAND(S) IN EACH LINE PRINTED DETERMINES THE SPACING TO THE NEXT LINE PRINTED.

4.2.8 ROUTINE 8 - CARRIAGE SPACE/SKIP TEST.
FIRST THE PROGRAM RESTORES THE CARRIAGE TO LINE 1 IF IT IS NOT ALREADY THERE. NEXT,IT BEGINS EXECUTION OF EACH COMMAND IN THE FOLLOWING TABLE:

C O M M A N D	C O D E (HEX)
SKIP TO LINE 42	E42A
SPACE 1	E001
SKIP TO LINE 85	E455
SPACE 1	E001
SKIP TO LINE 112	E470
SPACE 1	E001
SPACE 2	E002
SPACE 3	E003
SPACE 0	E000

PRIOR TO EXECUTION OF EACH OF THESE CARRIAGE COMMANDS,THE NAME OF THE COMMAND, THE FORM LENGTH CURRENTLY IN EFFECT, AND THE LINE NUMBER OF THE CURRENT POSITION OF THE CARRIAGE ARE PRINTED. DURING AND AFTER EXECUTION OF COMMANDS, ALL STATUS CONDITIONS ARE CHECKED AND ANY ERRORS INDICATED. IN ADDITION, THE CARRIAGE LINE COUNTER IS SAMPLED AFTER EACH CARRIAGE COMMAND AND ANALYZED FOR CORRECT CARRIAGE MOVEMENT. ANY CARRIAGE/LINE COUNTER DISCREPANCIES WILL BE INDICATED, HOWEVER THE PRINTED OUTPUT SHOULD BE CHECKED FOR HARDWARE UNDETECTABLE CARRIAGE ERRORS.

4.2.9 ROUTINE 9 - H & T PRINT TEST.
THE DATA AREA IS FILLED WITH H'S AND PRINT COMMANDS ISSUED UNTIL 25 LINES OF H'S ARE PRINTED . A LINE OF ASTERISKS ARE THEN PRINTED IN EVERY 10TH PRINT POSITION FOR REFERENCE. NEXT,25 LINES OF T'S ARE PRINTED IN THE SAME MANNER AS THE H'S . IF ANY ERRORS OCCUR DURING THE ROUTINE ,THEY WILL BE INDICATED. THE PRINT LINES SHOULD BE EXAMINED FOR PRINT QUALITY . A BAD HAMMER OR ADJUSTMENT IS READILY APPARENT WITH THIS PATTERN.

4.2.10 ROUTINE A - PAPER SETTLING TEST.

FIRST, EVERY EIGHTH PRINT POSITION (FROM 8 THRU 128) OF THE DATA AREA IS FILLED WITH A X'4B' . THE CHAIN IMAGE AREA IS FILLED WITH THE SAME VALUE, SO THAT THE HAMMERS WILL FIRE DURING THE 3 PSS'S OF SCAN 1 . NOW, A SPACE 1 COMMAND IS ISSUED, AND AS SOON AS THE CARRIAGE DROPS BUSY, THE COMMAND IS ISSUED TO PRINT THE PREVIOUSLY SET UP DATA AREA. THEREFORE, PRINTING BEGINS AS SOON AS POSSIBLE AFTER CARRIAGE MOVEMENT. THEN, AFTER ALL BUSY CONDITIONS HAVE DROPPED, A COMMAND IS ISSUED TO PRINT 7 T'S BETWEEN THE PREVIOUSLY PRINTED CHARACTERS AS A REFERENCE . 20 SUCH LINES ARE PRINTED .
THEY SHOULD BE CAREFULLY SCANNED FOR MISALIGNMENT OF EVERY 8TH CHARACTER WITH THE 7 T'S BETWEEN THEM, PARTICULARLY IN THE LEFT PRINT POSITIONS SINCE THEIR HAMMERS FIRE EARLIEST.

4.2.11 ROUTINE B - WORSE CASE PRINT TEST.

FIRST A LINE (1ST 30 POSITIONS) OF H'S ARE PRINTED AS A REFERENCE LINE. THEN A PRINT PATTERN IS SET UP IN THE DATA AREA SUCH THAT 10 HAMMERS WILL FIRE 11.2 USEC'S APART (4.8 USEC ON 1100 LPM), IN EACH PRINT SUB SCAN . ALL 30 HAMMERS WILL FIRE IN THE 1ST PRINT SCAN .
THE PRINT PATTERN THAT CAUSES THIS IS AS FOLLOWS :

12334556778990##@//STTUVVWXXYZ

25 OF THESE LINES ARE PRINTED . ALL ERROR CONDITIONS ARE CHECKED DURING AND AFTER EACH COMMAND, AND ANY ERRORS INDICATED.

4.2.12 ROUTINE C - RIPPLE PRINT.

THIS TEST FILLS THE DATA AREA WITH THE CHAIN IMAGE.AFTER PRINTING A LINE, THE DATA FIELD IS SHIFTED 1 POSITION TO THE RIGHT, UNTIL EACH CHARACTER OF THE IMAGE HAS BEEN PRINTED IN EVERY PRINT POSITION. ALL ERROR CONDITIONS ARE CHECKED DURING AND AFTER EACH COMMAND AND ANY ERRORS INDICATED. IF THE ROUTINE IS TO BE USED FOR CHAIN CLEANING, THE CARRIAGE CLUTCH MUST BE IN NEUTRAL AND THE FORMS ADVANCED BY THE OPERATOR.

4.2.13 ROUTINE D - THRU-PUT TEST (EXECUTED AT OPERATOR REQUEST)

THIS TEST SETS UP TO PRINT 101 (132) CHARACTER LINES OF H'S AND ACCUMULATES THE ELAPSED TIME OF THE LAST 100. ELAPSED TIME FOR EACH COMMAND IS COMPOSED OF BUSY TIME ,CYCLE STEAL TIME(404 USEC), AND INSTRUCTION TIME BETWEEN PRINTER COMMANDS (737 USEC). THE TOTAL TIME IS DIVIDED BY 100 TO GET A ONE LINE AVERAGE AND THIS IS PRINTED OUT FOR THE OPERATOR. THIS AVERAGE IS COMPARED TO THE MAXIMUM TIME (129.68 MSEC ON 465 LPM), (100.50 MSEC ON 600 LPM) AND (54.81 MSEC ON 1100 LPM) ALLOWABLE FOR THE LPM RATING. IF AVERAGE ELAPSED TIME IS MORE THAN THIS, ERROR HALT '35' IS INDICATED. THE PRINTED ERROR INFORMATION INCLUDES THE MAXIMUM EXPECTED TIME OF THE LINE, THE TOTAL CARRIAGE TIME, AND ERROR STATUS IF ANY.

4.2.14 ROUTINE E - OPERATOR ENTRY COMMANDS TEST. (EXECUTED AT OPERATOR REQUEST)

THE PROGRAM FIRST GIVES THE OPERATOR INSTRUCTIONS, TO ENTER THE COMMANDS AND/OR DELAYS DESIRED, FOLLOWED BY AN 'EA' HALT. AT THIS TIME THE OPERATOR MAY ENTER A COMMAND 'EXXX' OR DELAY '0XXX' AND RESET THE HALT. AN 'EC' HALT WILL THEN APPEAR AND ANOTHER COMMAND OR DELAY ENTERED. ALTERNATING 'EA' AND 'EC' HALTS OCCUR UNTIL UP TO 20 ENTRIES ARE MADE, OR A '0000' IS ENTERED. ANY INVALID ENTRY WILL BE INDICATED WITH A '44' ERROR HALT. BEFORE EXECUTION OF ENTRIES BEGINS,THE LIST OF ENTRIES IS PRINTED. DURING AND AFTER EXECUTION OF EACH COMMAND, ALL POSSIBLE ERROR CONDITIONS ARE CHECKED. ANY ERRORS FOUND WILL BE INDICATED BY A MESSAGE AND/OR THE APPROPRIATE HALT ID. THE DATA PRINTED DURING EXECUTION WILL CONTAIN THE LINE NUMBER AND THE NAME OF EACH COMMAND EXECUTED. THE TEST CONTINUES LOOPING ON THE ENTERED LIST UNTIL STOPPED BY THE OPERATOR.

4.3 SECTION E13

4.3.1 ROUTINE 1 - CHAIN CHARACTER COUNTER TEST.
THE PROGRAM FIRST CHECKS TO SEE IF THE CHAIN IMAGE LOADED BY DCP MATCHES THE CHAIN CURRENTLY MOUNTED ON THE PRINTER. IF THE CHAIN AND IMAGE DO NOT AGREE, ERRORS WILL OCCUR ON THIS TEST. NEXT, THE CHAIN EMITTER IS SAMPLED AT A 24.3 USEC RATE FOR ABOUT 37 MSEC. (1550 SAMPLES), AND THE FOLLOWING 2 TESTS ARE PERFORMED ON THE DATA SAMPLED.

STEP 1. FIND A CHAIN EMITTER PULSE WITHIN 1.94 MSEC OF THE START OF SAMPLING. HALT '51' IF NO PULSE.

STEP 2. FIND CHAIN EMITTER PULSES EVERY 559 USEC (267 USEC FOR 1100 LPM) AND (777 USEC FOR 465 LPM) THROUGH THE ENTIRE SAMPLE TIME. HALT '52' IF A PULSE IS MISSING.

THE TEST THEN GOES INTO A LOOP SEARCHING FOR HOME LATCH.IF NOT FOUND IN 564 MSEC, THE TEST CONTINUES ANYWAY , SINCE ANY CHAIN ERROR WILL SHOW UP AS AN ERROR HALT ON THIS TEST. WHEN HOME LATCH IS FOUND, THE TEST DELAYS 375 MSEC (150 MSEC FOR 1100 LPM) AND (515 MSEC FOR 465 LPM) AND IMMEDIATELY FOLLOWING THIS DELAY, THE TEST GOES INTO A 91.2 USEC LOOP (73 USEC FOR 1100 LPM) SAMPLING THE CHAIN CHAR. COUNT. AND THE EB2 BYTE OF THE PRINTER TIMING UNTIL 1550 SAMPLES OF EACH ARE TAKEN. THE FOLLOWING ARE TESTS PERFORMED ON THE DATA SAMPLED, THE ORDER IN WHICH THEY ARE PERFORMED, AND THE ASSOCIATED HALT IN THE EVENT OF A FAILURE.

STEP 3. FIND A HOME LATCH AND CHECK THE TIME TO THE NEXT HOME TO BE LESS THAN 80.40 MSEC (35.33 MSEC FOR 1100 LPM) AND (108.8 MSEC FOR 465 LPM) ON A 48 CHARACTER CHAIN. (ONLY 1 HOME WITH UCS). HALT '53' IF NO HOME FOUND OR TOO LONG BETWEEN HOMES.

STEP 4. CHECK THE TIME FROM ONE HOME LATCH TO THE NEXT TO BE GREATER THAN 79.50 MSEC (34.68 MSEC FOR 1100 LPM) AND (104.5 MSEC FOR 465 LPM) ON A 48 CHARACTER CHAIN.(ONLY 1 HOME LATCH WITH UCS). HALT '54' IF TOO MANY HOME LATCHES ARE FOUND.

STEP 5. CHECK THE CHAR COUNTER FOR CORRECT INCREMENTING AND RESETTING AT HOME LATCH TIME. THE FOLLOWING TABLE ILLUSTRATES THE POSSIBLE ERRORS AND HOW THE CHECKING IS DONE:

CHARACTER COUNTER VALUES AROUND HOME LATCH (RESET)
TIME WHEN ERRORS OCCUR. EACH VALUE SHOULD REMAIN IN
THE COUNTER FOR 1 PRINT SCAN, 1666 USEC(729 USEC FOR 1100 LPM AND 2223 USEC FOR 465 LPM).

```
                           |- NOTE- HOME LATCH OCCURS ABOUT 456 USEC (220 USEC FOR
                           |        1100 LPM )   BEFORE THE CHAR COUNTER RESETS.
-NORMAL-                   |
48 CHAR SET    --2D-----2E-----2F---H-00-----01-----02--
U C S          --75-----76-----77---H-00-----01-----02--

-ERRORS-
(48 CHAR. SET SHOWN ONLY)

NO CHAR. CTR.  --6E-----6F-----70---H-71-----72-----73--
RESET

NO CHAR. CTR.
SHIFT OR NO    --7F-----7F-----7F---H-7F-----7F-----7F--
PSS1 PULSE

EXTRA EMITTER
PULSES         --2F-----30-----31---H-00-----01-----02--

CHAR.CTR.ERROR
(BIT ALWAYS ON )--06-----07-----04---H-04-----05-----04--
(BIT ALWAYS OFF)--02-----03-----00---H-00-----01-----02--
```

(A) IS CHAR COUNTER AT '00',547 USEC (292 USEC FOR 1100 LPM) AFTER HOME LATCH? IF NOT GO TO (D).

(B) IS CHAR COUNTER AT '2F'('77'FOR UCS),AT HOME LATCH TIME? IF NOT GO TO (D).

(C) THE CHAR COUNTER IS CORRECT. GO TO STEP 6.

(D) IS CHAR COUNTER HIGHER THAN '2F'('77'FOR UCS), AT 547 USEC (292 USEC FOR 1100 LPM) AFTER HOME LATCH? IF NOT GO TO (J).

(E) IS CHAR COUNTER AT '7F',547 USEC (292 USEC FOR 1100 LPM) AFTER HOME LATCH? IF NOT, GO TO (J).

(F) DID PSS1 OCCUR 547 TO 730 USEC (292 USEC TO 438 USEC FOR 1100 LPM) AFTER HOME LATCH? IF NOT GO TO (H).

(G) HALT 58, NO CHAR COUNTER SHIFT.

(H) HALT 57, PSS1 DID NOT OCCUR.

(J) IS THE CHAR COUNTER VALUE AT 365 USEC (292 USEC FOR 1100 LPM) BEFORE HOME LATCH 1 LESS THAN 365 USEC (292 USEC FOR 1100 LPM) AFTER HOME LATCH? IF NOT, GO TO (L).

(K) HALT 55, CHAR COUNTER DID NOT RESET.

(L) CHECK THE VALUES IN THE CHAR COUNTER EVERY 1.64 MSEC (.73 MSEC FOR 1100 LPM) (2.28 USEC FOR 465 LPM) FOR 65.6 MSEC (30 MSEC FOR 1100 LPM) STARTING AT HOME LATCH.IF ANY CHAR COUNTER VALUE IS MORE THAN 2 HIGHER THAN THE PREVIOUS VALUE, GO TO (M). IF THE CHAR COUNTER VALUE IS 2 HIGHER THAN THE PREVIOUS VALUE MORE THAN 10 TIMES, GO TO (N).

(M) HALT 59, CHAR COUNTER ERROR DUE TO EXTRA CHAIN EMITTERS OR NOISE.

(N) HALT 56, CHAR COUNTER ERROR.

STEP 6. THE ENTIRE SAMPLING AND CHECKING PROCEDURE IS DONE 50 TIMES BEFORE THE TEST IS COMPLETED.

4.4 SECTION E14

4.4.1 ROUTINE 1- CHAIN EMITTER TIMING TEST.

AFTER INITIALIZING, THIS TEST WAITS FOR HOME LATCH TO OCCUR, DELAYS 1 MSEC, THEN SAMPLES THE CHAIN EMITTER TIMING EVERY 9.12 USEC FOR 10 MSEC (1100 BYTES). THE TIME FROM CHAIN EMITTER TO CHAIN EMITTER IS THEN CHECKED TO BE BETWEEN 538 USEC AND 574 USEC, (228 USEC TO 255 USEC FOR 1100 LPM) (720 USEC TO 757 USEC FOR 465 LPM). IF ANY EMITTER TIME FALLS OUTSIDE THESE TOLERANCES, HALT '80' OCCURS. THIS SAMPLING AND CHECKING CONTINUES UNTIL 12 BATCHES OF SAMPLES ARE CHECKED. EACH TIME, THE DELAY AFTER HOME LATCH IS INCREASED BY 9 MSEC SO THAT EVENTUALLY ALL THE EMITTERS FROM ONE HOME THRU THE NEXT HOME (48 CHAR SET), ARE CHECKED. WHEN HOME DOES OCCUR IN THE SAMPLES TAKEN, EMITTER PULESES 1, 2, 142, 143, 144, AND HOME PULSE 145 ARE CHECKED TO ASSURE THE PULSE WIDTH TO BE 18.2 USEC OR MORE, AND THAT THE GAP BETWEEN PULSES IS 9.12 USEC OR MORE, IF NOT HALT '81' OCCURS.
THEN, THE TIME FROM EMITTER PULSE 144 TO 145 IS CHECKED TO BE WITHIN 255 USEC TO 292 USEC (91.2 USEC TO 146 USEC FOR 1100 LPM), AND (182 USEC TO 520 USEC FOR 465 LPM). IF NOT, HALT '82' OCCURS THE PULSE WIDTHS AND HOME PULSE TIME ARE SAMPLED AND CHECKED 8 TIMES, THEN THE ROUTINE IS EXITED

4.5 SECTION E15

4.5.1 ROUTINE 1 - CARRIAGE TIMING ANALYSIS TEST.

FIRST,THE OPERATOR MUST SET CONSOLE SWITCHES ,AS INSTRUCTED BY MAP CHARTS,DURING 'E5'HALT . THIS TEST ISSUES 6 CARRIAGE COMMANDS ,THEN SAMPLES AND SAVES THE CARRIAGE TIMING OF EACH. THE SAMPLING STARTS AT THE DROP OF CARR. INHIBIT AND CONTINUES AT 250 USEC. RATE (EACH SAMPLE IS A COMPOSITE OF 3 SENSES TAKEN APPROX. 83 USEC. APART) FOR 40 MSECS. PRINTER BUSY AND READY CONDITIONS AND THE CARR. LINE COUNTER ARE ALSO SAVED FOR EACH COMMAND. THE CARR. TIMING BITS ARE, HI-SPEED DRIVE, LO-SPEED DRIVE, CARR. EMITTER, AND CARR. SETTLING. THE INFORMATION FROM EACH COMMAND IS ANALYZED IN THE FOLLOWING SEQUENCE.

1. HI-SPEED DRIVE OFF DURING THE SPACE 0 CMD.? IF NOT,HALT '22',HI-SPEED DRIVE ALWAYS ON .
2. HI-SPEED DRIVE OFF DURING ALL LO-SPEED CMDS.? IF NOT,HALT '21',HI-SPEED ON DURING 1 OR MORE LO-SPEED COMMANDS.
3. LO-SPEED DRIVE STILL ON 34 MSEC INTO HI-SPEED CMD.? IF NOT,WAS LO-SPEED ON FOR AT LEAST 4 MSEC OF THE CMD.? IF IT WAS ,DID IT GO OFF WITH THE HI-SPEED DRIVE ? IF SO ,HALT '3C', LO-SPEED OFF WITH HI-SPEED,IF NOT ,HALT '3D',HI-SPEED IS MECHANICALLY ACTIVE .
4. DID READY DROP DURING ANY CMD.? IF SO WAS THERE A FORMS CHECK ?IF SO ,HALT 'EF',JAM CONDITION, IF NOT ,WAS IT A CARR.SYNC CHECK ? IF NOT, HALT 'EE' CARR. INTLK. OR END OF FORMS.
5. IS THE CARR.SETTLING S.S.ON AT START OF SPACE 0 CMD.? IF NOT ,IS IT ON 10 MSEC. INTO THE SPACE 1 CMD.? IF NOT ,HALT '9D',NO CARR.SETTLING ,IF SO ,HALT '02',NO CARR.SETTLING ON A SPACE 0 CMD.
6. LO-SPEED DRIVE ON AT START OF SPACE 1 CMD. IF NOT,DID MANUAL SPACING FAIL ? IF NOT , HALT '2D' LO-SPEED FAILS ON PROGRAMMED SPACE CMDS. IF SO ,DID LO-SPEED FAIL ON ALL OTHER CMDS.? IF IT DID ,HALT '05',IF NOT ,HALT'06',LO-SPEED FAILED ON SPACE 1 CMD.ONLY ,HALT '07' FAILED ON ALL SPACE CMDS.,OR HALT '20' FAILED INTERMITTENTLY .
7. LO-SPEED DRIVE ON AT START OF SPACE 2 CMD.? IF NOT ,HALT '17',NO LO-SPEED ON SPACE 2 .
8. LO-SPEED DRIVE ON AT 12.5 MSEC INTO SPACE 3 CMD? IF NOT, HALT '18', LO-SPEED DRIVE OFF TOO SOON ON A SPACE 3 CMD .
9. CARR. EMITTER SS. ON AT START OF SPACE 1 COMMAND? IF NOT, HALT '0D', NO CARR. EMITTER ON SPACE 1 COMMAND.
10. CARR.EMITTER PULSING ON A SPACE 3 CMD.? IF NOT ,HALT'15',BAD CARR.EMITTER ON SPACE 3 CMD .
11. CARR.SETTLING S.S.ON, 10 MSEC. INTO A SPACE 3 CMD.? IF NOT, HALT '0F', NO CARR. SETTLING ON A SPACE 1 CMD.
12. LO-SPEED DRIVE ON AT THE START OF LO-SPEED SKIP CMD.? IF NOT ,DID MANUAL RESTORE FAIL TOO ? IF SO ,HALT '19',LO-SPEED DRIVE FAILS ON LO-SPEED SKIP .IF NOT ,HALT'36', LO-SPEED FAILS ON PROGRAMMED SKIP CMD .
13. HI-SPEED DRIVE ON AT START OF HI-SPEED SKIP ? IF NOT ,HALT '1A' NO HI-SPEED ON SKIP .
14. HI-SPEED DRIVE STILL ON 9.25 MSEC. INTO HI-SPEED SKIP CMD.? IF SO, HALT '23', CARR. SKIPPED AT LO-SPEED INSTEAD OF HI.
15. LO-SPEED DRIVE OFF BETWEEN 5.25-7.25 MSEC. OF A SPACE 1 CMD.? IF NOT, HALT '49', SPACE 1 SINGLE SHOT MARGINAL.
16. LO-SPEED DRIVE OFF BETWEEN 8.75-12 MSEC OF A SPACE 2 CMD.? IF NOT HALT '49', SPACE 2 SINGLE SHOT MARGINAL.
17. LO-SPEED DRIVE OFF BETWEEN 12.5-17 MSEC OF SPACE 3 CMD.? IF NOT ,HALT '49' SPACE 3 SINGLE SHOT MARGINAL.
18. CARR. EMITTER OFF .25 MSEC AFTER 1ST CARR. EMITTER SS. HAS DROPPED ON HI-SPEED SKIP COMMAND? IF NOT OFF, HALT '40' OCCURS.
19. CARR.EMITTER ON AT 2.5 MSEC. AFTER 1ST CARR.EMITTER SS. HAS DROPPED ON SPACE 3 COMMAND. IF NOT ON, IS IT ON AT 3.25 MSEC.? IF NOT IS IT ON AT 1.75 MSEC.? IF NOT ON AND NO CARR. SYNC. CHECK ON SPACE 1 COMMAND THEN '4D' HALT OCCURS.
20. CARR.SETTLING S.S. GOES OFF BETWEEN 20.5-20.75 MSEC. OF SPACE 1 COMMAND? (TIME INCLUDES DATA XFER TIME OF 202 USEC.) IF NOT, HALT '50' OCCURS.
21. CARR.SYNC CHECK OCCUR ON ANY COMMAND ? IF SO ,AND THE CMD.WAS A SPACE 0 ,HALT '1D' OR HALT '1C' ON ALL OTHER CMDS.
22. LINE COUNTER CORRECT BEFORE AND AFTER CMDS.? IF NOT ,HALT '1E' LINE COUNTER WRONG .
23. ANY MANUAL FAILURES ENTERED IN THE CONSOLE SWITCHES ? IF SO ,HALT '1F' CARR. FUNCTIONED O.K. UNDER PROGRAM CONTROL ,BUT FAILED MANUALLY .

IF ALL TIMINGS ARE WITHIN THESE LIMITS ,THE PROGRAM EXITS.

4.5.2 ROUTINE 2 - RATE LIMITER TEST. (EXECUTED AT OPERATOR REQUEST)

SOME HI-SPEED SKIPS OF MAXIMUM LENGTH ARE ISSUED, THEN HI-SPEED DRIVE OFF IS CHECKED TO ASSURE THAT THE RATE LIMITER SLOWED DOWN THE CARRIAGE. IF IT DIDN'T A '5C' HALT OCCURS.

4.5.3 ROUTINE 3 CONTINUOUS SKIP TEST.(EXECUTED AT OPERATOR REQUEST)

HYDRAULIC ADJUSTMENTS REQUIRE CONTINUOUS LO & HI-SPEED CARRIAGE RUNAWAY,THEREFORE PUT THE CARRIAGE IN NEUTRAL BEFORE THIS TEST .THEN TIE OFF THE HI-LO TIEDOWN .THIS BLOCKS THE CARR. EMITTER AND THE RATE LIMITER . A SKIP TO 4 LINES (10 LINES FOR HI-SPEED) AHEAD OF THE LINE COUNTER IS ISSUED .THE CARR.STARTS AND CONTINUES SKIPPING UNTIL CARR.STOP IS PRESSED . IF THE CARR.IS STOPPED AND STARTED 3 TIMES , THE PROGRAM CHANGES TO THE OTHER SPEED .

4.5.4 ROUTINE 4 CARRIAGE EMITTERS TEST (EXECUTED AT OPERATOR REQUEST)

A LONG SKIP CMD. IS ISSUED ,AND AFTER DELAYING TO ALLOW THE CARRIAGE TO REACH CONSTANT SPEED , THE CARR.EMITTER TIMING IS SAMPLED .IT IS SAMPLED LONG ENOUGH TO ASSURE ALL 12 POINTS OF THE EMITTER WHEEL HAVE PASSED THE TRANSDUCER .THE SAMPLES ARE ANALYZED FOR THE PULSES BEING BETWEEN .7 & 1.5 MSEC IN LENGTH AND LESS THAN 2300 USEC FROM LEADING EDGE TO LEADING EDGE. IF EITHER OF THESE CHECKS EXCEED THE LIMITS, A '5D' HAIT WILL OCCUR.

4.5.5 ROUTINE 5 - PRINT & SPACE LOOP (EXECUTED AT OPERATOR REQUEST)

PROGRAM LOOPS ON A PRINT & SPACE 1 . FOR CHECKING SINGLE CYCLE KEY.

4.6 SECTION E16

4.6.1 ROUTINE 1 - HAMMER ADDRESS ANALYSIS TEST.

(SET SSW-05 BEFORE RUNNING THIS ROUTINE)

FIRST,THE OPERATOR IS INSTRUCTED TO TIE-UP DIAGNOSTIC INHIBIT RESET. THEN, THE ENTIRE IMAGE IS MADE TO MATCH THE CHARACTER THAT IS RIPPLED,LEFT TO RIGHT THROUGH THE PRINT POSITIONS. THUS, THE SELECTED HAMMER WILL ALWAYS FIRE ON THE 1ST PRINT SCAN. IF A HAMMER ECHO CHECK OCCURS ON ANY POSITION,THE D.A.R. VALUE IS CONVERTED TO HAMMER NO. AND SAVED WITH THE SET OR RESET INDICATOR. AFTER ALL PRINT POSITIONS HAVE BEEN INDIVIDUALLY OPTIONED, THE PROGRAM ANALYZES THE HAMMER ECHO CHECK SAVE AREA FOR ALL THE FAILING HAMMERS,AND WHETHER THEY WERE SET OR RESETS . IF SET CHECKS ONLY, OR A MIXTURE OF BOTH OCCURRED,IT ANALYZES TO FIND THE FAILING COMMON HAMMER ADDR.LINE AND WHETHER OR NOT IT IS POWERED.THIS INFORMATION IS PRINTED OUT BEFORE ERROR HALT '5A' FOR RESET AND '4A' FOR SET ERRORS .

4.6.2 ROUTINE 2 - SENSE COMMANDS ANALYSIS TEST. (EXECUTED AT OPERATOR REQUEST)

(BEFORE RUNNING THIS ROUTINE SSW-05 MUST BE ON).

THE OPERATOR IS INSTRUCTED TO PUT THE PRINTER INTO A PARTICULAR CONDITION, SO THAT THE SENSE INFORMATION CAN BE PREDICTED. AN EXPECTED SENSE BYTE TABLE IS SET UP ACCORDING TO THE OPTIONS DEFINED IN DCP'S UDT CARD. AFTER THE OPERATOR EXECUTES THE MANUAL INSTRUCTIONS AND RESETS THE 'E2' HALT, SENSE CODES 'E0' - LINE COUNTER AND CHAIN CHARACTER COUNTER, 'E2' - PRINTER TIMINGS, AND 'E3' PRINTER CHECK STATUS,ARE SAMPLED AND COMPARED TO THE EXPECTED SENSE TABLE. CARRIAGE INHIBIT (BIT 7 OF EB1) , ALSO CHAIN EMITTER , HOME PULSE , AND C.E.SENSE BIT (BITS 3,5,&7 OF EB2) OF SENSE CODE 'E2' , AND THE C.E. SENSE BIT OF SENSE CODE 'E3'(BIT 7 OF BYTE EB1), ARE IGNORED, BECAUSE THEY ARE UNPREDICTABLE. IN THE EVENT A SENSE BYTE, OR BYTES, DO NCT COMPARE WITH THE EXPECTED TABLE, AN ERROR MESSAGE IS PRINTED ON THE ALTERNATE PRINTER . IT CONTAINS THE SENSE CODE THAT FAILED, AND ACTUAL & EXPECTED DATA.

4.6.3 ROUTINE 3 - SENSE TIMING BIT TEST. (EXECUTED AT OPERATOR REQUEST)

(IF THE PRINTER IS NOT READY UPON ENTRY TO THIS ROUTINE, A MESSAGE AND/OR HALT WILL INDICATE THIS).

AFTER RESETTING THIS INSTRUCTION HALT, A PRINT AND SPACE COMMAND IS ISSUED AND ALL TIMING BITS ARE SAMPLED FOR 1 SECOND TO ASSURE THAT THEY GO OFF, AND ON, DURING THE COMMAND EXECUTION. C.E. SENSE BIT AND 1403 IDENT. (BITS 4 & 7 OF EB2) , ALSO CHAIN/TRAIN READY AND END-OF-FORMS INDICATOR (BITS 3 & 6 OF EB1) ARE IGNORED.IF ANY BITS FAILED TO CHANGE STATE, THEY WILL BE INDICATED WITH A PRINTOUT AND ERROR HALT.

4.7 SECTION E17

4.7.1. ROUTINE 1 - 1403 SPECIAL ATTACHMENT TEST.
LOADS AND SENSES PATTERNS AA,55,01 INTO LSRS IAR,RAR,DAR,SCR. THEN LOADS AND SENSES SAME PATTERNS INTO ALL BMT LOCATIONS. THEN ISSUES PRINT COMMAND AND CHECKS DATA TRANSFER TO BMT. FINALLY, USES THE RESULTS OF THESE 3 TESTS TO PERFORM SPECIAL TESTS TO ANALYZE THE SPECIFIC PROBLEM.

4.8 SECTION E18

4.8.1 ROUTINE 1 - CARRIAGE SINGLE SHOTS CHECK

THIS ROUTINE ISSUES CARR.SPACE CMDS.,AND WHILE THEY ARE EXECUTING, ACCUMULATES THE TOTAL TIME EACH S.S. IS ON. THE 6 SINGLE SHOTS CHECKED ARE, SPACE 1,2,&3, HI & LO SPEED 1ST CARR.EMITTERS, AND CARRIAGE SETTLING. THE PRINTED TIME OF EACH SS. IS AN AVERAGE OF THE TIME OF THAT SS. OVER 10 COMMANDS. IF ANY STATUS ERROR OCCURED WHILE ACCUMULATING THE TIME, IT IS INDICATED ON THE PRINTOUT AFTER THE AVERAGE TIME IS PRINTED.
NOTE : CARR.SETTLING PLUS SPACE 1 SHOULD TOTAL ABOUT 20.4 MSEC. (21.4 MSEC. ON 465 LPM)

4.8.2 ROUTINE 2 - CARRIAGE SINGLE SHOTS INSTALLATION ADJUSTMENT TEST (EXECUTED AT OPERATOR REQUEST)

FIRST, THE OPERATOR IS INSTRUCTED TO ENTER THE DESIRED S.S.SELECTION INTO THE CONSOLE SWITCHES DURING THE 'E6' HALT. IF SPACE 1,2,3 OR HI & LO SPEED 1ST CARR. EMITTER SS. IS SELECTED, TIME MUST ALSO BE ENTERED AS SHOWN BELOW:

```
*********************************
CONSOLE SWITCH    -  1  2  3  4
*********************************
SPACE 1 S.S.      -  1  0  5  8----ANY VALUE BETWEEN 03.1-07.8 MSECS. ( SEE THE PLATE  )
SPACE 2 S.S.      -  2  1  0  5----  ''    ''    ''  08.1-12.3 MSECS. ( ON HYDRAULIC   )
SPACE 3 S.S.      -  3  1  5  8----  ''    ''    ''  12.4-19.8 MSECS. ( UNIT.          )
CARR.SETTLING     -  4  X  X  X---- X'S = DON'T CARES.
HS 1ST CARR.EMIT  -  5  0  5  8----VALUE TO WHICH SPACE 1 SS. HAS BEEN ADJUSTED.
LS 1ST CARR.EMIT  -  6  0  5  8----VALUE TO WHICH SPACE 1 SS. HAS BEEN ADJUSTED.
```

NOTE : CARR. MUST BE IN NEUTRAL FOR HI OR LO SPEED 1ST CARR. EMITTER ADJUSTMENT.

THE PROGRAM THEN SETS UP AND ISSUES THE APPROPRIATE CMD. AND SAMPLES THE DESIRED S.S. TIMING. THIS IS COMPARED TO THE VALUE ENTERED, OR THE PRESET VALUE. IF THE S.S. IS LOW, THE PRINTER WILL EMIT A CLUNKING SOUND BY FIRING MANY HAMMERS IN 1 PRINT SCAN. IF THE S.S.IS HIGH, THE PRINTER EMITS A HIGH PITCHED SOUND PRINTING A RIPPLE PRINT PATTERN. WHEN THE S.S.IS WITHIN TOLERENCE, THE PRINTER SPACES OR SKIPS WITHOUT PRINTING. THE SELECTED S.S. POT SHOULD BE TURNED C.W. IF LOW, C.C.W. IF HIGH. THE SPACE 1,2 & 3 SS'S ARE CORRECT WHEN WITHIN 100 USEC OF VALUE IN SWITCHES, CARR.SETTLING WHEN WITHIN 100 USEC OF 20.4 MSEC. (21.4 MSEC ON 475 LPM). THE HI-SPEED 1ST CARR. EMITTER IS FIRST CHECKED TO BE WITHIN 1.2 MSEC. OF THE VALUE IN THE SWITCHES. THE LO-SPEED 1ST CARR. EMITTER IS FIRST CHECKED TO BE +4.75 MSEC. -.000 OF THE VALUE IN THE SWITCHES. THEN IF A SS. FALLS WITHIN IT'S RESPECTIVE RANGE, IT IS CHECKED FOR A .4 TO .75 MSEC. GAP BETWEEN THE END OF THE SS. AND THE START OF THE 2ND CARR. EMITTER.

4.8.3 ROUTINE 3 - PRINT IN FLIGHT TEST. (EXECUTED AT OPERATOR REQUEST)

FIRST ,THE OPERATOR IS INSTRUCTED TO TIE OFF CARR. BUSY DURING THE 'ED' HALT. THEN, A PARTICULAR VALUE IN THE CHAR.COUNTER TRIGGERS THE START OF THE OPERATIONS .THE CHAIN IMAGE IS SET UP AS THE PRINT PATTERN SO 1 CHARACTER IS PRINTED PER SUBSCAN . A PRINT & SPACE 1 IS ISSUED TO PRINT A REFERENCE LINE ,AND AS SOON AS BUFFER BUSY DROPS ,A PRINT & SPACE 0 IS ISSUED SO PRINTING OCCURS DURING THE CARR.OPERATION . THEN ANOTHER PRINT & SPACE 1 IS ISSUED WHICH OVER PRINTS THE LAST PART OF THE IN-FLIGHT LINE .AFTER WAITING FOR ALL NORMAL SPACING TO OCCUR ,ANOTHER LINE IS PRINTED TO INDICATE WHERE THE IN-FLIGHT LINE SHOULD HAVE SETTLED FOR ALL THE DIFFERENT MODEL PRINTERS . THIS IS REPEATED 20 TIMES , THEN THE 1ST PRINT & SPACE 1 IS CHANGED TO A PRINT & SPACE 2 AND 20 GROUPS PRINTED ,AND FINALLY REPEATED WITH A PRINT & SPACE 3 . IF THE LEFT-MOST CONSOLE SWITCH IS SET TO A 1,THE PROGRAM STAYS ON A SPACE1,IF SET TO A 2, ON A SPACE 2, OR IF A 3, IT LOOPS ON THE SPACE 3 OPERATION.
THE GRAPH THAT IS PRINTED CAN BE USED TO CHECK THAT THE TIMING IS CORRECT . 'PULLIN',CAUSED BY SHORT SINGLE SHOT TIMING SHOWS UP AS NOT HAVING REACHED THE OVER-PRINT LINE AT THE INDICATED CHARACTER . 'OVER-SHOOT',CAUSED BY LONG SINGLE SHOT TIME SHOWS UP AS GOOD CHARACTER ALIGNMENT AT THE INDICATED CHARACTER BUT VARIATIONS AFTER IT .

5. GENERAL 1403 PRINTER INFORMATION

5.1 1403 PRINTER COMMANDS

5.1.1 START I/O COMMANDS

FUNCTION CODE	CONTROL CODE	FUNCTION	CONTROL
E0	0X	SPACE ONLY	X = 0,1,2 OR 3 SPECIFYING THE NUMBER OF LINES TO SPACE.
E2	0X	PRINT AND SPACE	X = 0,1,2 OR 3 SPECIFYING THE NUMBER OF LINES TO SPACE.
E4	XX	SKIP ONLY	XX = A HEX VALUE, NOT TO EXCEED THE CURRENT FORM LENGTH,SPECIFYING WHICH LINE TO SKIP TO. NOTE-IF THIS VALUE EQUALS THE CURRENT VALUE IN THE LINE COUNTER,THE CARRIAGE WILL NOT MOVE.
E6	XX	PRINT AND SKIP	XX = A HEX VALUE,NOT TO EXCEED THE CURRENT FORM LENGTH, SPECIFYING WHICH LINE TO SKIP TO. NOTE-IF THIS VALUE EQUALS THE CURRENT VALUE IN THE LINE COUNTER,THE CARRIAGE WILL NOT MOVE.
E9	XX	DIAGNOSTIC INSTRUCTION 1	XX = 80-SET DIAGNOSTIC MODE ON 40-UNUSED 20-GENERATE READY 10-GENERATE PTR CK RESET 08-GENERATE SYSTEM RESET 04-GENERATE NOT READY 02-FORCE EOF TO ATTACHMENT 01-FORCE FORMS JAM/CARRIAGE STOP CHECK
EA	XX	DIAGNOSTIC INSTRUCTION 2	XX = 80-FORCE HAMMER ECHO CK(SA) 40-FORCE HAMMER ECHO CK(RA) 20-GENERATE CARR EMITTER 10-GENERATE CHAIN EMITTER 08-TURN OPTION STEP MODE ON 04-TURN OPT. STEP MODE OFF 02-ADVANCE TO NEXT OPTION 01-GENERATE UCS EMITTER
E3	X0	INTERRUPT CONTROL	XX = 80-ENABLE INTERRUPT 40-RESET PRINTER BUSY OR NO-OP INTERRUPT 20-RESET CARRIAGE BUSY OR NO-OP INTERRUPT 00-DISABLE INTERRUPTS

5.1.2 TEST I/O AND APL COMMANDS

CONDITION CODE	CONDITION DEFINITION
E0	TEST FOR PRINTER NOT READY/NO-OP
E2	TEST FOR PRINT BUFFER BUSY
E4	TEST FOR PRINTER CARRIAGE BUSY
E6	TEST FOR PRINTER BUSY
E9	TEST FOR DIAGNOSTIC MODE OFF
E3	INTERRUPT PENDING

5.1.3 LOAD I/O COMMANDS

REGISTER CODE	DATA ADDRESS	DATA DEFINITION BYTE 2	BYTE 1
E0	XXXX	LOAD THE CARRIAGE FORMS LENGTH REGISTER WITH THE BINARY VALUE OF THE FORMS LENGTH.	NOT USED.
E4	XXXX	LOAD THE LINE PRINTER IMAGE ADDRESS REGISTER (LPIAR) WITH THE CHAIN IMAGE STARTING ADDRESS AND TURN ON THE 'IMAGE' LATCH IN THE 1403 ATTACHMENT, WHICH CAUSES AN IMAGE TRANSFER DURING THE FOLLOWING SIO INSTRUCTION.	
E6	XXXX	LOAD THE LINE PRINTER DATA ADDRESS REGISTER (LPDAR) WITH THE PRINT DATA STARTING ADDRESS.	
* * * * * * * * * * * THE FOLLOWING INSTRUCTIONS ARE VALID IN DIAGNOSTIC MODE ONLY * * * * * * * * * * * * * *			
E8	XXXX	LOAD THE RESET ADDRESS REGISTER (RAR) IN THE 1403 ATTACHMENT	NOT USED
EA	XXXX	LOAD THE IMAGE ADDRESS REGISTER (IAR) IN THE 1403 ATTACHMENT.	NOT USED
EC	XXXX	PRINTER DATA BYTE TO BE LOADED.	LOAD THE DATA ADDRESS REGISTER. THIS ADDRESS SELECTS THE PRINTER BUFFER LOCATION TO STORE THE DATA IN BYTE 2.
EE	XXXX	LOAD THE SCAN COUNT REGISTER (SCR).	NOT USED

5.1.4 SENSE I/O COMMANDS

DATA SOURCE CODE	STORAGE ADDRESS	LOW STORAGE ADDRESS BYTE 2 (EB-2)	HIGH STORAGE ADDRESS BYTE 1 (EB-1)
E0	XXXX	CARRIAGE LINE COUNTER	CHARACTER COUNTER
E2	XXXX	PRINTER TIMING BYTE 2	PRINTER TIMING BYTE 1
E3	XXXX	PRINTER CHECK STATUS BYTE 2	PRINTER CHECK STATUS BYTE 1
E4	XXXX	LPIAR	LPIAR
E6	XXXX	LPDAR	LPDAR
* * * * * * * * * * * THE FOLLOWING INSTRUCTIONS ARE VALID IN DIAGNOSTIC MODE ONLY * * * * * * * * * * * * * *			
E8	XXXX	IMAGE ADDRESS (IAR)	DATA ADDRESS (DAR)
E9	XXXX	HAMMER ADDRESS Y-HI	HAMMER ADDRESS Y-LO
EA	XXXX	PRINTER TIMING X - BYTE 2	PRINTER TIMING X - BYTE 1
EB	XXXX	HAMMER ADDRESS X-HI	HAMMER ADDRESS X-LO
EC	XXXX	PRINTER BUFFER (BITS 0-7)	PRINTER BUFFER PARITY BIT
EE	XXXX	SCAN COUNT REGISTER (SCR)	RESET ADDRESS REGISTER (RAR)

5.2 1403 LINE PRINTER SENSE DATA DEFINITION

5.2.1 PRINTER TIMING INFORMATION --- DATA SOURCE CODE 'E2'

NOTE: THESE SENSE BITS ARE NOT LATCHED UNLESS OTHERWISE SPECIFIED.

BIT	BYTE 2 (LO ADDRESS BYTE)	BIT	BYTE 1 (HI ADDRESS BYTE)
0	HIGH SPEED DRIVE	0	HAMMER SET LATCHED
1	LOW SPEED DRIVE	1	PRINT SUB SCAN 1 (PSS1)
2	CARRIAGE EMITTER LATCHED	2	CYCLE STEAL LATCH
3	CHAIN EMITTER W/O HOME	3	CHAIN/TRAIN READY
4	1403 IDENTIFIER	4	PRINT TIME
5	HOME PULSE LATCHED	5	HAMMER OFF ECHO
6	CARRIAGE SETTLING	6	END OF FORMS (EOF)
7	C.E. SENSE BIT	7	INHIBIT CARRIAGE

5.2.2 PRINTER CHECK STATUS INFORMATION --- DATA SOURCE CODE 'E3'

NOTE: THESE SENSE BITS ARE LATCHED UNLESS OTHERWISE SPECIFIED.

BIT	BYTE 2 (LO ADDRESS BYTE)	BIT	BYTE 1 (HI ADDRESS BYTE)
0	CARRIAGE SYNC CHECK - LOSS OF SYNC BETWEEN FORMS AND FORMS COUNTER.	0	CHAIN/TRAIN SYNC CHECK - INDICATES LOSS OF SYNC BETWEEN CHAIN AND CHAIN COUNTER.
1	NOT USED	1	NOT USED
2	FORMS JAM CHECK OR CARRIAGE STOP KEY WAS DEPRESSED.	2	NOT USED
3	PRINT DATA CHECK - INDICATES THAT A BUFFER PARITY CHECK HAS OCCURED IF BYTE 1, BIT 4 NOT ON, ELSE INDICATES INTERLOCK CHECK.	3	ECHO CHECK OF S.A. - INDICATES THAT AN ECHO CHECK OCCURED WHILE OPTIONING TO SET A PRINT HAMMER.
4	CE SENSE BIT.	4	INTERLOCK CHECK - INDICATES THAT A 1403 INT-ERLOCK HAS BEEN OPENED.
5	HAMMER ECHO CHECK - IMPROPER RESPONSE FROM HAMMER DRIVER DURING PRINT TIME.	5	INDICATES STANDARD 48 CHARACTER CHAIN IS INSTALLED. BIT IS NOT LATCHED.
6	ANY HAMMER ON CHECK - INDICATES AN ACTIVE HAMMER DURING NO PRINT TIME OR A DEFECTIVE CHECK CIRCUIT.	6	U.P.C. - UNPRINTABLE CHARACTER WAS DETECTED IN PRINT FIELD OF LAST PRINT COMMAND.
7	NO-OP CHECK - INDICATES LAST SIO COMMAND WAS NO-OPED DUE TO AN EXISTING ERROR CONDITION.	7	CE SENSE BIT. NOT LATCHED.

6.0 GLOSSARY

BMT - ATTACHMENT MEMORY/BUFFER
DAR - DATA ADDRESS REGISTER
D.M. - DIAGNOSTIC MODE
E.O.F. - END OF FORMS
HAR - HAMMER ADDRESS REGISTER
H.E.C. - HAMMER ECHO CHECK
IAR - IMAGE ADDRESS REGISTER
L.C. - LINE COUNTER
LSR - LOCAL STORE REGISTER (IAR, DAR, ETC.)
MSEC - MILLISECOND
PSS1 - PRINTER SUB-SCAN 1
RAR - RESET ADDRESS REGISTER
S.S. - SINGLE SHOT
SSW - SENSE SWITCH
TMD - THEORY-MAINTENANCE DIAGRAMS

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1. GENERAL PROGRAM SUMMARY

NOTE: FLOW CHARTS ON PAGES 5-6 OF THE MLTA MAP CHARTS SHOULD BE USED WHENEVER THE MLTA DIAGNOSTIC PROGRAMS ARE RUN.

1.1 DIAGNOSTIC PROGRAM DESCRIPTIONS

1.1.1 SECTION 201 LINE CONFIGURATION

RTN	DESCRIPTION
1	SECTION 201 CONTAINS THE MLTA LINE CONFIGURATION INFORMATION. SECTION 201 IS NOT PART OF THE RELEASED MLTA DIAGNOSTIC PROGRAMS. IT IS THE OUTPUT OF MLTA CONFIGURATOR PROGRAM (ID = FE7). SECTION 201 MUST BE LOADED INTO CORE BEFORE ANY OTHER MLTA DIAGNOSTIC PROGRAM CAN BE RUN.

1.1.2 SECTION 202 MLTA ERROR RECORDING ANALYSIS PROGRAM

RTN	DESCRIPTION
1	PRINTS THE MLTA ERROR HISTORY TABLE.
2	PRINTS THE MLTA LINE SDR (STATISTICAL DATA RECORDING) TABLES.

NOTE: SSW 2E AND SSW 2F ARE USED FOR SECTION 202 ONLY IF 3340 AND 5444 ARE BOTH DEFINED IN THE UDT. SET SSW 2E IF ERAP DATA IS ON THE 5444. SET SSW 2F IF ERAP DATA IS ON THE 3340.

1.1.3 SECTION 203 BASIC MLTA CHECKOUT

RTN	DESCRIPTION	
1	MLTA TIO TEST	
2	STORAGE ADDRESS BUFFER TEST	
3	LINE SELECT AND HIGH DENSITY BUFFER (HDB) TEST	
4	MICROINSTRUCTION ADDRESSING TEST	
5	LIO/SNS MICROCONTROLLER STORAGE TEST	
6	CONTROL STORE MEMORY AND BRANCHING TEST	
7	LINE SIO AND BUSY TEST	
8	SET SIGNAL ON & SET SIGNAL OFF (SSN & SSF)	MICROINSTRUCTION TEST
9	LOAD REGISTER (LR)	MICROINSTRUCTION TEST
A	BRANCH REGISTER (BR)	MICROINSTRUCTION TEST
B	TEST SIGNAL ON (TSN)	MICROINSTRUCTION TEST
C	SET BITS ON (SBN)	MICROINSTRUCTION TEST
D	INSERT CHARACTER (IC)	MICROINSTRUCTION TEST
E	BRANCH ON CONDITION (BOC)	MICROINSTRUCTION TEST
F	EXCLUSIVE OR REG TO REG (XR)	MICROINSTRUCTION TEST
10	COMPARE IMMEDIATE REGISTER TO REGISTER (CIR)	MICROINSTRUCTION TEST
11	SET BITS OFF (SBF)	MICROINSTRUCTION TEST
12	TEST BITS OFF MASKED (TBF)	MICROINSTRUCTION TEST
13	COMPARE IMMEDIATE MASK (CI)	MICROINSTRUCTION TEST
14	TEST BITS ON MASKED (TBN)	MICROINSTRUCTION TEST
15	INCREMENT + 1 (INC)	MICROINSTRUCTION TEST
16	SHIFT LEFT (SL)	MICROINSTRUCTION TEST
17	LOAD EXTERNAL REG (LDX)	MICROINSTRUCTION TEST

1.1.4 SECTION 204 FUNCTIONAL MLTA CHECKOUT

RTN	DESCRIPTION
1	OP-END AND PROGRAM CONTROLLED INTERRUPT (PCI) SOURCES
2	MLTA INTERRUPTS AND INSTRUCTION REJECTION
3	HIGH DENSITY BUFFERS
4	TIMEOUT
5	LINE LOGIC
6	BIT TIME SCANNER
7	CYCLE STEAL
8	LD2 FREQUENCY AND INTERFACE TEST
9	INTERFACE LOOP TEST

1.1.5 SECTION 205 MICROCODE LOADER

RTN	DESCRIPTION
1	THE MICROCODE IS LOADED INTO CONTROL STORE. THE CONTROL STORE IS THEN SENSED TO DETERMINE IF THE MICROCODE WAS ENTERED CORRECTLY.

1.1.6 SECTION 206 LINE LOOP/WRAP TEST

RTN	DESCRIPTION
1	LOOP TEST (TEST MODE ON)
2	WRAP TEST (TEST MODE ON)
3	LOOP TEST (TEST MODE OFF) (NEED EXTERNAL LOOP CONNECTOR AND SSW 10 ON TO RUN)
4	WRAP TEST (TEST MODE OFF) (NEED EXTERNAL WRAP CONNECTOR AND SSW 10 ON TO RUN)
5	CONTINUOUS TRANSMIT

1.1.7 SECTION 207 MLTA LINE TEST

RTN	DESCRIPTION
1	THE COMMUNICATION LINES BETWEEN THE SYSTEM/3 MLTA AND THE TERMINALS ARE CHECKED OUT. ANY OR ALL OF THE FOLLOWING TESTS CAN BE REQUESTED FOR TRANSMISSION TO A TERMINAL: TEST 1: ALL CHARACTERS TEST 2: STORED COMPARE TEST 3: TILT/ROTATE/TWIST TEST 4: ECHO TEST 5: SELECTRIC MECHANISM ANALYZER TEST 6: INVALID CASE NOTE: SOME TESTS MAY NOT BE VALID FOR ALL TERMINALS.

1.2 MLTA CONFIGURE PROGRAM (PROGRAM ID = FE7)

THE MLTA CONFIGURE PROGRAM ALLOWS THE CE TO DEFINE OR UPDATE THE MLTA SYSTEM CONFIGURATION VIA A QUESTION AND ANSWER SESSION ON THE 3277 KEYBOARD. THE FINAL OUTPUT OF THE CONFIGURE PROGRAM WILL BE THE CREATION OF SECTION 201 WHICH WILL BE AUTOMATICALLY PLACED ON THE CE PACK VIA THE DISK EDITOR (ID = FF6/DD6).

1.3 PROGRAM TO UPDATE MLTA MICROCODE ON CUSTOMER'S SYSTEM PACK (PROGRAM ID = FE5)

THIS PROGRAM WILL TAKE THE MLTA MICROCODE (ID = FF0) FROM THE CE DIAGNOSTIC PACK AND PLACE IT ON THE CUSTOMER'S SYSTEM PACK. THE SYSTEM PACK MUST HAVE A FILE ALLOCATED FOR THE FF0 DECK.

1.4 MLTA MICROCODE DECK (PROGRAM ID = FF0)

THE MLTA MICROCODE DECK WHICH RESIDES ON THE CE PACK AND THE CUSTOMER'S SYSTEM PACK CONTAINS THE PROGRAM FOR OPERATING THE MLTA. THE MICROCODE (ID = FF0) IS AUTOMATICALLY LOADED BY THE MICROCODE LOADER (ID = 205) WHEN RUNNING MLTA DIAGNOSTICS. IF THE MICROCODE (ID = FF0) IS TO BE UPDATED, IT MUST 1ST BE PLACED ON THE CE PACK VIA THE DISK EDITOR (ID = FF6 OR DD6). THEN IT CAN BE PLACED ON THE CUSTOMER'S SYSTEM PACK VIA THE UPDATE MLTA MICROCODE PROGRAM (ID = FE5).

3. INDEX TABLE FOR HALTS AND PRINTOUTS

3.1 PROGRAM OPERATOR HALTS -A0- THROUGH -FF-

HALT ID	SECT RTN	DESCRIPTION	MAP REF
0D	202	ERROR PRINTOUT. SEE PRINTOUT.	
E0	206	ENTER DECIMAL LINE NUMBER IN DATA SWICHES FOR LINE LOOP/WRAP TEST.	
E1	205	MICROCODE DECK WHICH WAS LOADED IS TOO LARGE FOR THE SYSTEM MLTA CONTROL STORAGE. SET DATA SWITCHES TO 04 AND RESET HALT TO PRINT MICROCODE DECK.	
E2	205	LOADING ERROR. SET DATA SWITCHES TO 05 AND RESET HALT TO RELOAD MLTA CONTROL STORE WITH THE MICROCODE ALREADY IN SYSTEM/3 MEMORY.	
E3	206 207	ADAPTER CHECK. RUN MLTA DIAGNOSTIC SECTIONS 203 AND 204.	
E4	204 RTN 09	ALLOWS THE CE TO BYPASS TESTING OF DATA ADAPTER LINES BY SETTING THE RIGHTMOST DATA SWITCH TO 1.	
E5	204 RTN 09	HALT OCCURS AFTER VISUAL CHECK OF MLTA INDICATORS AND AFTER THE MANUAL TEST OF THE -CHECK RESET- KEY.	
E6	204 RTN 09	ALLOWS THE CE TO POSITION THE LOOP/WRAP CARD FOR AN INTERFACE CARD TEST.	
E6	207	LINE CODE NOT DEFINED FOR LINE. IF RUNNING FROM DISK, RESETTING HALT WILL LOAD IN FE7. IF RUNNING FROM CARDS, PUT FE7 IN HOPPER AND RESET HALT.	
E7	206 207 FE5 FE7	3277 MICROCODE NOT LOADED.	
E8	203 204	SSW10 OPTION. ENABLE/DISABLE LINE FOR TESTING. ENTER SELECTION ON ADDRESS SWITCHES AS DESCRIBED IN 4.3.24.	
E8	206 207 FE5 FE7	3277 NOT READY OR ATTACHMENT ERROR.	
E9	203 204	LINE SELECTED NOT DEFINED FOR SYSTEM.	
E9	206 207 FE5 FE7	3277 NOT DEFINED IN THE UDT TABLE.	
EA	203 204	ENABLE LINE. VALID ENTRY.	
EC	203 204	ENABLE LINE FOR MULTIPLE LINE SELECT. VALID ENTRY.	
EE	203 204	DISABLE LINE. VALID ENTRY.	
EF	203 204	DISABLE LINE FROM MULTIPLE LINE SELECT. VALID ENTRY.	
F0	205	SSW 10 OPTION HALT. SELECT LOADER OPTION IN DATA SWITCHES AND RESET HALT. OPTIONS: 01 - LOAD, SENSE, & PRINT 02 - LOAD & SENSE 03 - SENSE & PRINT	
F1	205	CHECK TO MAKE SURE THAT DATA DECK FF0 FOR MICROCODE LOADER IS IN THE PRIMARY HOPPER. RESET HALT TO CONTINUE.	
F2	205 FE5	CARD SEQUENCE OF DECK ID FF0 IS OUT OF ORDER. SEQUENCE CARDS AND RERUN SECTION.	
F3	205 FE5	NO END CARD TO DECK FF0, OR DECK IS TOO LONG. CORRECT DECK FF0 AND RERUN SECTION.	
F4	205 FE5	DECK ID IS NOT FF0. PLACE DECK FF0 IN HOPPER AND RERUN SECTION.	
F5	207	RECEIVED CIRCLE-N TO ADDRESSING 8 TIMES. RESET HALT TO RETRY ADDRESSING.	
F6	207	UNIDENTIFIED REPLY TO TRANSMISSION. RESET HALT TO RE-TRANSMIT. SEE PRINTOUT FOR DATA RECEIVED.	
F7	FE5	MICROCODE OBJECT FILE ON SYSTEM PACK DIDN'T CONTAIN 9 SECTORS OF SPACE. MAKE SURE THE MICROCODE FILE HAS 9 SECTORS BEFORE RUNNING FE5.	
F8	FE7	MFCU SECONDARY NOT READY OR ERROR. MAKE MFCU SECONDARY READY AND RESET HALT.	
F9	FE5	COULDN'T OPEN MICROCODE OBJECT FILE ON SYSTEM PACK. CHECK TO SEE IF FILE NAME GIVEN IS CORRECT. RERUN SECTION.	
FA	202	ERROR STATISTICS FILE ON F1 DOESN'T EXIST. TERMINATE SECTION.	
FC	202 FE5	DISK ERROR. RESET HALT TO RETRY. IF ERROR PERSISTS, RUN DISK DIAGNOSTICS.	
FD	202	MANUAL INPUT NEEDED. (BOTH 3340 AND 5444 WERE DEFINED IN THE UDT. SET SSW 2E OR SSW 2F TO SELECT WHERE THE ERAP DATA IS STORED).	
FD	FE5	MANUAL INPUT NEEDED. SET SSW 2E TO INDICATE SYSTEM PACK FOR MLTA MICROCODE RESIDES ON 5444. SET SSW 2F TO INDICATE SYSTEM PACK FOR MLTA MICROCODE RESIDES ON 3340.	
FE	202 FE5	DISK DRIVE 1 NOT READY. MAKE DRIVE 1 READY AND RESET HALT.	
FF	ALL SECT.	SECTION 201 HAS NOT BEEN RUN. LOAD AND RUN SECTION 201.	

3.2 PROGRAM ERROR HALTS -01- THROUGH -9F-

HALT ID	SECT RTN	MEANING	MAP
01	203 01	WITH MLTA DISABLED, A TIO FOUND ADAPTER NOT READY OFF.	
02	203 01	WITH MLTA DISABLED, A TIO FOUND ANY LINE OP-END INT REQ ON.	
03	203 01	WITH MLTA DISABLED, A TIO FOUND ANY LINE BUSY ON.	
04	203 01	WITH MLTA DISABLED, A TIO FOUND ANY LINE PCI REQ ON.	
05	203 01	WITH MLTA DISABLED, A TIO FOUND ANY LINE UNIT CHECK ON.	
06	203 01	WITH MLTA DISABLED, A TIO FOUND AN ADAPTER CHECK ON.	
07	203 01	WITH MLTA DISABLED, A TIO FOUND THIS SPARE SIGNAL ON. IT SHOULD ALWAYS BE OFF.	
08	203 01	WITH MLTA DISABLED, A TIO FOUND A LINE SELECTED.	
09	203 01	WITH MLTA DISABLED, A TIO FOUND LINE UNIT CHECK ON.	
0A	203 01	WITH MLTA DISABLED, A TIO FOUND LINE OP-END ON.	
0C	203 01	WITH MLTA DISABLED, A TIO FOUND LINE BUSY ON.	
0E	203 01	WITH MLTA DISABLED, A TIO FOUND LINE PCI REQ ON.	
10	203 02	SAB WAS LOADED WITH DATA AND THEN SENSED. SENSED DATA WAS NOT EQUAL TO EXPECTED DATA. DATA PATTERNS ARE X'AA55', X'55AA', THEN X'0101'.	
11	203 02	SAB WAS LOADED WITH X'0101' AND THEN SENSED. SENSED DATA WAS NOT X'0101'.	
12	203 02	WITH ADAPTER DISABLED, SAB WAS SENSED. SENSED DATA WAS NOT X'FFFF'.	
14	203 03	WITH MLTA ENABLED, A TIO FOUND ADAPTER NOT READY OFF WITH MICROCONTROLLER STILL DISABLED.	
15	203 03	WITH MLTA ENABLED, A SNS OF OP-END SOURCES FOUND ONE OR MORE ON. EXPECTED X'0000'.	
16	203 03	WITH MLTA ENABLED, A SNS OF PCI SOURCES FOUND ONE OR MORE ON. EXPECTED X'0000'.	
17	203 03	WITH MLTA ENABLED, A TIO FOUND ADAPTER CHECK ON AFTER SENSING OP-END AND PCI SOURCES.	
18	203 03	WITH MLTA ENABLED, A TIO FOR ANY LINE SELECTED INDICATED ONE SELECTED WHEN NONE SHOULD BE.	
19	203 03	WITH MLTA ENABLED AND A LINE SELECTED, A TIO FOUND NO LINE SELECTED.	
1A	203 03	WITH MLTA ENABLED AND A LINE SELECTED, A TIO FOUND LINE UNIT CHECK ON.	
1C	203 03	WITH MLTA ENABLED AND A LINE SELECTED, A TIO FOUND LINE OP-END ON.	
1E	203 03	WITH MLTA ENABLED AND A LINE SELECTED, A TIO FOUND LINE BUSY ON.	
1F	203 03	WITH MLTA ENABLED AND A LINE SELECTED, A TIO FOUND LINE PCI ON.	
20	203 03	ALL HDB'S ARE LOADED AND SENSED. SENSED DATA WAS NOT AS EXPECTED. PATTERNS ARE X'0000',X'AA55',X'55AA', AND X'0101'.	
21	203 03	AFTER ALL HDB'S WERE LOADED AND SENSED, A TIO FOUND ADAPTER CHECK ON.	
22	203 03	WITH A LINE SELECTED, A DISABLE INSTRUCTION FOLLOWED BY A TIO ANY LINE SELECTED SHOWED A LINE STILL SELECTED.	
25	203 04	AN LIO CONTROL STORE INSTRUCTION IS USED TO INCREMENT THE ADDRESSES TO CONTROL STORE. A SNS FOUND THE WRONG ADDRESS IN SAB.	
26	203 04	A SNS CONTROL STORE INSTRUCTION IS USED TO INCREMENT THE ADDRESSES TO CONTROL STORE. A SNS FOUND THE WRONG ADDRESS IN SAB.	
27	203 04	MLTA WAS DISABLED AND THEN ENABLED. ONE LIO CONTROL STORE INSTRUCTION AND SNS SAB WAS ISSUED. SENSED ADDRESS WAS NOT X'0000'.	
28	203 05	CONTROL STORE IS LOADED AND SENSED. 1ST BMT'S SENSED DATA WAS NOT THE SAME AS LOADED DATA.	
29	203 05	CONTROL STORE IS LOADED AND SENSED. 2ND BMT'S SENSED DATA WAS NOT THE SAME AS LOADED DATA.	
2A	203 05	CONTROL STORE IS LOADED AND SENSED. 3RD BMT'S SENSED DATA WAS NOT THE SAME AS LOADED DATA.	
2C	203 05	CONTROL STORE IS LOADED AND SENSED. 4TH BMT'S SENSED DATA WAS NOT THE SAME AS LOADED DATA.	
2E	203 05	AFTER SENSING CONTROL STORE, A TIO FOUND ADAPTER CHECK ON.	

HALT ID	SECT RTN	MEANING	MAP
30	203 06	WITH ADAPTER MADE READY, A TIO FOUND ADAPTER NOT READY.	
31	203 06	DURING CONTROL STORE MEMORY TEST, A TIO FOUND ADAPTER CHECK ON.	
32	203 06	AFTER CONTROL STORE MEMORY TEST, A SNS OF CONTROL STORE DID NOT FIND EXPECTED DATA (INDICATES INCORRECT BRANCHING).	
33	203 06	FOR SIO SERVICE REQUEST TEST, RESULTS INDICATED SIO SERVICE REQUEST WAS ON WHEN IT SHOULD BE OFF.	
34	203 06	IN SIO SERVICE REQUEST TEST, A LINE IS SELECTED AND AN SIO ISSUED. RESULTS INDICATED SIO SERVICE REQUEST WAS NOT ON.	
35	203 06	FOR TIMEOUT SERVICE REQUEST TEST, RESULTS INDICATED TIMEOUT SERVICE REQUEST WAS ON WHEN IT SHOULD BE OFF.	
36	203 06	FOR DATA SERVICE REQUEST TEST, RESULTS INDICATED DATA SERVICE REQUEST WAS ON WHEN IT SHOULD BE OFF.	
37	203 07	AFTER AN SIO TO A LINE, HDB 7 WAS SENSED TO SEE IF THE Q BYTE WAS PROPERLY INSERTED.	
38	203 07	AFTER AN SIO TO A LINE, A TIO FOR INDICATED BUSY (LINE BUSY) WAS IMPROPERLY SET ON/OFF.	
39	203 07	AFTER AN SIO TO A LINE, A TIO FOR INDICATED BUSY (ANY LINE BUSY) WAS IMPROPERLY SET ON/OFF.	
3A	203 07	AFTER A LINE DISABLE, A TIO FOR INDICATED BUSY (LINE BUSY) WAS STILL ON.	
3C	203 07	AFTER A LINE DISABLE, A TIO FOR INDICATED BUSY (ANY LINE BUSY) WAS STILL ON.	
3E	203 07	WITH ALL LINES BUSY AND NO LINE SELECTED, A TIO FOR LINE BUSY INDICATES BUSY ON.	
3F	203 07	WITH ALL LINES BUSY AND MLTA DISABLED, A TIO FOR ANY LINE BUSY INDICATES BUSY STILL ON.	
40	203 07	SSN/SSF TEST. MICROPROGRAM SHOULD TURN LINE UNIT CHECK ON, BUT TIO FOR LINE UNIT CHECK SHOWS IT OFF.	
41	203 08,09 0D,15 17	A SNS OF CONTROL STORE AFTER TEST INDICATES MICROPROGRAM DID NOT END ON CORRECT INSTRUCTION.	
42	203 08	A TIO FOR ANY LINE UNIT CHECK INDICATES IT WAS OFF.	
43	203 08	MICROPROGRAM SETS AN OP-END INTERRUPT WHICH SHOULD RESET LINE BUSY. A TIO FOR ANY LINE BUSY SHOWS IT STILL ON.	
44	203 09	LR TEST. MICROPROGRAM SHOULD MOVE X'5A' FROM HDB 1 TO HDB 0 BUT SNS SHOWS HDB 0 NOT EQUAL TO X'5A'.	
45	203 0A	BR TEST. MICROPROGRAM USES THE BR INSTRUCTION FOR ALL BMT'S INSTALLED. A SNS OF CONTROL STORE INDICATES AN INCORRECT BRANCH.	
46	203 0B	TSN TEST. MICROPROGRAM TESTS FOR 'SW NET' BEING OFF AND 'LINE DISABLED' BEING ON. A SNS OF CONTROL STORE SHOWS ERROR FOUND.	
47	203 0C	SBN TEST. MICROPROGRAM TESTS ALL BITS BEING PROPERLY SET ON. AFTER SNS OF HDB'S, DATA WAS NOT AS EXPECTED.	
48	203 0D	IC TEST. MICROPROGRAM INSERTS X'3C' INTO HDB 0. A SNS OF HDB 0 INDICATED DATA NOT EQUAL TO X'3C'.	
49	203 0E	BOC TEST. MICROPROGRAM TESTS ALL BITS FOR PROPER CONDITIONS. A SNS OF CONTROL STORE INDICATES PROGRAM DID NOT END ON CORRECT INSTRUCTION.	
4A	203 0F	XR TEST. MICROPROGRAM TESTS ALL BITS OF EXCLUSIVE OR OPERATION. A SNS OF CONTROL STORE INDICATES PROGRAM DID NOT END ON CORRECT INSTRUCTION.	
4C	203 10	CIR TEST. MICROPROGRAM TESTS THE COMPARE REG-TO-REG OPERATION. A SNS OF CONTROL STORE INDICATES PROGRAM DID NOT END ON CORRECT INSTRUCTION.	
4E	203 11	SBF TEST. MICROPROGRAM TESTS ALL BITS BEING PROPERLY SET OFF. A SNS OF CONTROL STORE INDICATES PROGRAM DID NOT END ON CORRECT INSTRUCTION.	
4F	203 12	TBF TEST. MICROPROGRAM TESTS ALL BITS FOR TEST BITS OFF OPERATION. A SNS OF CONTROL STORE INDICATES PROGRAM DID NOT END ON CORRECT INSTR.	
50	203 13	CI TEST. MICROPROGRAM TESTS THE COMPARE IMMEDIATE OPERATION. A SNS OF CONTROL STORE INDICATES PROGRAM DID NOT END ON CORRECT INSTRUCTION.	
51	203 14	TBN TEST. MICROPROGRAM TESTS ALL BITS FOR TEST BITS ON OPERATION. A SNS OF CONTROL STORE INDICATES PROGRAM DID NOT END ON CORRECT INSTRUCTION.	
52	203 15	INC TEST. MICROPROGRAM TESTS ALL BITS BEING PROPERLY INCREMENTED. A SNS OF HDB SHOWS INCREMENTED VALUE NOT CORRECT.	
53	203 16	SL TEST. MICROPROGRAM TESTS ALL BITS BEING PROPERLY SHIFTED. A SNS OF HDB 0 SHOWS SHIFTED DATA WAS NOT CORRECT.	
54	203 17	LDX TEST. MICROPROGRAM SETS LINE BUSY ON, THEN OFF. A TIO FOR LINE BUSY INDICATED BUSY NOT IN PROPER STATE.	
58	204 01	A TIO FOR LINE OP-END SHOWED IT OFF WHEN IT SHOULD BE ON.	
59	204 01	A TIO FOR ANY LINE OP-END SHOWED IT OFF WHEN IT SHOULD BE ON.	
5A	204 01	A TIO FOR LINE PCI SHOWED IT ON WHEN IT SHOULD BE OFF.	
5C	204 01	A TIO FOR ANY LINE PCI SHOWED IT ON WHEN IT SHOULD BE OFF.	
5E	204 01	A SNS OF OP-END SOURCES SHOWED LINES WITH OP-END ON WERE NOT AS EXPECTED.	
5F	204 01	A SNS OF PCI SOURCES SHOWED LINES WITH PCI ON WERE NOT AS EXPECTED.	
60	204 01	A TIO FOR LINE OP-END SHOWED IT OFF AFTER A PCI INTERRUPT RESET.	
61	204 01	A TIO FOR LINE OP-END SHOWED IT ON AFTER AN OP-END INTERRUPT RESET.	
62	204 01	A TIO FOR LINE OP-END SHOWED IT ON WHEN IT SHOULD BE OFF.	

HALT ID	SECT RTN	MEANING	MAP
63	204 01	A TIO FOR ANY OP-END SHOWED IT ON WHEN IT SHOULD BE OFF.	
64	204 01	A TIO FOR LINE PCI SHOWED IT OFF WHEN IT SHOULD BE ON.	
65	204 01	A TIO FOR ANY LINE PCI SHOWED IT OFF WHEN IT SHOULD BE ON.	
66	204 01	A SNS OF OP-END SOURCES SHOWED LINES WITH OP-END ON WERE NOT AS EXPECTED.	
67	204 01	A SNS OF PCI SOURCES SHOWED LINES WITH PCI ON WERE NOT AS EXPECTED.	
68	204 01	A TIO FOR LINE PCI SHOWED IT OFF AFTER AN OP-END INTERRUPT RESET.	
69	204 01	A TIO FOR LINE PCI SHOWED IT ON AFTER A PCI INTERRUPT RESET.	
6A	204 01	WITH OP-END ON FOR ALL LINES, THE SELECTED LINE OP-END IS RESET. A SNS OF OP-END SOURCES SHOWED LINES WITH OP-END ON NOT AS EXPECTED.	
6C	204 01	WITH PCI ON FOR ALL LINES, THE SELECTED LINE PCI IS RESET. A SNS OF PCI SOURCES SHOWED LINES WITH PCI ON NOT AS EXPECTED.	
6E	204 01	AFTER A MLTA DISABLE, A SNS OF OP-END SOURCES SHOWED THEY WERE NOT ALL RESET.	
6F	204 01	AFTER MLTA DISABLE, A SNS OF PCI SOURCES SHOWED THEY WERE NOT ALL RESET.	
70	204 01	A TIO FOR LINE UNIT CHECK SHOWED IT ON AFTER MICROPROGRAM ISSUED A SSF TO RESET IT.	
71	204 01	A TIO FOR LINE UNIT CHECK SHOWED IT ON AFTER A LINE DISABLE WAS GIVEN TO RESET IT.	
72	204 01	A TIO FOR ANY LINE UNIT CHECK SHOWED IT ON AFTER AN MLTA DISABLE.	
78	204 02	AN OP-END INTERRUPT OCCURS WHEN OP-END INTERRUPT IS ENABLED BUT WHEN NO OP-ENDS ARE PENDING.	
79	204 02	NO OP-END INTERRUPT OCCURRED WHILE AN OP-END INTERRUPT WAS PENDING.	
7A	204 02	THE INTERRUPT LEVEL 3 IAR DID NOT EXECUTE BRANCHES CORRECTLY.	
7C	204 02	AFTER AN OP-END INTERRUPT OCCURRED, AN OP-END INTERRUPT DISABLE DID NOT RESET THE INTERRUPT LEVEL.	
7E	204 02	A PCI INTERRUPT OCCURS WHEN PCI INTERRUPT IS ENABLED BUT NO PCI'S ARE PENDING.	
7F	204 02	NO PCI INTERRUPT WHEN A PCI INTERRUPT WAS PENDING.	
80	204 02	AFTER A PCI INTERRUPT OCCURRED, A PCI INTERRUPT DISABLE DID NOT RESET THE INTERRUPT LEVEL.	
81	204 02	A LINE SIO IS ACCEPTED WHEN NO LINE IS SELECTED.	
82	204 02	A LINE LIO IS ACCEPTED WHEN NO LINE IS SELECTED.	
83	204 02	A LIO CONTROL STORE, OP DECODE, OR SAB IS ACCEPTED WHILE A LINE WAS BUSY.	
84	204 02	LINE SIO'S ARE ACCEPTED (OR REJECTED) INCORRECTLY WHILE THE SELECTED LINE IS BUSY.	
85	204 02	A LINE LIO IS ACCEPTED WHILE THE SELECTED LINE IS BUSY.	
86	204 02	A LINE LIO IS REJECTED WHILE THE SELECTED LINE IS BUSY BUT ALSO HAS PCI PENDING.	
88	204 03,04 05,06 07,08	AFTER 1 SECOND, NO OP-END INTERRUPT OCCURRED FROM THE MICROPROGRAM BEING RUN.	
89	204 03	AN ERROR WAS DETECTED BY THE MICRODIAGNOSTIC WHILE READING AND WRITING INTO THE HDB'S.	
8A	204 03,04 05,06	AN ERROR WAS DETECTED ON A LINE OTHER THAN THE ONE BEING TESTED.	
8C	204 04	AN ERROR WAS DETECTED BY THE MICRODIAGNOSTIC WHILE TESTING THE LINE TIMEOUT OPERATION.	
8E	204 05	AN ERROR WAS DETECTED BY THE MICRODIAGNOSTIC WHILE TESTING THE DATA ADPTER LINE LOGIC.	
8F	204 06	AN ERROR WAS DETECTED BY THE MICRODIAGNOSTIC WHILE TESTING BIT SCANNER LOGIC.	
90	204 07	AN ERROR WAS DETECTED BY THE MICRODIAGNOSTIC WHILE TESTING THE FETCH AND STORE CYCLE STEAL LOGIC.	
91	204 08	AN ERROR WAS DETECTED BY THE MICRODIAGNOSTIC WHILE TESTING THE LIMITED DISTANCE TYPE 2 LINE ADAPTERS.	
92	204 09	A VISUAL CHECK OF MLTA BUSY INDICATOR SHOWED IT WAS OFF AND IT SHOULD BE ON.	
93	204 09	A VISUAL CHECK OF MLTA CHECK AND I/O CHECK INDICATORS SHOWED THEM OFF AND THEY SHOULD BE ON.	
94	204 09	A VISUAL CHECK OF MLTA ATTENTION AND I/O ATTENTION INDICATORS SHOWED THEM OFF AND THEY SHOULD BE ON.	
95	204 09	A VISUAL CHECK OF CPU USE METER SHOWED IT NOT RUNNING WHEN IT SHOULD BE.	
96	204 09	DEPRESSING THE CHECK RESET KEY DID NOT RESET ADAPTER CHECK.	
97	204 09	DEPRESSING THE CHECK RESET KEY DID NOT RESET LINE UNIT CHECK.	
98	204 09	AN ERROR WAS DETECTED BY THE MICRODIAGNOSTIC WHILE TESTING THE INTERFACE CARD WITH THE LOOP CARD ATTACHED FOR THE TEST.	
9F	202 01	SET SSW 2A FOR D1F1, 2B FOR D1R1, 2C FOR D3F1 OR 2D FOR D3R1.	

4. DETAILED DESCRIPTION OF TESTS

4.1 SECTION 201 LINE CONFIGURATION

SECTION 201 IS NOT PART OF THE RELEASED MLTA DIAGNOSTICS. IT IS GENERATED AT THE CUSTOMER'S LOCATION BY THE CE WHEN THE MLTA SYSTEM IS CONFIGURED. SECTION 201 IS THE OUTPUT OF THE MLTA CONFIGURATOR PROGRAM (ID = FE7) AND IS AUTOMATICALLY PLACED ON THE CE PACK VIA THE DISK EDITOR (ID = FF6). THE INFORMATION ENTERED BY THE CE IS STORED AND FORMATTED SUCH THAT THE COMPLETED MLTA LINE CONFIGURATION APPEARS AS A DCP SECTION. THIS SECTION SHOULD ALWAYS BE LOADED FIRST WHEN MLTA DIAGNOSTICS ARE RUN. ALL MLTA DIAGNOSTIC SECTIONS REFERENCE THIS INFORMATION IN ORDER TO TEST THE MLTA. IF SECTION 201 IS NOT LOADED FIRST, THE PROGRAM WILL HALT INDICATING THAT SECTION 201 IS NOT IN CORE (HALT FF). IF THE CONFIGURE DECK DOES NOT REFLECT THE CORRECT MLTA CONFIGURATION, ERRORS WILL OCCUR.

HINT: SINCE THERE IS NO PART NUMBER AND NO EC NUMBER FOR SECTION 201, USE THE DATE OF MLTA CONFIGURATION TO DETERMINE THE CORRECT CONFIGURATION DECK.

MLTA CONFIGURATION INFORMATION RESIDES IN CORE ADDRESSES X'0A19' THROUGH X'0AFF'. THE CORE MAP IS AS FOLLOWS:

```
X'0A00' - X'0A18'         SECTION PREFACE. THIS INFORMATION CHANGES WITH EACH SECTION LOADED.
X'0A19' - X'0AFF'         MLTA CONFIGURATION DATA.  (USE FE7 TO LIST CONFIGURATION DATA IN SECTION 201.)
X'0B00' -                 DIAGNOSTIC SECTION.
```

4.2 SECTION 202 MLTA ERAP

4.2.1 ERROR HISTORY TABLE

THE ERROR HISTORY TABLE CONTAINS UP TO THE LAST 50 ERRORS THAT OCCURRED. THE ERRORS ARE ENTERED IN CHRONOLOGICAL ORDER, OLDEST ERROR FIRST. IF THE TABLE IS EMPTY, IT IS NOT PRINTED OUT. THE TABLE IS RE-INITIALIZED AFTER BEING PRINTED UNLESS SSW 20 IS ON.

SAMPLE PRINTOUT:

```
      --- MLTA ERROR HISTORY TABLE ---

       THE TOTAL NUMBER OF ERRORS ENTERED:      06

       THE FOLLOWING IS A LISTING UP TO THE LAST 50 MLTA ERRORS.
       IF THE TERMINAL ADDRESS IS BLANK, THE TERMINAL IS NONPOLLED.

       LINE NUMBER IS PRINTED IN DECIMAL.

       TERMINAL ADDRESS IS PRINTED IN HEX.

       HDB0, HDB6, AND HDB7 ARE PRINTED IN BINARY.
      ***********************************************************
      *BIT*     HDB0          *     HDB6        *      HDB7     *
      ***********************************************************
      * 0 * PCI OVERRUN       * TIMEOUT         * MODEM NOT READY *
      * 1 * UPPER SHIFT CASE  * DATA CHECK      * N/A             *
      * 2 * TEXTIN MODE       * TRANS.ABORT     * N/A             *
      * 3 * TEXTOUT MODE      * REC.ABORT       * LINE NOT READY  *
      * 4 * .EIT              * OVER RUN        * N/A             *
      * 5 * . TIME            * T RM INTERRUPR  * .SIO            *
      * 6 * .  COUNT          * INST. NO-OP     * . N             *
      * 7 * .   FIELD         * LOST DATA       * .  FIELD        *
      ***********************************************************

       LINE    TERMINAL
       NUMBER  ADDRESS      HDB0     HDB6     HDB7
         1                00010000 10000000 00000010
         2        62      01100000 01000001 00000011
         2        2F      00000000 00000010 00000111
         1                00010000 00100100 00000010
         2        E2      00000000 10000000 00000010
         7        E2      00100000 00000001 00000011
```

4.2.2 STATISTICAL ERROR RECORDING BY LINE (SDR)

EACH LINE HAS ITS OWN SDR TABLE. THE SDR TABLE CONTAINS TWO COUNTERS FOR EACH TERMINAL ON THE LINE. IF THE TERMINAL'S COUNTERS ARE BOTH ZERO, THE TERMINAL ENTRY IS NOT PRINTED OUT. IF ALL TERMINAL COUNTERS ARE ZERO, THE SDR TABLE IS NOT PRINTED OUT. ALL COUNTERS ARE RE-INITIALIZED AFTER BEING PRINTED UNLESS SSW 20 IS ON. IF A LINE IS NON-POLLED, THE TERMINAL COUNTERS ARE RECORDED UNDER TERMINAL NUMBER -A-. THE TERMINAL NUMBERS ARE AS FOLLOWS:

```
 /          -- ALL TERMINALS (STATISTICS FOR OPERATIONS PERFORMED TO ALL TERMINALS)
 A THRU Z -- TERMINAL  1 THRU 26
 0 THRU 9 -- TERMINAL 27 THRU 36
 @          -- TERMINAL 37
 -          -- TERMINAL 38
 $          -- TERMINAL 39
 .          -- TERMINAL 40
 &          -- TERMINAL 41
```

SAMPLE PRINTOUT:

```
      --- LINE 3 SDR ---

       NUMBER OF I/O REQUESTS WITH INVALID TERMINAL ADDRESS:    0

       TERMINAL  NUMBER OF         NUMBER OF
       NUMBER    SUCCESSFUL I/O    ERRORS
         A          23142            43
         F          31145            32
         0          26731            45
         9          26731            45
         $          19480            12
         .          10756            43
         &            531             5
```

4.2.3 SECTION SENSE SWITCHES

SSW	OPTION IF SSW IS ON
20	DO NOT RE-INITIALIZE HISTORY OR SDR TABLES AFTER PRINTING.
2A	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-F1 AND CLEAR UNDER SSW 20 CONTROL.
2B	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-R1 AND CLEAR UNDER SSW 20 CONTROL.
2C	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-F1 AND CLEAR UNDER SSW 20 CONTROL.
2D	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-R1 AND CLEAR UNDER SSW 20 CONTROL.
2E	ERAP DATA LOCATED ON 5444 F1.
2F	ERAP DATA LOCATED ON 3340 SIMULATED F1.

4.2.4 STATUS BITS

PRIORITY OF ERRORS	BYTE	BIT(S)	ERROR CONDITION
1	NA	NA	ADAPTER CHECK
2	HDB6	6	INSTRUCTION NO-OP
3	HDB6	2&1	TRANSMISSION ABORTED WITH DATA CHECK
4	HDB6	2&0	TRANSMISSION ABORTED WITH TIMEOUT
4	HDB6	3&0	RECEPTION ABORTED WITH TIMEOUT
5	HDB6	2&4	TRANSMISSION ABORTED WITH OVERRUN
5	HDB6	3&4	RECEPTION ABORTED WITH OVERRUN
6	HDB6	2&5	TRANSMISSION ABORTED WITH TERMINAL INTERRUPT
6	HDB6	3&5	RECEPTION ABORTED WITH TERMINAL INTERRUPT
7	HDB6	3&7	RECEPTION ABORTED WITH LOST DATA
8	HDB6	2	TRANSMISSION ABORTED
8	HDB6	3	RECEPTION ABORTED
9	HDB6	0	TIMEOUT
10	HDB6	1	DATA CHECK
11	HDB6	7	LOST DATA
12	PROGRAM DETECTED ERROR		ABNORMAL RESPONSE

OPERATION	HDB 0, BIT 0: PCI OVERRUN
RECEIVE	1. PCI INTERRUPT REQUEST NOT SERVICED WITHIN 4 CHARACTER TIMES (NEW BUFFER NOT ASSIGNED).

OPERATION	HDB 0, BIT 1: UPPER SHIFT CASE
TRANSMIT, RECEIVE	1. CURRENT CASE (SHIFT) OF DATA

OPERATION	HDB 0, BITS 2-3: MODE OF OPERATION
	1. 00 - CONTROL MODE: CONTROL MODE IS SET WHEN A CIRCLE-C IS TRANSMITTED OR RECEIVED. 2. 01 - TEXT-OUT MODE: THIS MODE IS SET WHEN A CIRCLE-D IS TRANSMITTED WHILE IN CONTROL MODE OR TEXT-IN MODE. 3. 10 - TEXT-IN MODE: THIS MODE IS SET WHEN A CIRCLE-D IS RECEIVED WHILE IN CONTROL MODE.

OPERATION	HDB 6, BIT 0: TIMEOUT
RECEIVE WITH INHIBIT TIMEOUT FLAG OFF	1. DURING TEXT-IN MODE, THE LONG TIMEOUT COMPLETES BEFORE THE FIRST OR BETWEEN RECEIVED CHARACTERS (WITH VALID STOP BIT). 2. DURING CONTROL MODE OR TEXT-OUT MODE, THE SHORT TIMEOUT COMPLETES BEFORE RESPONSE CHARACTER (WITH VALID STOP BIT) IS RECEIVED. 3. DURING CONTROL MODE OR TEXT-OUT MODE, THE LONG TIMEOUT COMPLETES BETWEEN RE- CEIVED CHARACTERS (WITH VALID STOP BIT). 4. THE COMMUNICATION LINE (RECEIVE TRIGGER) IS AT A CONTINUOUS SPACE CONDITION FOR THE DURATION OF A LONG TIMEOUT DURING TEXT-IN MODE. 5. THE COMMUNICATION LINE (RECEIVE TRIGGER) IS AT A CONTINUOUS SPACE CONDITION FOR THE DURATION OF A SHORT TIMEOUT DURING CONTROL OR TEXT-OUT MODES.
RECEIVE WITH INHIBIT TIMEOUT FLAG ON	1. THE COMMUNICATION LINE (RECEIVE TRIGGER) IS AT A CONTINUOUS SPACE CONDITION FOR THE DURATION OF A LONG TIMEOUT. 2. THE DATA-CARRIER-DETECTOR SIGNAL IS OFF CONTINUOUSLY FOR THE DURATION OF A LONG TIMEOUT.
TRANSMIT	1. THE CLEAR-TO-SEND SIGNAL NOT DETECTED ON WITHIN A PERIOD OF AN EXTRA-LONG TIMEOUT AFTER SEND MODE WAS SET ON.
RECEIVE INITIAL WITH INHIBIT TIMEOUT FLAG OFF	1. WHILE BUSY, THE LONG TIMEOUT COMPLETES BETWEEN RECEIVED CHARACTERS (WITH A VALID STOP BIT). 2. THE COMMUNICATION LINE (RECEIVE TRIGGER) IS AT A CONTINUOUS SPACE CONDITION FOR THE DURATION OF A LONG TIMEOUT.
RECEIVE INITIAL WITH INHIBIT TIMEOUT FLAG ON	1. THE COMMUNICATION LINE (RECEIVE TRIGGER) IS AT A CONTINUOUS SPACE CONDITION FOR THE DURATION OF A LONG TIMEOUT. 2. WHILE BUSY, THE DATA-CARRIER-DETECTOR SIGNAL IS OFF CONTINUOUSLY FOR THE DURATION OF A LONG TIMEOUT.
LOOP TEST	1. THE CLEAR-TO-SEND SIGNAL NOT DETECTED ON WITHIN A PERIOD OF A LONG TIMEOUT AFTER SEND MODE WAS SET ON. 2. THE LONG TIMEOUT COMPLETES BEFORE THE FIRST OR BETWEEN RECEIVED EOA CHARACTERS (WITH A VALID STOP BIT).
AUTO POLL	1. SAME AS ABOVE, WHERE APPLICABLE, EXCEPT THAT DURING CONTROL MODE THE EXTRA-SHORT TIMEOUT COMPLETES BEFORE A RESPONSE CHARACTER (WITH VALID STOP BIT) IS RECEIVED.

OPERATION	HDB 6, BIT 1: DATA CHECK
RECEIVE OR RECEIVE INITIAL WHILE BUSY	1. VRC ERROR DETECTED (I.E. EVEN PARITY CHARACTER RECEIVED). 2. LRC ERROR DETECTED WHEN ERROR CHECKING FEATURE ON TERMINALS IS AVAILABLE. (LRC CHECKING IS ACTIVATED BY RECEIVING AN EOB CONTROL CHARACTER). 3. INVALID STOP BIT (SPACE CONDITION AT STOP BIT TIME) DETECTED WHILE RECEIVING. 4. DURING TEXT-OUT MODE A NAK RESPONSE WAS RECEIVED.
TRANSMIT	1. INVALID CHARACTER (EVEN PARITY) FETCHED FROM TRANSMIT DATA BUFFER WHILE TRANSMITTING. (DOES NOT APPLY DURING A TRANSMIT BREAK OPERATION OR AUTOPOLL OPERATION.)
LOOP TEST	1. VRC ERROR DETECTED. 2. INVALID STOP BIT DETECTED. 3. NON-EOA CHARACTER RECEIVED.
AUTO POLL	1. SAME AS ABOVE, WHERE APPLICABLE, EXCEPT THAT ANY RESPONSE TO POLLING OTHER THAN NAK OR EOA WILL SET THE DATA CHECK STATUS BIT ON.

OPERATION	HDB 6, BIT 2: TRANSMISSION ABORTED
TRANSMIT	1. MODEM OR LINE NOT READY WHILE TRANSMITTING. 2. THE CLEAR-TO-SEND SIGNAL NOT DETECTED ON WITHIN A PERIOD OF AN EXTRA-LONG TIME-OUT AFTER SEND MODE WAS SET ON. 3. DATA SERVICE REQUEST OVERRUN DETECTED WHILE TRANSMITTING. 4. FETCH I/O CYCLE OVERRUN DETECTED WHILE TRANSMITTING. 5. INVALID CHARACTER (EVEN PARITY) FETCHED FROM TRANSMIT DATA BUFFER WHILE TRANSMITTING. (DOES NOT APPLY DURING A TRANSMIT BREAK OPERATION.) 6. TERMINAL INTERRUPT WHILE TRANSMITTING. (DURING TWO CONSECUTIVE START BIT TIMES, THE RECEIVE TRIGGER WAS AT A SPACE CONDITION.)
LOOP TEST	1. MODEM OR LINE NOT READY WHILE LOOPING. 2. THE CLEAR-TO-SEND SIGNAL NOT DETECTED ON WITHIN A PERIOD OF A LONG TIMEOUT AFTER SEND MODE WAS SET ON. 3. DATA SERVICE REQUEST OVERRUN DETECTED WHILE LOOPING. 4. STORE I/O CYCLE OVERRUN DETECTED WHILE LOOPING. 5. THE LONG TIMEOUT COMPLETES BEFORE THE FIRST OR BETWEEN RECEIVED EOA CHARACTERS (WITH A VALID STOP BIT).

OPERATION	HDB 6, BIT 3: RECEPTION ABORTED
RECEIVE	1. MODEM OR LINE NOT READY WHILE RECEIVING. 2. THE COMMUNICATION LINE (RECEIVE TRIGGER) IS AT A CONTINUOUS SPACE CONDITION FOR THE DURATION OF A LONG TIMEOUT DURING TEXT-IN MODE. 3. THE COMMUNICATION LINE (RECEIVE TRIGGER) IS AT A CONTINUOUS SPACE CONDITION FOR THE DURATION OF A SHORT TIMEOUT DURING CONTROL OR TEXT-OUT MODES (LONG TIMEOUT PERIOD WITH INHIBIT TIMEOUT FLAG ON). 4. RECEIVE LENGTH COUNT EXPIRES WHILE THE BREAK/SKIP FLAG BIT IS OFF. 5. TERMINAL INTERRUPT DETECTED WHILE RECEIVING. (THE RECEIVE TRIGGER WAS AT A SPACE CONDITION AT STOP BIT TIME AND THE CHARACTER ASSEMBLED WAS ALL ZEROS.) 6. DATA SERVICE REQUEST OVERRUN DETECTED WHILE RECEIVING. 7. STORE I/O CYCLE OVERRUN DETECTED WHILE RECEIVING. 8. RECEIVE PCI OVERRUN DETECTED WHILE RECEIVING.

OPERATION	HDB 6, BIT 4: OVERRUN
RECEIVE, TRANSMIT, OR RECEIVE INITIAL	1. I/O CYCLE STEAL REQUEST NOT GRANTED WITHIN TWO BIT TIMES. 2. RECEIVE PCI INTERRUPT REQUEST IS NOT SERVICED BEFORE THE RECEIVE LENGTH COUNT EXPIRES. 3. DATA SERVICE REQUEST OVERRUN DETECTED.

OPERATION	HDB 6, BIT 5: TERMINAL INTERRUPT
RECEIVE OR TRANSMIT	1. TERMINAL INTERRUPT FLAG BIT ON AND THE RECEIVE TRIGGER IS AT A SPACE CONDITION EITHER A) DURING TWO CONSECUTIVE START BIT TIMES WHILE TRANSMITTING OR B) FOR A CHARACTER TIME WHILE RECEIVING. (AN OP-END INTERRUPT IS REQUESTED TO INITIATE A PROGRAM CONTROLLED ERROR RECOVERY PROCEDURE.)

OPERATION	HDB 6, BIT 6: INSTRUCTION NO-OP
TRANSMIT, RECEIVE, RECEIVE INITIAL, LOOP TEST, OR AUTO POLL	1. LINE NOT READY. 2. DATA-SET-READY DETECTOR OFF.
AUTO ANSWER (RECEIVE INITIAL SWITCHED NETWORK)	1. LINE NOT READY. 2. DATA-SET-READY SIGNAL ON.

OPERATION	HDB 6, BIT 7: LOST DATA
RECEIVE	1. RECEIVE LENGTH COUNT EXPIRES WITHOUT THE RECEPTION OF A VALID ENDING CHARACTER. 2. BREAK/SKIP FLAG ON - LINE WILL CONTINUE TO RECEIVE WITHOUT STORING DATA UNTIL EITHER AN ENDING CHARACTER IS RECEIVED AND STORED OR A TIMEOUT COMPLETES. 3. BREAK/SKIP FLAG OFF - AN IMMEDIATE OP-END INTERRUPT IS REQUESTED WITH RECEPTION ABORTED STATUS.

OPERATION	HDB 7, BIT 0: MODEM NOT READY
	1. DATA-SET-READY DETECTOR OFF CAUSES AN INSTRUCTION NO-OP OF A RECEIVE, TRANSMIT & RECEIVE, LOOP TEST, AUTO POLL, OR RECEIVE INITIAL (NON-SWITCHED) INSTRUCTION. 2. DATA-SET-SIGNAL ON CAUSES AN INSTRUCTION NO-OP OF A RECEIVE INITIAL (SWITCHED) INSTRUCTION. 3. DATA-SET-READY SIGNAL TURNS OFF AFTER INITIALLY BEING DETECTED ON. 4. CLEAR-TO-SEND IS NOT ON AFTER AN EXTRA- LONG TIMEOUT.

OPERATION	HDB 7, BIT 3: LINE NOT READY
	1. THIS BIT IS SET ON BY THE MICROPROGRAM WHEN THE DATA ADAPTER IS DISABLED.

OPERATION	HDB 7, BITS 5-7: SIO 'N' FIELD
	1. THESE BITS ARE LOADED WITH THE 'N' FIELD OF ANY SIO NON-CONTROL INSTRUCTION ACCEPTED BY THE SELECTED LINE. 000 - CONTROL 100 - N/A 001 - RECEIVE 101 - RESET 010 - TRANSMIT&RECEIVE 110 - LOOP TEST 011 - RECEIVE INITIAL 111 - AUTO POLL

DEFINITION OF MLTA TIMEOUTS:

LONG = 25.6 SEC	EXTRA-LONG = 51.2 SEC
SHORT = 3.0 SEC	EXTRA-SHORT = 1.5 SEC

4.3 SECTION 203 BASIC MLTA CHECKOUT

4.3.1 ROUTINE 1 - MLTA TIO TEST

ALL ADAPTER AND LINE CONDITIONS ARE TESTED ON ENTRY TO DETERMINE IF ANY CONDITION IS PENDING. AT THIS TIME, NO CONDITIONS SHOULD BE PENDING.

4.3.2 ROUTINE 2 - STORAGE ADDRESS BUFFER TEST

THE STORAGE ADDRESS BUFFER (SAB) IS TESTED FOR CORRECT LOADING, CORRECT PARITY, BITS STUCK ON OR OFF, AND CORRECT RESET.

4.3.3 ROUTINE 3 - LINE SELECT AND HDB TEST

OP-DECODE REGISTER IS LOADED AND CHECKED FOR NORMAL INDICATIONS. EACH DEFINED LINE WILL BE TESTED FOR CONDITIONS PENDING. THE LINE HIGH DENSITY BUFFERS (HDB'S) WILL BE LOADED, SENSED, AND THE CONDITIONS CHECKED FOR EACH LINE.

4.3.4 ROUTINE 4 - MICROINSTRUCTION ADDRESSING TEST

LOAD AND SENSE CONTROL STORE TO CHECK FOR ADDRESS INCREMENTING. THE DATA BEING LOADED IS UNIMPORTANT. THE ADDRESS OF THE CONTROL STORE IS LOADED INTO THE SAB DURING EACH LIO OR SNS OF CONTROL STORE. THIS ADDRESS SHOULD INCREMENT.

4.3.5 ROUTINE 5 - LIO/SNS MICROCONTROL STORAGE TEST

```
THE ROUTINE LOADS AND SENSES CONTROL STORE WITH TEST DATA AS FOLLOWS:
      PART 1: BMT1=BMT2=BMT3=BMT4= -0000-       (ALL CONTROL STORE CONTAINS -0000-)
      PART 2: BMT1=BMT2=BMT3=BMT4= -FFFF-       (ALL CONTROL STORE CONTAINS -FFFF-)
      PART 3: BMT1=0100-01FF,BMT2=0200-02FF     (PATTERN RIPPLED THROUGH CONTROL STORE)
              BTM3=0400-04FF,BMT4=0800-08FF
      PART 4: BMT1=0001-FF01,BMT2=0002-FF02     (PATTERN RIPPLED THROUGH CONTROL STORE)
              BMT3=0004-FF04,BMT2=0008-FF08
```

4.3.6 ROUTINE 6 - CONTROL STORE AND MEMORY BRANCHING TEST

THE ROUTINE TESTS MICROCONTROLLER INSTRUCTION BRANCH ON SERVICE REQUEST FOR THE FOLLOWING SERVICE REQUESTS: UNCONDITIONAL BRANCH, SIO, TIMEOUT SERVICE REQUEST, AND DATA SERVICE REQUEST.

4.3.7 ROUTINE 7 - LINE SIO AND BUSY TEST

EACH DATA ADAPTER LINE IS SELECTED AND EVERY SIO IS ISSUED TO TEST THE LINE CORRECTLY BECOMING BUSY.

4.3.8 ROUTINE 8 - SET SIGNAL ON & SET SIGNAL OFF (SSN & SSF) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTIONS SSN & SSF BY TURNING ON LINE UNIT CHECK SIGNAL AND TURNING OFF ALL SERVICE REQUESTS. ALL LINES ARE CHECKED.

4.3.9 ROUTINE 9 - LOAD REGISTER (LR) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION LR BY TRANSFERRING A KNOWN BYTE OF DATA FROM ONE HDB TO ANOTHER HDB WHICH ORIGINALLY HAD THE INVERSE PATTERN. ALL LINES ARE CHECKED

4.3.10 ROUTINE A - BRANCH REGISTER (BR) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION BY EXECUTING ALL ALLOWABLE BRANCHES: BMT1 TO BMT1, BMT2 TO BMT1, BMT2 TO BMT3, BMT3 TO BMT1, BMT3 TO BMT3, BMT4 TO BMT3, AND BMT4 TO BMT1.

4.3.11 ROUTINE B - TEST SIGNAL ON (TSN) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION TSN BY TESTING KNOWN SIGNALS. ALL LINES ARE TESTED.

4.3.12 ROUTINE C - SET BITS ON MASKED (SBN) MICROINSTRUCTION TEST

```
THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION SBN BY CLEARING THE LINE HDBS AND TURNING BITS ON IN
THE FOLLOWING PATTERNS: HDB INITIALLY -00-, MASKS USED = FF,00,11,22,44,88.
                        HDB INITIALLY -FF-, MASKS USED = 00,FF.
ALL LINES ARE TESTED.
```

4.3.13 ROUTINE D - INSERT CHARACTER (IC) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION IC BY INITIALIZING HDB0 TO -C3- AND ENTERING -3C-. ALL LINES ARE TESTED.

4.3.14 ROUTINE E - BRANCH ON CONDITION (BOC) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION BOC BY SETTING UP CONDITIONS AND TESTING IF THE BRANCH WAS TAKEN FOR THE CONDITIONS: XOR PARITY ODD, HI HALF BYTE ZERO, LO HALF BYTE ZERO, AND HI AND LO BYTE ZERO. ALL LINES ARE TESTED.

4.3.15 ROUTINE F - EXCLUSIVE OR REGISTER TO REGISTER (XR) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION XR BY SETTING UP PATTERNS TO BE 'EXCLUSIVELY OR'ED TOGETHER. INITIALLY -FF- & -FF- XORED, THEN -00- & -00- XORED, THEN -00- XORED WITH -11-,-22-,-44-,&-88- ALL LINES ARE TESTED.

4.3.16 ROUTINE 10 - COMPARE IMMEDIATE REGISTER TO REGISTER (CIR) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION CIR BY COMPARING -00- TO -00-, -FF- TO -FF-, AND -00- TO -FF-. ALL LINES ARE TESTED.

4.3.17 ROUTINE 11 - SET BITS OFF MASKED (SBF) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION SFF BY CHECKING THE RESULT AFTER SBF MASKED -00- AND -FF- OPERATES ON -FF- AND AFTER SBF MASKED -00- AND -FF- OPERATES ON -00-. ALL LINES ARE TESTED.

4.3.18 ROUTINE 12 - TEST BITS OFF MASKED (TBF) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION TBF BY CHECKING THE CONDITION SET AND THE RESULT AFTER TBF MASKED -00- OPERATES ON -FF- AND AFTER TBF MASKED -FF- OPERATES ON -00-, -11-, -22-, -44-, AND -88-. ALL LINES ARE TESTED.

4.3.19 ROUTINE 13 - COMPARE IMMEDIATE MASK (CI) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION CI BY CHECKING THE CONDITION SET AFTER CI DATA -00- IS COMPARED TO -00- AND AFTER CI DATA -FF- COMPARED TO -00- AND -FF-. ALL LINES ARE TESTED.

4.3.20 ROUTINE 14 - TEST BITS ON MASKED (TBN) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION TBN BY CHECKING THE CONDITION AFTER TBN MASKED -00- OPERATES ON -FF- AND AFTER TBN MASKED -FF- OPERATES ON -FF-, -EE-, -DD-, -BB-, AND -77-. ALL LINES ARE TESTED.

4.3.21 ROUTINE 15 - INCREMENT + 1 (INC) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION INC BY INCREMENTING HDB0 256 TIMES (UNTIL HDB0 WRAPS BACK TO ZERO). ALL LINES ARE TESTED.

4.3.22 ROUTINE 16 - SHIFT LEFT (SL) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION SL BY SHIFTING A PATTERN IN HDB0 FROM -AA- TO -55- AND FROM -55- TO -AA-. ALL LINES ARE TESTED.

4.3.23 ROUTINE 17 - LOAD EXTERNAL REGISTER (LDX) MICROINSTRUCTION TEST

THE ROUTINE TESTS THE MICROCONTROLLER INSTRUCTION LDX BY LOADING DATA INTO THE EXTERNAL REGISTER. ALL LINES ARE TESTED.

4.3.24 SENSE SWITCH 10 OPTION

CE OPTIONS ARE AS FOLLOWS:
WHEN SENSE SWITCH 10 IS TURNED ON, THE PROGRAM WILL HALT WITH -E8- HALT TO ALLOW THE CE TO SELECT OPTIONS ON THE ADDRESS SWITCHES.

ADDR SWS 1 2 3 4	MEANING
A X N N	ENABLE LINE 'NN' IF 'NN' A VALID LINE. VALID ENTRY INDICATED BY -EA- HALT.
B X N N	DISABLE LINE 'NN'. VALID ENTRY INDICATED BY -EE- HALT.
C X X X	MULTIPLE LINE SELECT OPTION IN USE. (MULTIPLE LINE SELECT OPTION MODE IN USE ONLY AS LONG AS 'C' IS IN ADDRESS SWITCH 1.)
C A N N	ENABLE LINE 'NN', IF VALID, FOR MULTIPLE LINE SELECT. VALID ENTRY HALT IS -EC-.
C B N N	DISABLE LINE 'NN' FROM MULTIPLE LINE SELECT. VALID ENTRY HALT IS -EF-.

LINE SELECTION IS AS FOLLOWS:

X X 0 1	SELECT LINE 1
X X 0 2	SELECT LINE 2
X X 0 3	SELECT LINE 3
X X 0 4	SELECT LINE 4
X X 0 5	SELECT LINE 5
X X 0 6	SELECT LINE 6
X X 0 7	SELECT LINE 7
X X 0 8	SELECT LINE 8
X X 0 9 - X X F F	INVALID ENTRY
X X 0 0	INVALID ENTRY

CAUTION: A LINE THAT IS NOT PRESENT SHOULD NOT BE SELECTED. IF A LINE THAT IS NOT PRESENT IS SELECTED, AN ERROR WILL OCCUR. AN -E9- HALT INDICATES AN INVALID LINE SELECTION.
NOTE: AS LONG AS THE ADDRESS SWICHES REMAIN IN THEIR INITIALLY SET STATE, THE SAME LINE SELECTION IS USED FOR ALL ROUTINES TO BE RUN. HOWEVER, IF ANY SWITCH SETTING IS CHANGED FROM ITS INITIAL SETTING, HALT -E8- WILL OCCUR. TO RE-SELECT A LINE, PROCEED AS ABOVE.

4.4 SECTION 204 FUNCTIONAL MLTA CHECKOUT

4.4.1 ROUTINE 1 - OP-END AND PCI SOURCES

THIS ROUTINE TESTS OP-END AND PCI INTERRUPT TIO COMMANDS FOR EACH LINE. THE INTERRUPTS ARE SET UP AND RESET TO SEE IF EACH TIO COMMAND DETECTS THE PRESENCE OR ABSENCE OF THE INTERRUPTS. NOTE THAT THE INTERRUPT NEVER OCCURS.

4.4.2 ROUTINE 2 - INTERRUPT TEST

OP-END AND PCI INTERRUPTS ARE SET UP, ARE ALLOWED TO OCCUR, AND ARE RESET TO TEST OUT THE INTERRUPT LOGIC. ALSO, CONDITIONS THAT CAUSE MLTA I/O ATTENTION ARE TESTED.

4.4.3 ROUTINE 3 - HDB TEST

ALL HDB'S (HIGH DENSITY BUFFERS) ARE LOADED WITH A PREDETERMINED PATTERN. THE MICROCODE TEST THEN CHECKS THE HDB'S FOR THE CORRECT PATTERNS.

4.4.4 ROUTINE 4 - TIMEOUT TEST

AFTER THE MICROCODE IS LOADED, THE MICROCODE TESTS AND VERIFIES THAT THE TIMEOUT PERIOD IS CORRECT.

4.4.5 ROUTINE 5 - LINE LOGIC TEST

THE MICROCODE TESTS THE LOGIC ON EACH DATA ADAPTER CARD AND ON THE LINE INTERFACE CARDS.

NOTE: AN -8E- HALT WITH HDB7 = 11 WILL OCCUR IF THIS TEST IS RUN ON AN EIA LEASED LINE OR A LD2 LINE WITH THE REMOTE TERMINAL IN TEXT-OUT MODE. THIS CAN BE AVOIDED BY DISCONNECTING THE EXTERNAL CABLE FOR THE LINE AT THE TAIL GATE.

4.4.6 ROUTINE 6 - BIT TIME SCANNER TEST

THE MICROCODE TESTS AND VERIFIES THE CORRECT BIT TIMES FOR ALL MLTA OSCILLATORS INSTALLED.

4.4.7 ROUTINE 7 - CYCLE STEAL TEST

THE MICROCODE VERIFIES THAT THE FETCH-AND-STORE CYCLE STEALS WORK CORRECTLY.

4.4.8 ROUTINE 8 - LD2 FREQUENCY TEST

IF LD2'S ARE INSTALLED, THE MICROCODE CHECKS THE TRANSMITTING FREQUENCY OF THE LINE ADAPTERS FOR BOTH MARKS AND SPACES AND THE OPERATION OF LD2'S WITH THEIR INTERFACE CARD.

4.4.9 ROUTINE 9 - INTERFACE LOOP TEST

THIS ROUTINE ALLOWS THE OPERATOR TO VISUALLY CHECK THE MLTA INDICATORS, THE CPU USE METER, AND ALSO CHECKS THE INTERFACE CARDS WITH THE CE LOOP/WRAP CARD.

4.4.10 SENSE SWITCH 10 OPTION

FOR EXPLANATION OF CE SENSE SWICH OPTION, SEE 4.3.24.

4.5 SECTION 205 MLTA MICROCODE LOADER

THIS PROGRAM LOADS THE MLTA CONTROL STORE WITH THE MICROCODE. THE MICROCODE DATA DECK HAS A COMMON PROGRAM ID, FFO, BUT DIFFERENT PART NUMBERS. THE CORRECT MICROCODE DATA DECK SHOULD BE USED FOR THE SYSTEM APPLICATION AND CONFIGURATION.

MICROCODE DATA DECK W/O AUTO POLL P/N = 5554852
MICROCODE DATA DECK WITH AUTO POLL P/N = 5554853

4.5.1 PROGRAM LOADING

4.5.1.1 LOADING FROM DISK

ONCE SECTION 205 IS LOADED, IT WILL AUTOMATICALLY BRING IN THE MICROCODE DATA DECK FFO.

4.5.1.2 LOADING WITH SENSE SWITCH 10 ON FROM DISK

WHEN SECTION 205 IS LOADED, THE FOLLOWING INFORMATION WILL BE PRINTED PRIOR TO -F0- HALT:

```
-                                                                         -
-    MLTA MICROCONTROLLER LOAD PROGRAM                                    -
-                                                                         -
-    SELECT OPTION BY PUTTING XX VALUE INTO DATA SWITCHES                 -
-    AND RESET HALT                                                       -
-                                                                         -
-    01 - LOAD CONTROL STORE, SENSE CONTROL STORE, AND PRINT OBJECT CODE  -
-                                                                         -
-    02 - LOAD AND SENSE CONTROL STORE ONLY                               -
-                                                                         -
-    03 - SENSE AND PRINT CONTENTS OF CONTROL STORE                       -
-                                                                         -
```

AFTER SELECTING OPTION ON DATA SWITCHES, RESET HALT -F0-.

4.5.2 PROGRAM EXECUTION

4.5.2.1 SENSE SWITCH 10 OFF

PROGRAM DEFAULTS TO OPTION 02 - LOAD AND SENSE CONTROL STORE ONLY (SEE EXPLANATION 4.5.2.2.2)

4.5.2.2 SENSE SWITCH 10 ON

4.5.2.2.1 OPTION 01 - LOAD CONTROL STORE, SENSE CONTROL STORE, AND PRINT OBJECT CODE

THE MICROCODE DECK (FFO) IS READ INTO THE SYSTEM/3 MEMORY. THE MLTA CONTROL STORE IS THEN LOADED WITH THE COMPLETE MICROPROGRAM. THE MICROCODE IS THEN SENSED FROM THE CONTROL STORE AND COMPARED WITH THE MICROCODE THAT WAS LOADED. THE SENSED MICROCODE IS THEN PRINTED OUT. IF DATA COMPARES, SECTION TERMINATES. IF NOT,ERROR DUMP & RE-TRY USING OPTION 5.

4.5.2.2.2 OPTION 02 - LOAD AND SENSE CONTROL STORE ONLY

THE MICROCODE DECK (FFO) IS READ INTO THE SYSTEM/3 MEMORY. THE MLTA CONTROL STORE IS THEN LOADED WITH THE COMPLETE MICROPROGRAM. THE MICROCODE IS THEN SENSED FROM THE CONTROL STORE AND COMPARED WITH THE MICROCODE THAT WAS LOADED. IF DATA COMPARES, SECTION TERMINATES. IF NOT, ERROR DUMP AND RE-TRY USING OPTION 5.

4.5.2.2.3 OPTION 03 - SENSE AND PRINT MLTA CONTROL STORE

THE MICROCODE DECK (FFO) IS READ INTO THE SYSTEM/3 MEMORY. THE CONTENTS OF THE MLTA CONTROL STORE IS SENSED AND COMPARED TO THE MICROCODE IN THE DATA DECK (FFO). THE INFORMATION IS PRINTED OUT IN A DOUBLE COLUMN. THE LEFT COLUMN CONTAINS MICROCODE FROM THE MICROCODE DECK (FFO). THE RIGHT COLUMN CONTAINS MICROCODE SENSED FROM THE MLTA CONTROL STORE. IF THE TWO LINES OF MICROCODE DO NOT COMPARE, A DOLLAR SIGN ($) IS ENTERED TO THE RIGHT OF THE LINE IN ERROR.

```
-                                                                         -
- ADDR      CODE READ INTO CORE                 CODE SENSED FROM MLTA      ERR -
-                                                                         -
- 0000  00000001000200030004000500060007  00000001000200030004000500060007     -
- 0008  00080009000A000B000C000D000E000F  00080009000A000B000C000D000E000F     -
- 0010  00100011001200130014001500160017  0010001100120013001400150016FFFF  $  -
- 0018  00180019001A001B001C001D001E001F  FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF  $  -
-                                                                         -
```

4.5.2.2.4 OPTION 04 - PRINT MLTA MICROCODE DECK IMAGE FROM SYSTEM/3 CORE

THIS OPTION IS AVAILABLE ONLY IF A LOADING ERROR HAS OCCURRED. THE MICROCODE DECK WHICH WAS LOADED IS TOO LARGE FOR THE SYSTEM MLTA CONTROL STORAGE. SETTING THE DATA SWITCHES TO 04 AND RESETTING -E1- HALT WILL DUMP THE MLTA MICROCODE DECK IMAGE FROM SYSTEM/3 CORE.

4.5.2.2.5 OPTION 05 - RETRY LOADING MLTA CONTROL STORE

THIS OPTION IS AVAILABLE ONLY IF A LOADING ERROR HAS OCCURRED. SETTING DATA SWITCHES TO 05 AND RESETTING -E2- HALT WILL RELOAD THE MLTA CONTROL STORE WITH THE MICROCODE ALREADY IN SYSTEM/3 MEMORY. OPTION 05 IS LIKE OPTION 02 EXCEPT THAT THE SOURCE CODE IS ALREADY IN SYSTEM/3 MEMORY.

4.6 SECTION 206 LINE LOOP/WRAP TEST

NOTE: IF THIS TEST IS RUN ON A LEASED LINE WITH A 2741, A STRING OF 9'S, #'S, OR INTERMITTENT DATA CAN BE PRINTED BY THE TERMINAL. THIS CAN BE AVOIDED BY DISCONNECTING THE EXTERNAL CABLE FOR THAT LINE AT THE TAIL GATE.

4.6.1 ROUTINE 1 - LOOP TEST WITH TEST MODE ON

EACH LINE WILL BE ISSUED AN SIO LOOP TEST FOR LOW AND/OR HIGH SPEED AS DEFINED FOR LINE. LINES WILL BE TESTED IN SEQUENTIAL ORDER UNLESS SSW 10 OPTION IS USED. FOR SSW 10 OPTION, EACH LINE FOR TESTING MUST BE SELECTED THROUGH THE DATA SWITCHES.

4.6.2 ROUTINE 2 - WRAP TEST WITH TEST MODE ON

EACH PAIR OF ADJACENT LINES WILL BE WRAPPED BY ISSUING AN SIO RECEIVE FOR ONE LINE AND SIO TRANSMIT & RECEIVE TO THE OTHER. ON COMPLETION OF WRAP LINE X TO LINE Y,THE LINES WILL BE WRAPPED LINE Y TO LINE X. THE WRAP OF ADJACENT LINES WILL BE DONE IN LOW AND/OR HIGH SPEED AS DEFINED FOR LINE. ADJACENT PAIRS OF LINES WILL BE TESTED IN SEQUENTIAL ORDER UNLESS SSW 10 OPTION IS USED. FOR SSW 10 OPTION, ONE LINE OF THE ADJACENT PAIR MUST BE SELECTED THROUGH THE DATA SWITCHES. THE SELECTED LINE WILL BE THE FIRST LINE TO TRANSMIT. ADJACENT LINES ARE 1-2, 3-4, 5-6, AND 7-8.

256 BYTES OF DATA WILL BE TRANSMITTED DURING THE WRAP TEST ON THE LINE SELECTED. THE WRAP TEST 'MESSAGE' IS ENTERED THROUGH THE 3277 KEYBOARD. DEPRESS THE -ENTER- KEY ON ENTRY COMPLETION. IF NO DATA IS ENTERED AND THE -ENTER- KEY IS DEPRESSED, THE WRAP TEST WILL DEFAULT TO TRANSMITTING ALL CHARACTERS. DATA ENTRY REQUEST IS AS FOLLOWS:

```
**********************************************
*   WRAP TEST - ENTER MESSAGE                *
*   (80 CHARACTERS MAXIMUM ON 3277)          *
*   NOTE: IF NO ENTRY, MESSAGE DEFAULTS      *      <----  MESSAGE ON 3277 CRT
*     TO ALL CHARACTERS                      *
**********************************************
```

4.6.3 ROUTINE 3 - LOOP TEST WITH TEST MODE OFF

SSW 10 MUST BE ON TO RUN THIS ROUTINE. THE 'LOOP' PORTION OF THE LOOP/WRAP CARD MUST BE INSERTED INTO THE PROPER LINE CONNECTOR SOCKET. THE LINE TO BE TESTED MUST BE DEFINED IN THE DATA SWITCHES BEFORE THE HALT IS RESET. THE SELECTED LINE WILL BE ISSUED AN SIO LOOP TEST FOR LOW AND/OR HIGH SPEED AS DEFINED FOR LINE. (FOR LINES WITH LD2 LINE ADAPTERS INSTALLED, THE LOOP/WRAP CARD IS NOT REQUIRED.)

4.6.4 ROUTINE 4 - WRAP TEST WITH TEST MODE OFF

SSW 10 MUST BE ON TO RUN THIS ROUTINE. THE 'WRAP' PORTION OF THE LOOP/WRAP CARD MUST BE INSERTED INTO THE PROPER LINE CONNECTOR SOCKET. ONE LINE OF THE ADJACENT PAIR MUST BE SELECTED THROUGH THE DATA SWITCHES. THE SELECTED LINE WILL BE THE FIRST LINE TO TRANSMIT. EACH PAIR OF ADJACENT LINES WILL BE WRAPPED BY ISSUING AN SIO RECEIVE FOR ONE LINE AND SIO TRANSMIT & RECEIVE TO THE OTHER. ON COMPLETION OF WRAP LINE X TO LINE Y, THE LINES WILL BE WRAPPED LINE Y TO LINE X. THE WRAP OF ADJACENT LINES WILL BE DONE IN LOW AND/OR HIGH SPEED AS DEFINED FOR LINE. ADJACENT LINES ARE 1-2, 3-4, 5-6, AND 7-8.

NOTE: THE I/O ATTENTION LIGHT MAY COME ON DURING THIS TEST.

256 BYTES OF DATA WILL BE TRANSMITTED DURING THE WRAP TEST ON THE LINE SELECTED. FOR EXPLANATION OF WRAP TEST 'MESSAGE' ENTRY, SEE 4.6.2 ABOVE.

4.6.5 ROUTINE 5 - CONTINUOUS TRANSMIT

UP TO 16 BYTES OF PATTERN WILL BE TRANSMITTED CONTINUOUSLY ON THE LINE SELECTED. THE INFORMATION IS ENTERED THROUGH THE 3277 KEYBOARD. DATA ENTRY IS AS FOLLOWS:

```
**************************************************
*    ROUTINE 5 -CONTINUOUS TRANSMIT TEST-        *
*    INPUT FORMAT = LN,S,M                       *
*    LN = LINE NUMBER1- 01,02,...                *
*    S  = LINE SPEED   - L (LOW,BASIC) OR        *
*                      - H (HIGH,FEATURE)        *      <---- MESSAGE ON 3277 CRT
*    M  = TEST MODE    - N (ON) OR F (OFF)       *
*    DEPRESS  -ENTER- KEY ON ENTRY COMPLETION    *
*                                                *
*    ENTER REQUEST                               *
**************************************************
```

AT THIS POINT ENTER THE INFORMATION AND DEPRESS -ENTER- KEY ON THE 3277. IF AN ERROR IS MADE, USE THE -BKSP- KEY AND RE-ENTER THE REQUEST.

```
**************************************************
*   ENTER NUMBER OF BYTES IN PATTERN             *
*   01 THRU 16. MAX=16.                          *      <---- MESSAGE ON 3277 CRT
**************************************************
```

ENTER LENGTH OF PATTERN. NOTE: USE TWO DECIMAL DIGITS, I.E. 01,02,03,...,09,10,11,...15, OR 16

```
**************************************************
*   HEX CHARACTERS? Y (YES) OR N (NO)            *      <---- MESSAGE ON 3277 CRT
**************************************************
```

IF HEX CHARACTERS ARE CHOSEN, THE EXACT PATTERN ENTERED WILL BE TRANSMITTED DOWN THE LINE.
NOTE: ENTER ONLY VALID CHARACTERS FOR THE LINE CODE USED ON THAT LINE. INVALID CHARACTERS WILL CAUSE DATA CHECKS. IF A TERMINAL IS ON THE LINE, IT WILL ATTEMPT TO RESPOND TO POLLING AND ADDRESSING WHICH MAY ALSO CAUSE ERRORS SINCE NO RESPONSE IS EXPECTED.

```
**************************************************
*   REFER TO CE HANDBOOK FOR VALID HEX FOR       *
*   LINE CODE DEFINED                            *
*                                                *      <---- MESSAGE ON 3277 CRT
*                                                *
*   ENTER PATTERN                                *
**************************************************
```

AFTER ENTERING THE DESIRED PATTERN, DEPRESS THE -ENTER- KEY AND THE MLTA WILL START THE CONTINUOUS XMIT.

NOTE: TO TERMINATE THE CONTINUOUS TRANSMIT AT ANY TIME, DEPRESS THE -TEST REQUEST- KEY ON THE 3277. THE PROGRAM WILL STOP THE CONTINUOUS TRANSMIT AND WILL RETURN TO THE -ENTER REQUEST- MODE.

SAMPLE ENTRY:

```
**************************************************
*    ROUTINE 5 -CONTINUOUS TRANSMIT TEST-        *
*    INPUT FORMAT = LN,S,M                       *
*    LN = LINE NUMBER - 01,02,...                *
*    S  = LINE SPEED   - L (LOW,BASIC) OR        *
*                      - H (HIGH,FEATURE)        *      <---- MESSAGE ON 3277 CRT
*    M  = TEST MODE    - N (ON) F (OFF)          *
*    DEPRESS -ENTER- KEY ON ENTRY COMPLETION     *
*                                                *
*    ENTER REQUEST                               *
*                                                *
*    02,L,F                                      *
**************************************************

**************************************************
*    ENTER NUMBER OF BYTES IN PATTERN            *
*    01 THRU 16. MAX=16.                         *      <---- MESSAGE ON 3277 CRT
*    16                                          *
**************************************************

**************************************************
*    HEX CHARACTERS? Y (YES) OR N (NO)           *
*    N                                           *      <---- MESSAGE ON 3277 CRT
**************************************************

**************************************************
*    ENTER PATTERN                               *
*    0123456789ABCDEF                            *      <---- MESSAGE ON 3277 CRT
**************************************************

**************************************************
*    INPUT ACCEPTED                              *
*    CHECK LINE PRINTER FOR MESSAGES             *      <---- MESSAGE ON 3277 CRT
*    DEPRESS TEST REQ TO RETURN TO ENTER MODE    *
**************************************************
```

4.7 SECTION 207 MLTA LINE TEST

THE MLTA LINE TEST PROVIDES THE MEANS TO CHECK OUT THE COMMUNICATION LINES BETWEEN THE SYSTEM/3 MLTA AND THE TERMINAL. WHEN THE COMMUNICATION LINES ARE OPERATING PROPERLY, THE SAME LINE TEST IS USED TO DIAGNOSE THE TERMINALS.

NOTE 1: LINES DEFINED WITH THE CONFIGURATOR IN SECTION 201 THAT ARE NOT 'ON LINE' OR ARE BEING WORKED ON MAY BE REMOVED FROM TEST BY CHANGING THE LINES DEFINED FOR THE SYSTEM AT CORE LOCATION X'0A1B'. TO REMOVE A LINE FROM TEST, TURN OFF THE BIT FOR THAT LINE: X'0A1B' BIT 0 1 2 3 4 5 6 7
LINE 8 7 6 5 4 3 2 1

NOTE 2: TERMINATION OF ANY TEST WHICH COMMUNICATES WITH A TERMINAL SHOULD BE DONE BY ENTERING X'EE00' IN THE CONSOLE SWITCHES. IF ANY OTHER METHOD OF TERMINATING THE TEST IS USED, THE DATA PRINTED BY THE TERMINAL DURING TERMINATION IS UNPREDICTABLE.

4.7.1 TERMINAL TESTS

4.7.1.1 TEST 01 - ALL CHARACTERS

THIS TEST TRANSMITS ALL PRINTABLE CHARACTERS TO THE TERMINAL TO VERIFY THE ABILITY OF THE TERMINAL TO CORRECTLY RECEIVE DATA. CHARACTERS RECEIVED AT THE TESTED TERMINAL ARE THE ALPHABET A-Z (LOWER AND UPPER CASE), THE NUMBERS 0-9, AND 26 SPECIAL CHARACTERS. (THE SPECIAL CHARACTERS MAY DIFFER FROM TERMINAL TO TERMINAL DEPENDING ON THE CHARACTER SET USED.)

4.7.1.2 TEST 02 - STORED COMPARE

THE TEXT RECEIVED FROM THE TESTED DEVICE IS COMPARED WITH A STORED MESSAGE IN THE CPU TO VERIFY THE ABILITY OF THE TERMINAL TO CORRECTLY TRANSMIT DATA. THE 'COMPARE MESSAGE' SENT FROM THE TERMINAL CONSISTS OF THE LOWER CASE ALPHABET A-Z, THE UPPER CASE ALPHABET A-Z, AND THE NUMBERS 0-9.

IF THE COMPARISON TO THE STORED DATA IS INVALID, THE FOLLOWING MESSAGE IS SENT TO THE 3277 CRT:

**** RECEIVE DATA FOR COMPARE NOT AS EXPECTED

THE RECEIVED DATA IS THEN PRINTED ON THE LINE PRINTER AND THE STORED COMPARE TEST IS RE-TRANSMITTED TO THE TERMINAL.

IF THE TEXT FROM THE TESTED TERMINAL COMPARES TO THE STORED MESSAGE, THE NEXT TEST IS SENT.

4.7.1.3 TEST 03 - TILT/ROTATE/TWIST

THIS TEST SENDS THREE MESSAGES TO THE TERMINAL TO EXERCISE THE SELECTRIC PRINT ELEMENT. THE FIRST MESSAGE EXERCISES THE TILT CAPABILITY OF THE SELECTRIC TYPING ELEMENT, THE SECOND MESSAGE EXERCISES THE ROTATE CAPABILITY, AND THE THIRD MESSAGE EXERCISES THE TWIST CAPABILITY. THE INABILITY OF THE SELECTRIC TYPING ELEMENT TO PERFORM THE TILT, ROTATE, AND TWIST TESTS CORRECTLY IS NORMALLY DETECTED BY OBSERVING PARTIALLY PRINTED CHARACTERS IN THE PATTERN PRINTED DURING THE TEST. THE TEST PATTERN CAN VARY DEPENDING ON THE CHARACTER SET OF THE SELECTRIC TYPING ELEMENT.

4.7.1.4 TEST 04 - ECHO

THIS TEST VERIFIES THE ABILITY OF A TERMINAL TO ENTER A MESSAGE AND RECEIVE THE SAME MESSAGE BACK. THE MESSAGE LENGTH MUST BE 40 CHARACTERS OR LESS.

NOTE: TAB AND CARRIAGE RETURN CHARACTERS MUST NOT BE INCLUDED IN THE ECHO TEST MESSAGE.

4.7.1.5 TEST 05 - SELECTRIC ANALYZER

THIS TEST SENDS A SERIES OF MESSAGES TO THE TERMINAL. THESE MESSAGES PROVIDE AN EXERCISE FOR ANALYZING THE CAPABILITY OF THE SELECTRIC MECHANISM TO PERFORM THE FOLLOWING FUNCTIONS:

-FORWARD SPACING
-BACK SPACING
-CARRIAGE RETURN
-LINE FEED

THE FOLLOWING TEST PATTERN IS PRINTED AT THE TESTED TERMINAL

```
-                                                              -
-    SELECTRIC ANALYZER                                        -
-    1234567890 SPACE&BKSP.                                    -
-                                                              -
-    CR  (LOWER CASE)                                          -
-    CR  (UPPER CASE)                                          -
-    LF  (LOWER CASE)                                          -
-          1                                                   -
-           2                                                  -
-            3                                                 -
-    LF  (UPPER CASE)                                          -
-          1                                                   -
-           2                                                  -
-            3                                                 -
-                                                              -
```

NOTE 1: THE 2741 TERMINAL WILL OVERPRINT THE 'E' IN 'SPACE&BKSP' WITH A '#' (EBCD CODE) OR A '9' (CORRESPONDENCE CODE).

4.7.1.6 TEST 06 - INCORRECT CASE

THIS TEST SENDS A MESSAGE TO THE TERMINAL IN UPPER CASE CHARACTERS AND THEN SENDS AN UPSHIFT CHARACTER WHICH SHOULD CAUSE THE TERMINAL TO PRINT A HYPHEN (EBCD CODE) OR AN EXLAMATION MARK (CORRESPONDENCE CODE).
NOTE 1: THIS TEST IS VALID FOR THE 2740 TERMINALS ONLY.
NOTE 2: THE 2740-1 TERMINAL WITH LRC WILL PRINT AN UNDERSCORE UNDER THE HYPHEN (EBCD CODE) OR A DEGREE SYMBOL (CORR. CODE). ALSO, AN ERROR MSG WILL BE PRINTED ON THE LINE PRINTER:
**** LINE/TADDR XX STATUS BYTES = 4002

4.7.1.7 TEST COMPLETION

A MESSAGE 'END OF SELECTED TESTS' WILL BE PRINTED ON THE TERMINAL WHEN THE SELECTED TESTS ARE COMPLETED. NOTE: NO COMPLETION MESSAGE IS SENT TO S/7 (2740-1 CONFIGURATION).

A MESSAGE 'END OF SELECTED TESTS ON LINE XX' WILL BE DISPLAYED ON THE 3277 WHEN THE SELECTED TEST FOR A LINE ARE COMPLETE.

4.7.2 TEST REQUEST FORMAT

TO ENTER A TEST REQUEST FROM THE 3277 KEYBOARD/CRT AT THE CPU SITE, DO THE FOLLOWING:

1. DEPRESS THE -TEST REQ- KEY ON THE 3277.
2. ENTER THE TEST REQUEST FORMAT. 99999KYBD/L2TW/T1,T2,...,TN/XX/OPT/
   (SEE BREAKDOWN OF FORMAT BELOW.)
3. DEPRESS THE -ENTER- KEY ON THE 3277.

TO ENTER A TEST REQUEST MESSAGE ON A TERMINAL, DO THE FOLLOWING:

1. DEPRESS THE KEY THAT WILL CAUSE YOUR TERMINAL TO BE SELECTED.
2. ENTER THE TEST REQUEST FORMAT. 99999L1RU/L2TW/T1,T2,...,TN/XX/
   (SEE BREAKDOWN OF FORMAT PELOW.)
3. DEPRESS THE KEY THAT WILL CAUSE YOUR TEST REQUEST TO BE SENT TO THE CPU.

THE FOLLOWING IS A BREAKDOWN OF THE TEST REQUEST FORMATS:

```
                                KEY TO DEPRESS WHICH WILL CAUSE THE CPU TO SELECT YOUR TERMINAL:
                                1050      - REQUEST KEY
                                2740-1    - BID KEY
                                2740-2    - ENTER KEY
                                2741      - (NO REQUESTS ALLOWED FROM 2741)
                                SYSTEM/7- (NO REQUESTS ALLOWED FROM SYSTEM/7)
                                CMCST     - (NO REQUESTS ALLOWED FROM CMCST)
                                3767      - 2741 CONFIG. (NO REQUESTS ALLOWED)
                                3767      - 2740-1 CONFIG. - SYS REQ KEY
                                3767      - 2740-2 CONFIG. - ATTN KEY

99999      (5 CHARACTERS)       MESSAGE IDENTIFIER: -99999-

L1         (2 CHARACTERS)       REQUESTING TERMINAL LINE NUMBER: 01,02,...,07, OR 08

R          (1 CHAR OR NONE)     REQUESTING TERMINAL ADDRESS FOR LINE WITH STATION CONTROL:
                                A,B,...,Z,0,1,...,9,@,-,$,.,&

U          (1 CHAR OR NONE)     SUBCOMPONENT FOR TERMINAL (NOT USED FOR 2740-2741)
                                1050 SUBCOMPONENTS:
                                       RECEIVING UNITS              TRANSMITTING UNITS
                                        1 - PRINTER 1                5 - KEYBOARD
                                        2 - PRINTER 2                6 - READER 1
                                        3 - PUNCH 1                  7 - READER 2
                                        4 - PUNCH 2                  0 - ANY TX UNIT
                                        9 - ALL RX UNITS

L2         (2 CHARACTERS)       TESTED TERMINAL LINE NUMBER: 01,02,...,07, OR 08

T          (1 CHAR OR NONE)     TESTED TERMINAL ADDRESS FOR LINE WITH STATION CONTROL
                                (BROADCAST CHARACTER VALID ONLY IF TEST REQUEST ENTERED FROM -KYBD-)

W          (1 CHAR OR NONE)     SUBCOMPONENT FOR TESTED TERMINAL (USED FOR 1050 ONLY)

T1 - TN    (2 CHAR EACH,        THE TEST(S) TO BE RUN ON TERMINAL (TESTS MAY BE ENTERED IN ANY
       SEPARATED BY COMMAS)     SEQUENCE. TESTS ARE RUN IN ASCENDING NUMERICAL ORDER.)
                                01 - ALL CHARACTERS
                                02 - STORED COMPARE
                                03 - TILT/ROTATE/TWIST
                                04 - ECHO
                                05 - SELECTRIC ANALYZER
                                06 - INCORRECT CASE

XX         (2 CHAR OR NONE)     REPETITION FACTOR FOR -ALL TEST 01/TEST 04 CHARACTERS- AND/OR -ECHO-
                                TEST(S) ONLY (NO ENTRY DEFAULTS TO 01. MAXIMUM REPETITION FACTOR
                                IS 99.)

OPT        (UP TO 80 CHAR)      3277 KEYBOARD OPTION ONLY - ECHO TEST TEXT TO BE
                                TRANSMITTED TO THE SELECTED TERMINAL IS ENTERED VIA THE 3277
                                (MAXIMUM LENGTH OF 80 CHARACTERS).
                                NOTE: THERE IS ONLY ONE KEYBOARD ENTRY BUFFER. THUS, ONLY THE LAST
                                      -OPT- MESSAGE ENTERED WILL BE PRINTED FOR THE ECHO TEST. THE
                                      FIRST LINE REQUESTING AN ECHO TEST WILL PRINT OUT THE -OPT-
                                      TEXT. ALL SUCCEEDING LINES WILL REQUIRE THE ECHO TEST ENTRY
                                      FROM THE TERMINAL. HINT: WAIT UNTIL THE -OPT- MESSAGE IS
                                      PRINTED AT THE DESIRED TERMINAL BEFORE ENTERING NEXT REQUEST.

                                KEY TO DEPRESS WHICH WILL CAUSE YOUR TEST REQUEST TO BE TRANSMITTED:
                                1050                - EOB THEN EOT KEY (ALT CODE)
                                2740-1 (WITH LRC)   - EOB THEN EOT KEY
                                       (W/O  LRC)   - EOT KEY
                                2740-2              - BID KEY
                                2741                - CARRIAGE RETURN
                                3767                - 2740-1 CONFIG. - EOB THEN EOM KEY
                                3767                - 2740-2 CONFIG. - SYS REQ KEY
```

4.7.3 SAMPLE TEST REQUEST MESSAGES

```
99999KYBD/01A9/01/03//
          REQUEST FROM 3277 KEYBOARD TO TEST TERMINAL ON LINE 01 WITH TERMINAL ADDRESS A AND UNIT
          ADDRESS 9. TEST 01 TO BE REPEATED 3 TIMES.

99999KYBD/02B/01,02,03,04,05,06/99/THIS MESSAGE TO TERM B/
          REQUEST FROM 3277 KEYBOARD TO TEST TERMINAL ON LINE 02 WITH TERMINAL ADDRESS B.
          TESTS 01-06 TO BE RUN. TESTS 01 AND 04 WILL BE RETRANSMITTED 99 TIMES.
          THE TEXT -THIS MESSAGE TO TERM B- WILL BE TRANSMITTED INSTEAD OF THE ECHO TEST (04).

9999902B/03/02,04,06,05,03,01//
          REQUEST FROM TERMINAL B ON LINE 02 TO PT-TO-PT TERMINAL ON LINE 03.
          TESTS 01-06 TO BE RUN. TESTS RUN IN ASCENDING ORDER STARTING WITH 01. REP FACTOR DEFAULT =
          01. TESTS 01 AND 04 WILL BE TRANSMITTED ONCE ONLY.

9999902B/02B/01,05/04/  OR
9999902B//01,05/04/
          REQUEST TO TEST TERMINAL ORIGINATING TEST REQUEST. TERMINAL ADDRESS B ON LINE 02.
          TEST 01 AND 05 TO BE RUN. TEST 01 WILL BE RE-TRANSMITTED 4 TIMES.

9999901A5/01A9/01,05/04/
          REQUEST TO TEST TERMINAL ORIGINATING TEST REQUEST. TERMINAL ADDRESS A ON LINE 01.
          TEST 01 AND 05 TO BE RUN. TEST 01 WILL BE RE-TRANSMITTED 4 TIMES.
          NOTE: USE BOTH FIELDS FOR TERMINALS WITH UNIT ADDRESSING WHEN REQUESTING TEST(S) FOR
                TERMINAL ORIGINATING TEST REQUEST.
          NOTE: DEFAULT - THE LINE TEST DEFAULTS TO TRANSMITTING TEST(S) TO ALL RECEIVING UNITS.
                DEFAULT - THE LINE TEST DEFAULTS TO RECEIVING DATA FROM ANY TRANSMITTING UNIT.
```

4.7.4 TERMINAL SETUP

4.7.4.1 1050 TERMINAL

4.7.4.1.1 COMPONENT ASSIGNMENT SWITCHES SETUP PROCEDURE

THE 1050 MUST HAVE POWER ON AND THE COMPONENT ASSIGNMENT SWITCHES MUST BE PROPERLY POSITIONED. THESE SWITCH SETTINGS WILL VARY ACCORDING TO THE 1050 SYSTEM DEVICES AVAILABLE AND THE COMPONENTS TO WHICH THEY ARE ASSIGNED. THE NORMAL SWITCH SETTINGS FOR LINE LOOP OPERATION ARE INDICATED BELOW. (REFERENCE THE IBM 1050 OPERATORS GUIDE SECTION 2 FOR FURTHER INFORMATION ON THE PROPER SETTING OF THESE SWITCHES.)

NOTE: IF AN ATTACHED DEVICE IS READY IT WILL BE POLLED/ADDRESSED BY THE MLTA LINE TEST DIAGNOSTIC

	SWITCH NAME	1050 DEVICES ATTACHABLE	COMP SEL.	SWITCH POSITION	COMMENT
	SYSTEM			ATTEND	
	MASTER			OFF	
*	PRINTER 1	1052 OR 1053	1	SEND REC	
**	PRINTER 2	1052 OR 1053	2	SEND REC	
***	KEYBOARD	1052 OR 1092/93	5	SEND	- IF 1050 HAS KEYBOARD DEVICE
****				OFF	- OTHERWISE
*****	READER 1	1054 OR 1056	6	SEND	- IF 1050 HAS PEADEP 1 DEVICE
******				OFF	- OTHERWISE
*****	READER 2	1054 OR 1056	7	SEND	- IF 1050 HAS READEP 2 DEVICE
****				OFF	- OTHERWISE
***	PUNCH 1	1055 OR 1057/58	3	SEND	- IF 1050 HAS PUNCH 1 DEVICE
**				OFF	- OTHERWISE
*	PUNCH 2	1055 OR 1057/58	4	SEND	- IF 1050 HAS PUNCH 2 DEVICE
				OFF	- OTHERWISE
	STOP CODE			SENSE	
	AUTO FILL			OFF	
	PUNCH			UP	
	SYSTEM			PROGRAM	
	EOB			MANUAL	
	SYSTEM			UP	
	TEST			OFF	
	SINGLE CYC			OFF	
	RDR STOP			OFF	

4.7.4.1.2 1055 PAPER TAPE PUNCH SETUP PROCEDURE

1. PLACE A REEL OF TAPE IN THE TAPE SUPPLY PAN.
2. MOVE THE DOCUMENT-PRESSURE LEVER TO THE LEFT. THIS LEVER IS AVAILABLE ONLY WHEN THE EDGE PUNCHING SPECIAL FEATURE IS AVAILABLE.
3. FLIP THE TAPE-PRESSURE LEVER UP.
4. TAKE THE LEADING EDGE OF THE TAPE AND THREAD IT OVER THE GUIDE PIN AND UNDER THE TAPE TENSION LEVER.
5. NOW PASS THE TAPE UNDER THE DOCUMENT-PRESSURE LEVER, THE PUNCH DIE, AND THE TEAR GUIDE.
6. LOWER THE TAPE-PRESSURE LEVER.
7. PRESS THE FEED BUTTON TO PUNCH 4 TO 6 INCHES OF FEED HOLES AND IDLE CHARACTERS.
8. WHEN TAPE PUNCHING IS COMPLETE, PREPARE A TRAILING EDGE OF AT LEAST SIX INCHES OF TAPE BY OPERATING THE FEED KEY.

4.7.4.1.3 1054 PAPER TAPE READER SETUP PROCEDURE

1. PLACE THE TAPE FACE UP ON THE READER TABLE WITH THE POINTED EDGE INDICATING THE START OF THE TAPE POINTING TO YOUR RIGHT. THE TAPE IS FACE UP IF THE PUNCHED HOLES READING FROM THE BACK OF THE TABLE TO THE FRONT ARE 3 LARGE DATA HOLES, 1 SMALL FEED HOLE, AND THEN 4 LARGE DATA HOLES.
2. POSITION THE 'T-D' LEVER SO THAT THE 'T' IS VISIBLE. THIS LEVER IS AVAILABLE ONLY WHEN THE EDGE PUNCH-READ SPECIAL FEATURE IS INSTALLED.
3. PRESS THE TABLE RELEASE BUTTON TO RAISE THE TABLE AND ALLOW INSERTION OF THE PAPER TAPE.
4. INSERT THE TAPE UNDER THE RAISED TAPE GUIDE MAKING SURE THAT THE TOP EDGE OF THE TAPE IS ALIGNED AGAINST THE REGISTRATION RAIL AT THE BACK OF THE TABLE.
5. MOVE THE TAPE EITHER RIGHT OR LEFT TO POSITION A TAPE COLUMN UNDER THE RED LINE OF THE GUIDE.
6. PRESS THE TABLE DOWN TO LATCH IT IN POSITION, AND CHECK THE FEED-HOLE REGISTRATION USING THE ADVANCE WHEEL.
7. MOVE THE TAPE RIGHT OR LEFT USING THE ADVANCE WHEEL UNTIL THE FIRST DATA CHARACTER IS LOCATED UNDER THE RED LINE ON THE GUIDE. THE FIRST DATA CHARACTER IS THE FIRST NON-FEED CHARACTER FROM THE START OF THE TAPE.

4.7.4.1.4 1057/1058 CARD PUNCH SETUP PROCEDURE

1. SET THE PUNCH MAINLINE SWITCH ON.
2. SET THE PUNCH KEYBOARD SWITCHES AS FOLLOWS:
   A. AUTO FEED - ON
   B. AUTO SKIP, AUTO DUP - ON
   C. PRINT - ON (FOR 1058 ONLY)
   D. AUTO PUNCH - AUTO PUNCH POSITION
   E. MOTOR CONTROL - ON
3. INSTALL A PROGRAM CARD AND LOWER THE STAR WHEELS.
4. LOAD THE PUNCH HOPPER WITH CARDS.
5. OPERATE THE KEYBOARD 'REL' KEY 3 TIMES.

4.7.4.1.5 1056 CARD READER SETUP PROCEDURE

1. TURN MAINLINE POWER ON.
2. PRESS THE READER EJECT BUTTON TO CLEAR THE READER OF ANY CARDS.
3. SET THE 'AUTO-EOB' SWITCH TO OFF.
4. PLACE THE DECK OF CARDS TO BE READ IN THE HOPPER FACE DOWN, COLUMN-1 EDGE TO THE BACK OF HOPPER, 12-EDGE TO YOUR LEFT.
5. PLACE THE CARD WEIGHT ON TOP OF DECK.
6. PRESS THE FEED BUTTON TO FEED THE FIRST CARD INTO THE READING POSITION. THE READER IS NOW READY.

4.7.4.2 2740 TERMINAL

4.7.4.2.1 2740 MODEL 1

1. THE 'ON/OFF' SWITCH MUST BE SET 'ON'.
2. THE 'COM/LCL' SWITCH/MUST BE SET 'COM'.
3. THE STANDBY 'S' LIGHT SHOULD BE ON. IF NOT, TURN 'ON/OFF' SWITCH 'OFF', THEN 'ON'.
4. THE TRANSMIT-CONTROL SWITCH (LOCATED ON THE LEFT SIDE OF THE 2740 CABINET FOR THOSE TERMINALS HAVING THE TRANSMIT CONTROL FEATURE INSTALLED) MUST BE SET. THE CORRECT SETTING FOR THIS ('TC') SWITCH IS 'OFF'.
5. AFTER POLLING STARTS, DEPRESS THE -BID- KEY. ONCE THE TERMINAL HAS BEEN SELECTED, ENTER THE TEST REQUEST FORMAT. NOTE: DO NOT DO A CARRAGE RETURN TO ALIGN THE TYPE ELEMENT TO THE LEFT MARGIN.

4.7.4.2.2 2740 MODEL 2

1. THE 'ON/OFF' SWITCH MUST BE SET 'ON'.
2. THE 'COM/LCL' SWITCH/MUST BE SET 'COM'.
3. THE 'STANDBY' LIGHT SHOULD BE ON. IF NOT, TURN 'ON/OFF' SWITCH 'OFF', THEN 'ON'.
4. THE 'HEADER' SWITCH ON THE SWITCH PANEL MUST BE SET 'OFF'.
5. THE 'TEST' SWITCH ON THE SWITCH PANEL MUST BE SET 'OFF'.
6. AFTER POLLING STARTS, DEPRESS THE -ENTER- KEY. ONCE THE TERMINAL HAS BEEN SELECTED, ENTER THE TEST REQUEST FORMAT. NOTE: DO NOT DO A CARRAGE RETURN TO ALIGN THE TYPE ELEMENT TO THE LEFT MARGIN.

4.7.4.3 2741 TERMINAL

1. THE 'ON/OFF' SWITCH MUST BE SET 'ON'.
2. THE 'COM/LCL' SWITCH MUST BE SET 'COM'.
3. THE 'CARRIAGE RETURN' OR 'ATTN' KEY MUST BE DEPRESSED TO LOCK KEYBOARD PRIOR TO TEST. ON A SWITCHED LINE THIS KEY MUST BE DEPRESSED AFTER THE COMMUNICATION LINE IS ESTABLISHED.

NOTE: THE EOA CHARACTER (# OR 9) WILL BE PRINTED BETWEEN MESSAGES WHEN TERMINAL IS TESTED.

4.7.4.4 SYSTEM/7 (SYSTEM/7 CONFIGURED AS 2740-1 WITH LRC)

1. DIAGNOSTIC PROGRAM 'PID 0762' MUST BE RESIDENT IN SYSTEM/7 CORE.
2. REPETITION FACTOR OF ONE(1) MUST BE ENTERED. (I.E. THE PROGRAM DEFAULTS TO A REPETITION FACTOR OF 10 WHICH IS NOT COMPATIBLE TO THE SYSTEM/3 - SYSTEM/7 DIAGNOSTIC INTERFACE.)
3. TEST 4 ('ECHO TEST') IS THE ONLY TEST VALID FOR SYSTEM/7 (2740-1 CONFIGURATION).
4. TEST REQUESTS CANNOT BE INITIATED FROM THE SYSTEM/7 (2740-1 CONFIGURATION).

4.7.4.5 CMCST (2741 CONFIGURATION)

1. THE 'ON/OFF' SWITCH MUST BE SET 'ON'.
2. THE 'CPU' KEY MUST BE LATCHED DOWN.
3. THE 'CARRIAGE RETURN' OR 'ATTN' KEY MUST BE DEPRESSED TO LOCK KEYBOARD PRIOR TO TEST.

NOTE: THE EOA CHARACTER (# OR 9) WILL BE PRINTED BETWEEN MESSAGES WHEN TERMINAL IS TESTED.

4.7.4.6 3767 (2741 CONFIGURATION)

* 1. THE 'SDLC/SS' SWITCH MUST BE SET TO 'SS'.
2. IF INSTALLED, THE 'POWER ON KEYLOCK' SWITCH MUST BE SET 'ON'.
3. THE 'ON/OFF' SWITCH MUST BE SET 'ON'.
4. THE 'COM/LCL' SWITCH MUST BE SET TO 'COM'.
5. THE CARRIAGE RETURN KEY OR 'ATTN' KEY MUST BE DEPRESSED TO LOCK THE KEYBOARD PRIOR TO TEST. ON A SWITCHED LINE THIS KEY MUST BE DEPRESSED AFTER THE COMMUNICATION LINE IS ESTABLISHED.

4.7.4.7 3767 (2740-1 CONFIGURATION)

* 1. THE 'SDLC/SS' SWITCH MUST BE SET TO 'SS'.
2. BF INSTALLED, THE 'POWER ON KEYLOCK' SWITCH MUST BE SET 'ON'.
3. THE 'ON/OFF' SWITCH MUST BE SET 'ON'.
4. THE 'COM/LCL' SWITCH MUST BE SET TO 'COM'.
5. THE 'AUTO EOB/EOM' SWITCH MUST BE SET TO 'OFF'.
6. AFTER POLLING STARTS, DEPRESS THE 'SYS REQ' KEY. ONCE THE TERMINAL HAS BEEN SELECTED, ENTER THE TEST REQUEST FORMAT.

4.7.4.8 3767 (2740-2 CONFIGURATION)

* 1. THE 'SDLC/SS' SWITCH MUST BE SET TO 'SS'.
2. IF INSTALLED, THE 'POWER ON KEYLOCK' SWITCH MUST BE SET 'ON'.
3. THE 'ON/OFF' SWITCH MUST BE SET 'ON'.
4. THE 'COM/LCL' SWITCH MUST BE SET TO 'COM'.
5. THE 'AUTO EOB/EOM' SWITCH MUST BE SET TO 'OFF'.
6. AFTER POLLING STARTS, DEPRESS THE 'ATTN' KEY. ONCE THE TERMINAL HAS BEEN SELECTED, ENTER THE TEST REQUEST FORMAT.

* STEP 1 MUST BE PERFORMED PRIOR TO TURNING TERMINAL POWER ON.

4.7.4.9 OTHER TERMINALS (INCLUDING WORLD TRADE TERMINALS)

1. IF A TERMINAL - OTHER THAN ONE OF ABOVE MENTIONED - IS DEFINED, THE LINE WILL NOT BE TESTED.

4.8 PROGRAM TO UPDATE MICROCODE ON SYSTEM PACK (ID = FE5)

-FE5-, WHICH RESIDES ON THE CE DIAGNOSTIC PACK, IS USED TO UPDATE THE MLTA MICROCODE (ID = FF0) ON THE CUSTOMER'S SYSTEM PACK. -FE5- WILL READ MLTA MICROCODE (ID = FF0) INTO CORE. IT WILL THEN ASK THE FOLLOWING THREE QUESTIONS ON THE 3277 CPT/KEYBOARD:
NOTE: QUESTION 2 IS BYPASSED IF THE ANSWER TO QUESTION 1 IS F1, R3, OR F3.

1. SYSTEM PACK RUNS FROM THE 5444/3340 SIMULATED AREA OF R1, F1, R3, OR F3? (ENTER R1,F1,R3 OR F3).
2. PLACE THE SYSTEM PACK ON R1/D2, POWER UP DISK AND PRESS ENTER.
3. GIVE THE NAME OF YOUR MICROCODE OBJECT FILE. IT WILL DEFAULT TO $MLMC1 IF NO NAME IS GIVEN.

AFTER THE QUESTIONS HAVE BEEN ANSWERED, THE MICROCODE IS WRITTEN ON THE SYSTEM PACK AND THE SECTION IS TERMINATED.

NOTE: IF BOTH 3340 AND 5444 ARE DEFINED IN THE UDT, SSW 2F IS USED TO SELECT 3340 AND SSW 2E IS USED TO SELECT 5444, TO DEFINE WHERE THE SYSTEM PACK RESIDES.

4.9 MLTA CONFIGURE PROGRAM (ID = FE7)

THE MLTA CONFIGURATION PROGRAM PROVIDES A MEANS TO DEFINE THE CONFIGURATION OF THE MLTA AT THE SITE AND TO OUTPUT THE INFORMATION IN A FORMAT REQUIRED BY THE DIAGNOSTICS. THE INFORMATION IS ENTERED VIA THE 3277 KEYBOARD IN A QUESTION AND ANSWER SESSION. A QUESTION WITH A LIST OF ALL THE POSSIBLE ANSWERS IS CALLED A 'MENU'. A LIST OF ALL MENUS APPEARS IN 4.9.2. THE ORDER IN WHICH THE MENUS ARE PRESENTED DEPENDS ON THE SYSTEM CONFIGURATION AND THE ANSWERS PREVIOUSLY KEYED IN ON THE 3277 KEYBOARD. A FLOW CHART DIAGRAM IN WHICH THE MENUS ARE PRESENTED APPEARS IN 4.9.3. THE SQUARE BLOCKS CONTAIN THE MENU NUMBERS.

NOTE: 1) MENU 002. THE UDT INFORMATION ON THE DCP UDT CARD MUST MATCH THE INFORMATION ENTERED.
2) MENU 005. THE STANDARD FREQUENCIES CAN BE ENTERED BY KEYING IN THE LETTER OR THE DECIMAL NUMBER FOR THE FREQUENCY. IF THE DDECIMAL NUMBER OF THE FREQUENCY IS ENTERED, THE FREQUENCY PRINTED OUT WHEN THE MLTA CONFIGURATION IS LISTED WILL BE SUBJECT TO A ROUND-OFF ERROR.
3) MENU 006

LINE	MLTA CARD	LINE ADAPTER CARD
1 (A1)	B4T2	B3U2
2 (A2)	B4S2	B3U4
3 (B1)	B4R2	B3R2
4 (B2)	B4Q2	B3R4
5 (C1)	B4P2	B3E2
6 (C2)	B4N2	B3E4
7 (D1)	B4M2	B3B2
8 (D2)	B4L2	B3B4

4) MENU 011. TWO TYPES OF LINE ADAPTERS ARE PRESENT: EIA AND LD2B. EIA IS 4 WIRE AND LD2B IS 2 WIRE AT THE INTERFACE. IF LD2B IS NOT SPECIFIED, THE PROGRAM DEFAULTS TO EIA INTERFACE, 4 WIRE.

4.9.1 CONFIGURATOR PROGRAM OUTPUT

THE FOLLOWING IS THE CARD IMAGE OF SECTION 201 WHICH WILL BE WRITTEN AUTOMATICALLY ON THE CE PACK VIA THE DISK EDITOR (ID = FF6).

```
      /R UAUD XXXXXX REP CARD FOR 20F| <------------- THIS CARD IMAGE WILL BE PLACED
     |                               |                AUTOMATICALLY IN THE SYSTEM TEST MODULE
    /E                             | <-----------     (ID = 20F) TO CONFIGURE IT.
   |                               |  |        /
  /____________________________/ |  |__|      /
 /T                          | |  |         /--------- THESE 7 CARDS IMAGES ARE MLTA SECTION 201.
|                            | |__|        /           THIS SECTION CONTAINS THE CONFIGURATION
/GBK GB    PN ----18 CHAR ID----| <------------        INFORMATION FOR MLTA SECTIONS 202 - 207.
|MLTA CONFIGURE DATA            |  | |                 THIS SECTION SHOULD ALWAYS BE THE FIRST
|84@@84@@               20100000|  |/                  SECTION THAT IS LOADED WHEN RUNNING THE
|                               |__|/                  MLTA DIAGNOSTICS.
|                               |
|_______________________________|
```

4.9.2 MLTA CONFIGURATION MENUS

```
*GEN**********************************************************
*        MLTA CONFIGURATION PROGRAM                          *
*  1  TO ANSWER QUESTIONS, ENTER ANSWER(S)                   *
*     ON LINE(S) 11 AND 12 (80 CHARACTERS                    *
*     OR LESS) MULTIPLE ANSWER(S) MUST BE                    *
*     SEPARATED BY A COMMA OR BLANK                          *
*  2  IF A TYPING ERROR OCCURS, USE THE                      *
*     BKSP KEY AND RE-ENTER THE ANSWER                       *
*  3  DEPRESS -ENTER- KEY TO ENTER ANSWER                    *
*         DEPRESS 1 TO CONTINUE                              *
**************************************************************

*002**********************************************************
*SPECIFY INSTALLED FEATURE(S)                                *
*   0  SECOND TERMINAL CONTROL TYPE                          *
*                  (WORLD TRADE ONLY)                        *
*   2  AUTO POLL                                             *
*   3  UNDER-THE-COVER LINE ADAPTER                          *
*   8  BMT CARD 2 PRESENT                                    *
*   9  BMT CARD 3 PRESENT                                    *
*   A  BMT CARD 4 PRESENT                                    *
*   X  NO FEATURE INSTALLED                                  *
**************************************************************

*004**********************************************************
*SELECT ONE OPTION AT A TIME TO DEFINE                       *
*OSCILLATOR FREQUENCY                                        *
*   1 BASIC  SPEED  (134.5 BPS)                              *
*   2 FEATURE SPEED  (600 BPS)                               *
*   3 JUMPER BASIC    ( 200 OR 300 BPS )                     *
*   4 JUMPER FEATURE (1200/2400 BPS)                      *
*   5 NO MORE SELECTION                                      *
**************************************************************

*006**********************************************************
*SELECT ONE LINE NUMBER FROM THE TABLE                       *
*SEE NOTE 3 IN USERS GUIDE BLK 22 PG 17                      *
*ENTER X TO RETURN TO MAIN OPTION MENU                       *
*                                                            *
*   AVAILABLE LINE NUMBERS                                   *
*   1 2 3 4 5 6 7 8                                          *
**************************************************************

*008**********************************************************
*JUMPER SPEED ?   Y (YES) OR N (NO)                          *
*                                                            *
*                                                            *
*                                                            *
**************************************************************

*010**********************************************************
*THIS SPACE IS INTENTIONALLY LEFT BLANK                      *
*                                                            *
**************************************************************

*012**********************************************************
*SELECT TERMINAL FOR THE LINE                                *
*   1 2740-1 (OR 3767 W/2740-1 FEATURE)                      *
*   2 2740-2 (OR 3767 W/2740-2 FEATURE)                      *
*   3 2741 (OR 3767 W/2741 FEATURE)                          *
*   4 1050                                                   *
*   5 S/7 (2740-1 CONFIGURATION)                             *
*   6 CMCST (2741 CONFIGURATION)                             *
*   7 2265 (WORLD TRADE ONLY)                                *
**************************************************************

*014**********************************************************
*SPECIFY 2265 FEATURE(S)                                     *
*   1 WLA FEATURE                                            *
*   2 DESTRUCTIVE CURSOR                                     *
*   3 12 BY 80 DISPLAY                                       *
*   4 NONE OF ABOVE                                          *
**************************************************************

*016**********************************************************
*SELECT ONE OPTION                                           *
*   1 DELETE A LINE                                          *
*   2 ADD OR RE-DEFINE A LINE                                *
*   3 ADD TERMINAL                                           *
*   4 DELETE TERMINAL                                        *
*   5 RETURN TO MAIN OPTION                                  *
**************************************************************

*018**********************************************************
* SUPPLY UP TO 18 CHARACTERS OF                              *
*IDENTIFICATION TO BE PLACED ON HEADER                       *
*CARD OF SECTION 201                                         *
*(DATE SHOULD BE INCLUDED)                                   *
**************************************************************

*020**********************************************************
*CHECK TO SEE AT LEAST 15 BLANK CARDS ARE                    *
*IN SECONDARY HOPPER AND THE MFCU IS RDY                     *
*NOTE: THE LAST CARD (R 0A0D XXXXXX) IS                      *
*USED TO CONFIGURE THE MLTA SYSTEM TEST                      *
*MODULE 20F                                                  *
*                                                            *
*   DEPRESS 1 TO CONTINUE                                    *
*                                                            *
*                                                            *
**************************************************************

*022**********************************************************
*SELECT OTHER OPTION(S) BEFORE OPTION 5                      *
*       DEPRESS 1 TO CONTINUE                                *
**************************************************************

*024**********************************************************
*YOU DID NOT DEFINE ANY LINE                                 *
*                                                            *
*                                                            *
**************************************************************

*026**********************************************************
*FROM NOW ON REFER ALL HALTS TO USER                         *
*GUIDE BLOCK 20/94 (PROG FF6/DD6)                            *
**************************************************************

*028**********************************************************
*SELECT TERMINAL ADDRESS(ES)                                 *
*                                                            *
*       AVAILABLE TERMINAL ADDRESSES                         *
*       0 1 2 3 4 5 6 7 8 9                                  *
*       A B C D E F                                          *
*                                                            *
**************************************************************

*001**********************************************************
* SELECT 1 OPTION                                            *
*     1  GENERATE SECTION 201                                *
*     2  LIST SECTION 201                                    *
*     3  UPDATE LINE INFORMATION                             *
*     4  OUTPUT SECTION 201                                  *
*     5  TERMINATE                                           *
*                                                            *
*                                                            *
*                                                            *
**************************************************************

*003**********************************************************
*SPECIFIED UDT OPTIONS ARE NOT THE SAME                      *
*AS DCP UDT ENTRIES. SELECT OPTION                           *
*                                                            *
*                                                            *
*   1 RESPECIFY INSTALLED FEATURE                            *
*   2 TERMINATE TO CORRECT UDT RECORD                        *
*     IN DCP                                                 *
*                                                            *
*                                                            *
**************************************************************

*005**********************************************************
*SELECT OR ENTER DECIMAL NUMBER OF                           *
*OSCILLATOR FREQUENCY IN BPS                                 *
*   C 134.5   (BASIC)                                        *
*   D 600.    (FEATURE)                                      *
*   E 1200/2400.  (JUMPER FEATURE)                           *
*   F 300.    (JUMPER BASIC)                                 *
*   G 200.    (JUMPER BASIC)                                 *
**************************************************************

*007**********************************************************
*SELECT LINE DESCRIPTIONS                                    *
*   1 SWITCHED LINE (TELEPHONE)                              *
*   2 STATION CONTROL LINE                                   *
*   3 LRC CHECKING                                           *
*   4 NONE OF ABOVE                                          *
**************************************************************

*009**********************************************************
*SELECT LINE CODE                                            *
*   1 IBM TC-I PTTC/EBCD                                     *
*   2 IBM TC-I PTTC/CORRESPONDENCE                           *
*   5 IBM TC-III INVERTED ASCII                              *
**************************************************************

*011**********************************************************
*LINE WITH UNDER-THE-COVER ADAPTER LD2B ?                    *
*Y(YES) OR N(NO)                                             *
**************************************************************

*013**********************************************************
*STATION CONTROL IS NOT SPECIFIED                            *
*   DEPRESS 1 TO CONTINUE                                    *
*                                                            *
*                                                            *
*                                                            *
*                                                            *
*                                                            *
*                                                            *
**************************************************************

*015**********************************************************
*MLTA CONFIGURATION (SECTION 201) HAS NOT                    *
*BEEN RUN OR DEFINED SELECT 1 OPTION                         *
*   1 TERMINATE SESSION                                      *
*   2 RETURN TO MAIN OPTION                                  *
*                                                            *
**************************************************************

*017**********************************************************
*SPECIFIED LINE NUMBER IS NOT DEFINED                        *
*SELECT ONE OPTION                                           *
*   1 CORRECT LINE NUMBER                                    *
*   2 RETURN TO MAIN OPTION                                  *
*                                                            *
*                                                            *
**************************************************************

*019**********************************************************
*SELECT OUTPUT UNIT                                          *
*   1 DISC                                                   *
*   2 MFCU                                                   *
*                                                            *
**************************************************************

*021**********************************************************
*ONCE OUTPUT STARTS, FE7 CANNOT BE RERUN                     *
*(PROGRAM MUST BE RELOADED)                                  *
*NOTE: THE CONFIGURATION DATA IN CORE                        *
*BECOMES INVALID                                             *
*                                                            *
*SELECT ONE OPTION                                           *
*   1  START OUTPUT                                          *
*   2  RETURN TO MAIN OPTION                                 *
*                                                            *
**************************************************************

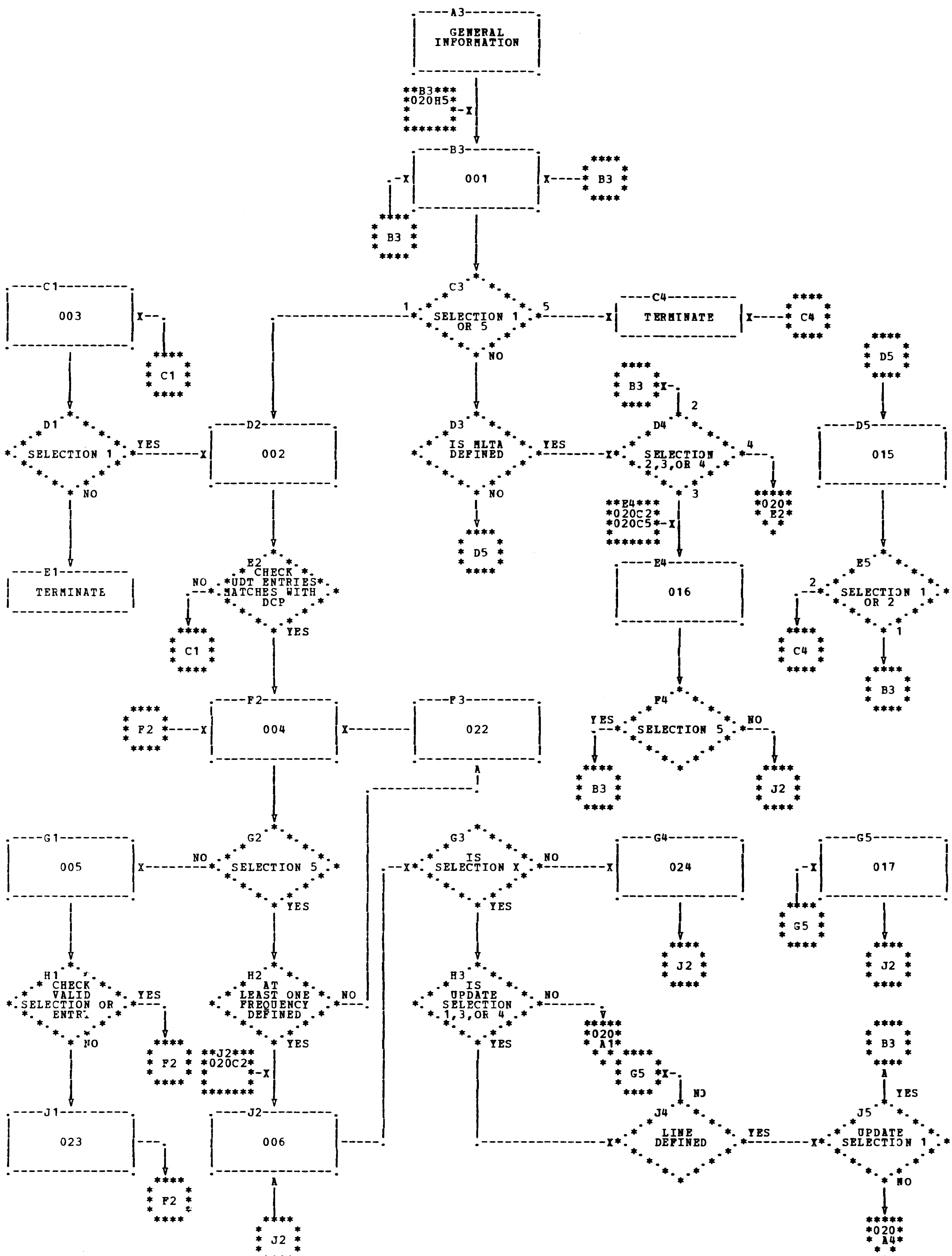
*023**********************************************************
*ENTERED FREQUENCY MUST BE A VALID                           *
*DECIMAL NUMBER OR SELECTION                                 *
**************************************************************

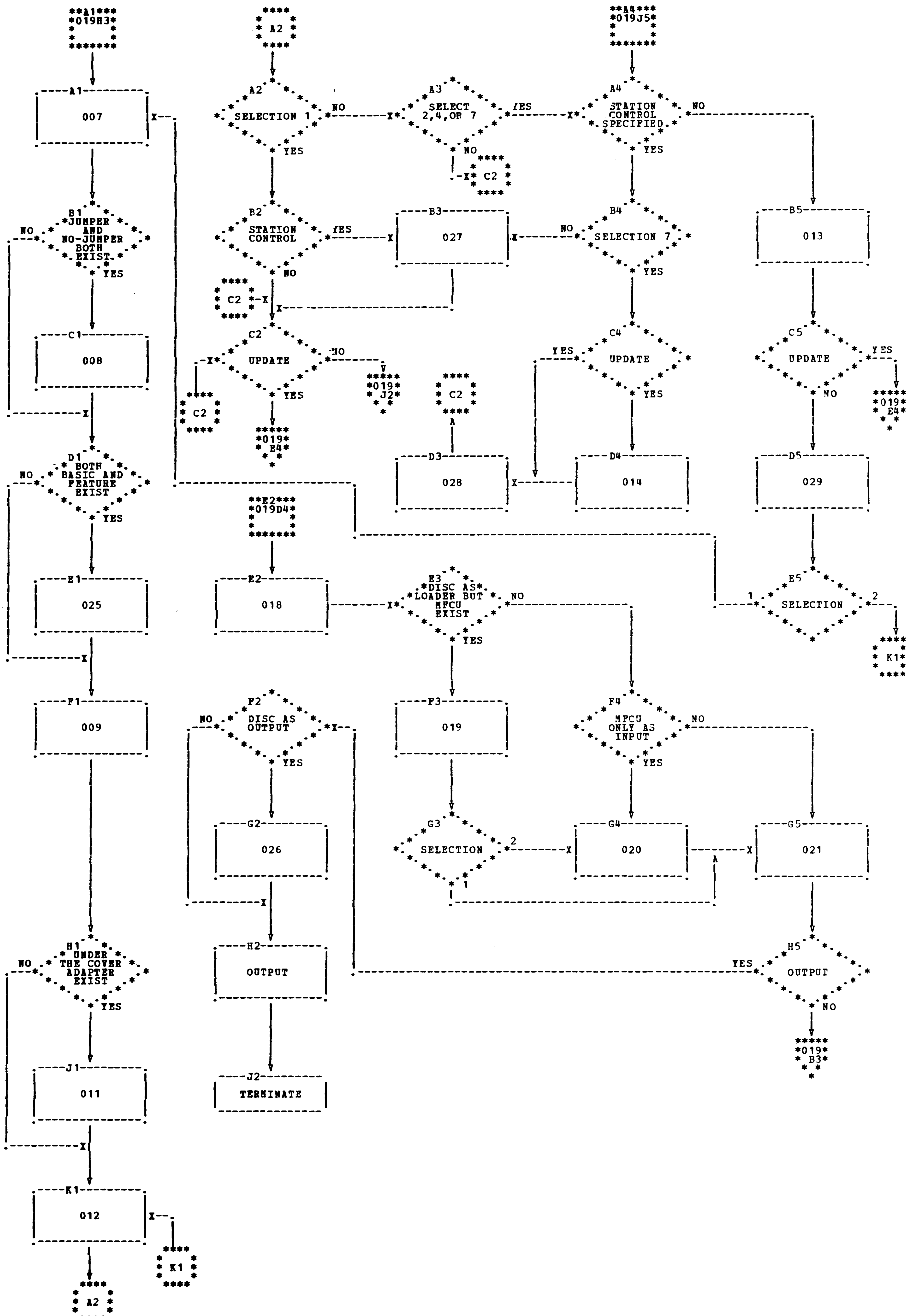
*025**********************************************************
*SELECT ONE SPEED FOR THE LINE                               *
*   1 BASIC                                                  *
*   2 FEATURE                                                *
**************************************************************

*027**********************************************************
*SELECT TERMINAL ADDRESS(ES)                                 *
*      AVAILABLE TERMINAL ADDRESSES                          *
*                                                            *
*      A B C D E F G H I J       (NOTE: THIS MENU IS         *
*      K L M N O P Q R S T        MODIFIED TO PRESENT        *
*      U V W X Y Z                THE VALID TERMINAL         *
*      0 1 2 3 4 5 6 7 8 9        ADDRESSES FOR THE          *
*      @ - $ . &                  CORRESPONDENCE CODE)       *
**************************************************************

*029**********************************************************
*SELECT ONE OPTION RETURN TO                                 *
*   1 LINE DESCRIPTION                                       *
*   2 TERMINAL SELECTION                                     *
**************************************************************
```

4.9.3 MLTA CONFIGURATION MENU FLOWCHART




A1 019H3
A2
A4 019J5
A1 007
A2 SELECTION 1
NO
YES
A3 SELECT 2,4,OR 7
YES
NO
C2
A4 STATION CONTROL SPECIFIED
NO
YES
B1 JUMPER AND NO-JUMPER BOTH EXIST
NO
YES
B2 STATION CONTROL
YES
NO
B3 027
B4 SELECTION 7
NO
YES
B5 013
C2
C1 008
C2 UPDATE
NO
YES
019 J2
C2
019 E4
C4 UPDATE
YES
YES
C5 UPDATE
YES
NO
019 E4
D1 BOTH BASIC AND FEATURE EXIST
NO
YES
D3 028
D4 014
D5 029
E2 019D4
E1 025
E2 018
E3 DISC AS LOADER BUT MFCU EXIST
NO
YES
E5 SELECTION
1
2
K1
F1 009
F2 DISC AS OUTPUT
NO
YES
F3 019
F4 MFCU ONLY AS INPUT
NO
YES
G2 026
G3 SELECTION
2
1
G4 020
G5 021
H1 UNDER THE COVER ADAPTER EXIST
NO
YES
H2 OUTPUT
H5 OUTPUT
YES
NO
019 B3
J1 011
J2 TERMINATE
K1 012
K1
A2

4.10 MLTA MICROCODE DECK (ID = FF0)

THE FIRST CARD IN THE DECK IS THE DATA DECK HEADER CARD. THE FUNCTION OF THIS CARD IS TO MAKE THE MICROCODE DECK CONFORM TO THE DIAGNOSTIC PROGRAMMING STANDARDS. THE HEADER CARD DEFINES THE REST OF THE DECK AS DATA. IT CONTAINS THE PART NUMBER, EC NUMBER, PROGRAM NUMBER, AND EC LEVEL.

NOTE: ALL MICROCODE DECKS WILL HAVE THE SAME PROGRAM NUMBER: FF0.

THE DATA DECK HEADER CARD IS REQUIRED TO BE THE FIRST CARD WHEN THE FF0 DECK IS USED WITH 205 OR FE5. THE 'H' CARD, THE SECOND CARD IN THE DECK, IS IGNORED WHEN THE MICROCODE DECK (FF0) IS USED WITH 205/FE5.

THE DATA DECK HEADER CARD MUST BE REMOVED WHEN THE FF0 DECK IS USED WITH THE IOCS PROGRAM. THE 'H' CARD CONTAINS INFORMATION REQUIRED BY THE IOCS PROGRAM TO LOAD THE MICROCODE DECK (FF0) TO DISK.

THE 39 'T' CARDS CONTAIN THE MLTA MICROCODE.

THE 'E' CARD IS THE 'LAST CARD' OF THE MLTA MICROCODE DECK (FF0).

5. GENERAL MLTA INFORMATION

5.1 MLTA CONFIGURATION WORKSHEET

THE FOLLOWING WORKSHEET SHOULD BE FILLED OUT PRIOR TO RUNNING THE MLTA CONFIGURATOR PROGRAM (ID=FE7). THE LINE CONFIGURATION INFORMATION REQUIRED BY THE CONFIGURATOR PROGRAM FOR EACH LINE IS LISTED IN THE LEFTMOST COLUMN. USE A PENCIL TO CHECK THE LINE CONFIGURATION ITEMS WHICH DESCRIBE THE LINE. USE NUMBER OR FIRST LETTER OF WORD TO INDICATE MULTIPLE CHOICE ENTRY. ITEMS NOT APPLICABLE TO THE CONFIGURATION OF THE LINE SHOULD NOT BE MARKED.

DATE CONFIGURED				
201 DECK ID				
FFO FILE NAME				

LINE DEFINITION ENTRY	LINE 01	LINE 02	LINE 03	LINE 04	LINE 05	LINE 06	LINE 07	LINE 08
SWITCHED LINE								
STATION CONTROL								
LRC CHECKING								
JUMPER (YES/NO)								
BASIC/FEATURE SPEED								
1 IBM TC-1 EBCD 2 IBM TC-1 CORRESP 5 IBM TC-3 ASCII								
IBM LD2B ADAPTER								
1 2740-1 2 2740-2 3 2741 4 1050 5 S/7 (2740-1) 6 CMCST (2741) 7 2265 (W.T. ONLY)								
2265- WLA								
2265- DESTRUC CURSR								
2265- 12 BY 80 DISP								
(NO TERM ADDR)								
A								
B								
C								
D								
E								
F								
G								
H								
I								
J								
K								
L								
M								
N								
O								
P								
Q								
R								
S								
T								
U								
V								
W								
X								
Y								
Z								
0								
1								
2								
3								
4								
5								
6								
7								
8								
9								
@								
-								
$								
.								
& (EXL MK CORR CD)								

5.2 STANDARD BCD CONVERSION TABLE

THE FOLLOWING IS A TABLE OF STANDARD BCD CHARACTERS AND THEIR HEX, CARD CODE, AND PAPER TAPE CODE EQUIVALENTS FOR USE IN BUILDING TEST MESSAGES.

5.2.1 LOWER CASE ALPHABETIC CHARACTERS (NOTE THAT LOWER CASE CHARACTERS ARE REPRESENTED IN UPPER CASE.)

CHAR	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
PTTC/EBCD	62	64	67	68	6B	6D	6E	70	73	43	45	46	49	4A	4C	4F	51	52	25	26	29	2A	2C	2F	31	32
CARD CODE	12	12	12	12	12	12	12	12	12	11	11	11	11	11	11	11	11	11	0	0	0	0	0	0	0	0
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	2	3	4	5	6	7	8	9
PAPR 1	*		*		*		*			*		*		*		*		*		*		*		*		*
TAPE 2		*	*			*	*				*	*			*	*			*	*			*	*		
CODE 4				*	*	*	*						*	*	*	*					*	*	*	*		
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8								*	*								*	*							*	*
C			*		*	*			*	*	*		*			*	*		*		*			*	*	
A	*	*	*	*	*	*	*	*	*										*	*	*	*	*	*	*	*
B	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								

5.2.2 UPPER CASE ALPHABETIC CHARACTERS (NOTE THAT THE PAPER TAPE CODE FOR UPPER AND LOWER CASE IS THE SAME.)

CHAR	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
PTTC/EBCD	E2	E4	E7	E8	EB	ED	EE	F0	F3	C3	C5	C6	C9	CA	CC	CF	D1	D2	A5	A6	A9	AA	AC	AF	B1	B2
CARD CODE	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	11	11	11	11	11	11	11	11
	0	0	0	0	0	0	0	0	0	11	11	11	11	11	11	11	11	11	0	0	0	0	0	0	0	0
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	2	3	4	5	6	7	8	9
PAPR 1	*		*		*		*			*		*		*		*		*		*		*		*		*
TAPE 2		*	*			*	*				*	*			*	*			*	*			*	*		
CODE 4				*	*	*	*						*	*	*	*					*	*	*	*		
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8								*	*								*	*							*	*
C			*		*	*			*	*	*		*			*	*		*		*			*	*	
A	*	*	*	*	*	*	*	*	*										*	*	*	*	*	*	*	*
B	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								

5.2.3 NUMERIC CHARACTERS

CHAR	0	1	2	3	4	5	6	7	8	9
PTTC/EBCD	15	02	04	07	08	0B	0D	0E	10	13
CARD CODE	0	1	2	3	4	5	6	7	8	9
PAPR 1		*		*		*		*		*
TAPE 2	*		*	*			*	*		
CODE 4					*	*	*	*		
.	.	.	.	.	.	.	.	.	.	.
8	*								*	*
C	*			*		*	*			*
A										
B										

5.2.4 LOWER CASE SPECIAL CHARACTERS

CHAR	,	.	/	$	#	@	-	&
PTTC/EBCD	37	76	23	57	16	20	40	61
CARD CODE	0	12	0	11	3	4	11	12
	3	3	1	3	8	8		
	8	8		8				
PAPR 1	*	*	*	*	*			
TAPE 2	*	*		*	*			
CODE 4								
.	.	.	.	.	.	.	.	.
8	*	*		*	*			
C	*		*	*				*
A	*	*	*			*		*
B		*		*			*	*

5.2.5 LINE CONTROL CHARACTERS

ABREV	CIRCLE-C	CIRCLE-D	CIRCLE-Y	CIRCLE-N	CIRCLE-B
PTTC/EBCD	1F	16	76	40	3D
CARD CODE	9	3	12	11	0
	7	8	3		6
			8		9
PAPR 1	*	*	*		
TAPE 2	*	*	*		*
CODE 4	*				*
.	.	.	.	.	.
8	*	*	*		*
C	*				*
A			*		*
B			*	*	

5.2.6 CONTROL CHARACTERS

ABREV	SPACE	PUNCH ON	RDR STOP	UPSHIFT	BYPASS	LINE FEED	PREFIX	MINUS ZERO	RESTORE
PTTC/EBCD	01	19	1A	1C	38	3B	3E	54	58
CARD CODE		4	5	6	0	0	0	11	11
		9	9	9	4	5	7	0	4
					9	9	9		9
PAPR 1			*			*	*		
TAPE 2				*			*	*	
CODE 4		*	*	*	*	*	*		*
.	.	.	.	.	.	.	.	.	.
8		*	*	*	*	*	*	*	*
C	*	*				*			
A					*	*	*		
B								*	*

ABREV	CR/LF	BACKSPACE	IDLE	PLUS ZERO	PUNCH OFF	HORIZ TAB	DOWNSHIFT	DELETE
PTTC/EBCD	5B	5D	5E	75	79	7A	7C	7F
CARD CODE	11	11	11	12	12	12	12	12
	5	6	7	0	4	5	6	7
	9	9	9		9	9	9	9
PAPR 1	*		*			*		*
TAPE 2		*	*	*			*	*
CODE 4	*	*	*		*	*	*	*
.	.	.	.	.	.	.	.	.
8	*	*	*	*	*	*	*	*
C	*	*		*	*			*
A				*	*	*	*	*
B	*	*	*	*	*	*	*	*

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1. GENERAL PROGRAM SUMMARY

1.1 DIAGNOSTIC PROGRAM DESCRIPTIONS

1.1.1 SECTION 141 BASIC ATTACHMENT CHECKOUT

RTN	DESCRIPTION	
1	INITIAL ATTACHMENT CONDITIONS TEST	
2	CRT DATA ADDRESS REGISTER (CRTAR) TEST	
3	OP DECODE REGISTER TEST	
4	MICRO INSTRUCTION ADDRESS REGISTER (MIAR) TEST	
5	LIO/SNS MICROCONTROLLER STORAGE TEST	
6	CONTROL STORE MEMORY AND BRANCHING TEST	
7	SHIFT LEFT (SL)	MICRO INSTRUCTION TEST
8	BRANCH ON CONDITION (BOC)	MICRO INSTRUCTION TEST
9	SET BITS ON (SBN)	MICRO INSTRUCTION TEST
A	SET BITS OFF (SBF)	MICRO INSTRUCTION TEST
B	INSERT CHARACTER (IC)	MICRO INSTRUCTION TEST
C	TEST BITS ON (TBN)	MICRO INSTRUCTION TEST
D	TEST BITS OFF (TBF, TBFR)	MICRO INSTRUCTION TEST
E	COMPARE IMMEDIATE (CI)	MICRO INSTRUCTION TEST
F	COMPARE IMMEDIATE REGISTER (CIR)	MICRO INSTRUCTION TEST
10	EXCLUSIVE 'OR' REGISTER (XR)	MICRO INSTRUCTION TEST
11	BRANCH REGISTER (BR)	MICRO INSTRUCTION TEST
12	INCREMENT REGISTER (INC)	MICRO INSTRUCTION TEST
13	LOAD REGISTER (LR)	MICRO INSTRUCTION TEST
14	TEST SIGNAL ON (TSN)	MICRO INSTRUCTION TEST
15	SET SIGNAL OFF/ON (SSF/SSN)	MICRO INSTRUCTION TEST
16	MESSAGE BUFFER ADDRESS REG (MBAR) & CURSOR ADDRESS REG (CURAR) TEST	
17	CHECK OF ENTIRE MESSAGE BUFFER	
18	ATTACHMENT CHECK DETECTION	
19	CONTROL STORE EXERCISE	
1A	CYCLE STEAL HARDWARE TEST	
1B	TSN-9 TEST	
1C	INTERRUPT HARDWARE TEST	
1D	SIO NON-IMMEDIATE TEST	
1E	TSN-0 AND TSN-1 CHECKED IN DIAGNOSTIC MODE	
1F	A 13-BIT CONTROL WORD CONTAINING ALL 1'S IS WRAPPED WHILE IN DIAGNOSTIC MODE	
20	SAME AS ROUTINE 1F EXCEPT ALL 0'S ARE USED	
21	SAME AS ROUTINE 1F EXCEPT ALTERNATE BIT PATTERN USED	
22	SAME AS 21 EXCEPT OPPOSITE ALTERNATE BIT PATTERN USED	
23	IN DIAGNOSTIC MODE, TRANSMIT ZEROS HARDWARE CHECKED	
24	CHECKOUT OF SSN-6 INSTRUCTION OPERATION	
25	CHECKOUT OF SSN-B INSTRUCTION OPERATION	
26	CHECKS FOR A CURSOR WHEN MBAR = CURAR	
27	CHECKOUT OF LINE 0 DRIVER/RECEIVER	
28	SAME AS 27 EXCEPT LINE 1 IS CHECKED (IF INSTALLED)	
29	CHECKS CONDITIONS OF ATTACHMENT RESET	
2A	POLL THE 3277/3284/3287 MANUAL INTERVENTION TESTS	
2B *	SPECIAL ROUTINE WHICH ALLOWS CE SELECTION OF HIS OWN MICRO INSTRUCTIONS	
2C *	CONTROL STORE AND/OR MESSAGE BUFFER DUMP	
2D	RESERVED	
2E *	CHECKS CE TEST BOX	
2F *	DUMPS HDB'S	
*	ROUTINES MUST BE MANUALLY SELECTED	

1.1.2 SECTION 143 MICROCODE LOADER

RTN	DESCRIPTION
1	THE MICROCODE IS LOADED INTO CONTROL STORE. THE CONTROL STORE IS THEN SENSED TO DETERMINE IF THE MICROCODE WAS ENTERED CORRECTLY.

1.1.3 SECTION 144 UNIT FUNCTION TEST (3277 , 3284 AND 3287)

RTN	DESCRIPTION
1	WRITE/READ ALL DATA TEST
2	INTERRUPT STACKING TEST
3	MBAR AND CURAR GREATER THAN 480 TEST
4	PARITY GENERATION TEST
5	INFORMATIONAL TEST PATTERN
6	ALL DATA KEYS TEST PATTERN
7	ALLIGNMENT TEST PATTERN
8	BASIC PRINTER PATTERN
9	UNIVERSAL CHARACTERS PATTERN
A	NEW LINE FUNCTION PATTERN
B	ALL DATA KEYS TEST
C	FUNCTION KEYS TEST
D	NORMAL TERMINATION ROUTINE
E	LOOP ON 480 WRITE (SELECTED VIA DCP OPTION 'F20E')
F	LOOP ON 480 READ (SELECTED VIA DCP OPTION 'F20F') NOTE: ROUTINE 0E MUST BE RUN BEFORE THIS ROUTINE.

1.1.4 MICROPROGRAM DECK (PROGRAM ID = FC0)

THE 3277 MICROCODE DECK CONTAINS THE PROGRAM FOR OPERATING THE UNITS. THE MICROCODE DECK (ID = FC0) IS USED IN CONJUNCTION WITH THE MICROCODE LOADER (ID = 143) AND WITH THE PROGRAM TO UPDATE THE 3277 MICROCODE ON THE CUSTOMERS SYSTEM PACK (ID = FC1).

1.1.5 PROGRAM TO UPDATE 3277 MICROCODE ON CUSTOMERS SYSTEM PACK (PROGRAM ID = FC1)

THIS PROGRAM WILL TAKE THE 3277 MICROCODE (ID = FC0) FROM THE DIAGNOSTIC PACK OR CARD DECK AND WILL PLACE IT ON THE CUSTOMERS SYSTEM PACK. THE SYSTEM PACK MUST HAVE A FILE ALLOCATED FOR THE FC0 DECK. IF UPDATING FROM DISK, THE PROGRAM (FC1) SHOULD BE USED AFTER THE 3277 MICROCODE (FC0) HAS BEEN UPDATED ON THE DIAGNOSTIC PACK.

1.2 OPTIONS

SENSE SWITCH OPTIONS

SENSE SWITCH NUMBER	OPTION PROVIDED WHEN SENSE SWITCH IS ON	SECTIONS WHERE USED
10	ALLOW OPTIONS TO BE USED WHILE LOADING CONTROL STORE OPTIONS: 01-LOAD, SENSE, & PRINT. 02 - LOAD & SENSE. 03- SENSE & PRINT.	143
10	PRINT CONTENTS OF HDB'S AS THEY ARE SENSED (ROUTINE 3)	141
12	PRINT CONTENTS OF CONTROL STORE AFTER EACH SENSE OF 256 WORDS (ROUTINE 5)	141
14	USED TO SKIP POLLING 3277 IN ROUTINE 2A	141
15	USED TO SKIP POLLING 3284 AND3287 IN ROUTINE 2A	141
16	USED TO ALLOW 3277/3284/87 TO POLL FOR STATUS OTHER THAN CLEAR	141
17	USED WITH SSW01 TO PUT ROUTINES 7 THRU 2A INTO A TIGHT LOOP WHICH BYPASSES CONTROL STORE LOAD AFTER FIRST PASS	141
18	SKIP PRINTING 1ST 256 WORDS OF CONTROL STORE DUMP	141
19	SKIP PRINTING 2ND 256 WORDS OF CONTROL STORE DUMP	141
1A	SKIP PRINTING 3RD 256 WORDS OF CONTROL STORE DUMP	141
1B	SKIP PRINTING 4TH 256 WORDS OF CONTROL STORE DUMP	141
1C	BYPASS ROUTINE 19 (CONTROL STORE EXERCISE)	141
20	BYPASS DISPLAYING TEST PATTERNS ON THE CRT.	144
21	BYPASS PRINTING TEST PATTERNS ON THE PRINTER AND BYPASS TESTING PARITY GENERATION TO THE 3284/87 (ROUTINE 4)	144
23	USE DATA SWITCHES TO MODIFY DATA TO BE WRITTEN IN ROUTINE '0E'	144
24	SELECT 3284/87 RATHER THAN 3277 (ROUTINES 01,0E,0F ONLY)	144
2D	SYSTEM PACK FOR 3277 MICROCODE RESIDES ON 3340.	FC1
2E	SYSTEM PACK FOR 3277 MICROCODE RESIDES ON 5444.	FC1
2F	USED ONLY AT IPL TIME, AND SHOULD BE IGNORED AND NEVER SET ON BY THE CE.	143

NOTE: SENSE SWITCHES 20 AND 21 SHOULD NOT BOTH BE ON SIMULTANEOUSLY BECAUSE NO TESTING WOULD THEN BE ACCOMPLISHED IN THE AFFECTED ROUTINES.

1.3 3277 TROUBLE SHOOTING MANUALS

IT MUST BE NOTED THAT THE CORRECT 3270 TROUBLE SHOOTING MANUAL MUST BE USED IN CONJUNCTION WITH THE TEST PATTERNS PROVIDED IN THESE SYSTEM/3 PROGRAMS. THIS USER'S GUIDE DOES NOT PROVIDE SERVICE AID INFORMATION RELATED TO THE USE OF THE PATTERNS.

2. OPERATING PROCEDURES REFER TO BLOCK 10.

3. INDEX TABLE FOR HALTS AND PRINTOUTS

3.1 PROGRAM OPERATOR HALTS -A0- THROUGH -FF-

HALT ID	SECT RTN	DESCRIPTION	MAP REF
OF	FC1	ERROR PRINTOUT. SEE PRINTOUT.	
A3	143	3277 MICRO-CODE BEING LOADED.	
A4	143	MICRO-CODE (LEVEL X) LOADED SUCCESSFULLY. NOTE THAT 'X' WILL BE REPLACED WITH THE LEVEL OF MICROCODE.	
E1	143	MICROCODE DECK WHICH WAS LOADED IS TOO LARGE FOR THE SYSTEM CONTROL STORAGE. SET DATA SWITCHES TO 04 AND RESET HALT TO PRINT MICROCODE DECK.	
E2	143	LOADING ERROR. SET DATA SWITCHES TO 05 AND RESET HALT TO RELOAD CONTROL STORE WITH THE MICROCODE ALREADY IN MEMORY.	
E5	144	ENTER IN DATA SWITCHES HEX VALUE OF DATA TO BE WRITTEN - THEN RESET HALT.	
E7	FC1	3277 AVAILABILITY FLAG IS OFF INDICATING THE MICROCODE MAY NOT BE LOADED. IF IT IS LOADED CORRECTLY, JUST RESET THE HALT TO CONTINUE. IF IT IS NOT LOADED, RUN SECTION 143.	
E8	FC1	3277 NOT READY OR THERE IS AN ERROR.	
E9	FC1	3277 NOT DEFINED IN UDT TABLE. CORRECT THE UDT BEFORE PROCEEDING WITH ANY OTHER PROGRAMS.	
F0	143	SSW 10 OPTION HALT. SELECT LOADER OPTION IN DATA SWITCHES AND RESET HALT. OPTIONS: 01 - LOAD, SENSE, & PRINT. 02 - LOAD & SENSE. 03 - SENSE & PRINT.	
F1	143	CHECK TO MAKE SURE THAT DATA DECK FC0 FOR MICROCODE LOADER IS IN PRIMARY HOPPER. RESET HALT TO CONTINUE.	
F2	143 FC1	CARD SEQUENCE OF DECK ID FC0 IS OUT OF ORDER. SEQUENCE CARDS AND RERUN SECTION.	
F3	143 FC1	NO END CARD TO DECK FC0, OR DECK IS TOO LONG. CORRECT DECK FC0 AND RERUN SECTION.	
F4	143 FC1	DECK ID IS NOT FC0. PLACE DECK FC0 IN READER AND RERUN SECTION.	
F7	FC1	MICRO-CODE OBJECT FILE ON SYSTEM PACK DIDN'T CONTAIN 9 SECTORS OF SPACE. MAKE SURE THE MICRO-CODE FILE HAS 9 SECTORS BEFORE RUNNING FC1.	
F9	FC1	COULDN'T OPEN MICRO-CODE OBJECT FILE ON SYSTEM PACK. CHECK TO SEE IF FILE NAME GIVEN IS CORRECT. RERUN SECTION.	
FC	FC1	DISK ERROR. RESET HALT TO RETRY. IF ERROR PERSISTS, RUN DISK DIAGNOSTICS.	
FE	FC1	DISK DRIVE 1 NOT READY. MAKE DRIVE 1 READY AND RESET HALT.	
FF	141 FC1	MANUAL INPUT NEEDED. SEE PRINTOUT.	

3.2 PROGRAM HALTS -01- THROUGH -9F-

3.2.1 SECTION 141

HALT	RTN	MEANING OF ID
01	01	WITH THE ATTACHMENT DISABLED, A TIO FOUND IT READY.
02	01	WITH THE ATTACHMENT DISABLED, A TIO FOUND AN INTERRUPT PENDING.
03	01	WITH THE ATTACHMENT DISABLED, A TIO FOUND AN ATTACHMENT CHECK.
04	01	WITH THE ATTACHMENT DISABLED, A TIO FOUND IT BUSY.
05	02	THE CRTAR WAS LOADED WITH 0101. A LIO TO CHANGE CONTROL STORE TO FFFF WAS DONE AND CRTAR WAS FOUND TO HAVE CHANGED.
06	02	THE CRTAR WAS LOADED WITH 0101 AND THEN THE OP DECODE REGS WERE LOADED WITH FFFF. WHEN THE CRTAR WAS SENSED, IT DID NOT CONTAIN 0101.
07	02	THE CRTAR WAS LOADED WITH 0101. HDB 16-17 WERE LOADED WITH FFFF AND CRTAR WAS FOUND TO HAVE CHANGED.
08	02	THE MAIN STORAGE DATA ADDRESS REGISTER (CRTAR) WAS LOADED WITH DATA (AA55 OR 55AA) AND WHEN SENSED, IT WAS FOUND NOT CONTAINING THE DATA LOADED.
09	03	THE OP DECODE REGISTERS WERE LOADED WITH THE PROPER INFORMATION. THE ADAPTER WAS LEFT ENABLED AND A TIO THEN FOUND IT READY.
0A	03	AFTER THE OP DECODE REGISTERS WERE LOADED, A TIO FOUND AN INTERRUPT PENDING.
0B	03	AN ATTEMPT WAS MADE TO LOAD HDB 0-1 WITH 0000 AND FFFF, BUT IT WAS FOUND THAT NEITHER HDB WOULD CHANGE.
0C	03	SAME AS HALT 0B EXCEPT THAT ONLY HDB 0 WOULD NOT CHANGE.
0D	03	SAME AS HALT 0B EXCEPT THAT ONLY HDB 1 WOULD NOT CHANGE.
0E	03	AFTER THE OP DECODE REGISTERS WERE LOADED, A FAILURE WAS NOTED. EITHER THE OP DECODE REGISTERS CANNOT BE LOADED PROPERLY OR THERE IS A FAILURE IN THE DIAGNOSTIC HARDWARE THAT BLOCKS THE PARITY BIT.
0F	03	AFTER THE OP DECODE REGISTERS WERE LOADED, A TIO FOUND THE ATTACHMENT BUSY.
10	03	AFTER LOADING AND SENSING HDB'S, THERE WAS AN ATTACHMENT CHECK.
11	03	AFTER LOADING FDB'S, THE DATA SENSED WAS NOT THAT EXPECTED.
12	03	AFTER LOADING AND SENSING THE LOW HDB'S, IT WAS NOTED THAT THE HI HDB'S HAD CHANGED.
13	04	WHILE DOING LIO'S TO CONTROL STORAGE, THE MIAR ADDRESS DUMPED INTO HDB 1F WAS FOUND TO BE NOT INCREMENTING CORRECTLY.
14	05	AN ATTEMPT WAS MADE TO WRITE 0000 AND FFFF INTO CONTROL STORE, BUT IT WAS FOUND THAT THE ENTIRE WORD COULD NOT BE CHANGED.
15	05	SAME AS HALT 14, EXCEPT THAT THE HI BYTE ONLY COULD NOT BE CHANGED.
16	05	SAME AS HALT 14, EXCEPT THAT THE LO BYTE ONLY COULD NOT BE CHANGED.
17	05	WHILE DOING A LIO TO CONTROL STORE, AN ATTACHMENT CHECK OCCURRED.
18	05	CONTROL STORE WAS LOADED, BUT WHILE SENSING THE DATA IN CONTROL STORAGE IT WAS FOUND TO BE INCORRECT.
1A	05	WHILE DOING LIO'S TO CONTROL STORAGE, THE MIAR DID NOT INCREMENT PROPERLY.
1C	06	WHILE DOING BOS,0 MICROINSTRUCTIONS, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED LOCATION INDICATING BOS, 0 DOES NOT FUNCTION PROPERLY. CAUTION - IF THE STOP SWITCH IS DEPRESSED WHILE ROUTINE 06 IS RUNNING, THIS ERROR WILL OCCUR WHEN THE PROGRAM IS RESTARTED.
1E	06	THE BOS,3 (BRANCH ON I/O SERVICE REQUEST) MICROINSTRUCTION BRANCHED WITH NO SIO HAVING BEEN ISSUED.
1F	06	THE BOS,3 MICROINSTRUCTION DID NOT BRANCH AFTER A SIO WAS ISSUED.
20	06	AFTER THE MICROCONTROLLER WAS ENABLED, A TIO FOUND THE ADAPTER WAS NOT READY.
21	06	AFTER THE MICROCONTROLLER WAS ENABLED, A TIO FOUND THERE WAS AN ATTACHMENT CHECK.
25	07	WHILE DOING THE SL MICROINSTRUCTION, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED ADDRESS.
26	07	THE SL MICROINSTRUCTION FAILED WHILE TRYING TO SHIFT DATA 00 & FF (DATA SHOULD HAVE REMAINED THE SAME).
27	07	THE SL MICROINSTRUCTION FAILED WHILE TRYING TO SHIFT DATA AA & 55 (DATA SHOULD HAVE CHANGED TO 55 & AA).
2A	08	THE BOC (BRANCH ON CONDITION) MICROINSTRUCTION WAS FOUND TO BE FAILING.
2F	09	WHILE DOING THE SBN (SET BITS ON) MICROINSTRUCTION, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED ADDRESS.
30	09	SBN MICROINSTRUCTIONS FAILED TO CHANGE DATA FROM 0000 TO 55AA.
31	09	SBN MICROINSTRUCTIONS FAILED TO CHANGE DATA FROM 55AA TO FFFF.
32	09	SBN MICROINSTRUCTIONS FAILED TO CHANGE DATA FROM 55AA TO F5AF.
36	0A	WHILE DOING THE SBF (SET BITS OFF) MICROINSTRUCTION, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED ADDRESS.
37	0A	SBF MICROINSTRUCTIONS FAILED TO CHANGE DATA FROM FFFF TO 55AA.
38	0A	SBF MICROINSTRUCTIONS FAILED TO CHANGE DATA FROM 55AA TO 0480.
3C	0B	WHILE DOING THE IC (INSERT CHARACTER) MICROINSTRUCTION, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED ADDRESS.
3E	0B	IC INSTRUCTIONS FAILED TO CHANGE DATA FROM FFFF TO 55AA.
3F	0B	IC INSTRUCTIONS FAILED TO CHANGE DATA FROM 00FF TO FF00.

SECTION 141--CONTINUED

ID	RTN	
42	0C	THE TBN (TEST BITS ON) MICROINSTRUCTION HAS FAILED.
44	0D	THE TBF (TEST BITS OFF) OR TBFR (TEST BITS OFF REG. TO REG.) MICROINSTRUCTION HAS FAILED.
46	0E	THE CI (COMPARE IMMEDIATE) MICROINSTRUCTION HAS FAILED.
48	0F	THE CIR (COMPARE IMMEDIATE REGISTER) MICROINSTRUCTION HAS FAILED.
4A	10	THE XR (EXCLUSIVE OR REGISTER) MICROINSTRUCTION HAS FAILED.
4E	11	THE BR (BRANCH REGISTER) MICROINSTRUCTION HAS FAILED.
50	12	THE INC (INCREMENT REGISTER) MICROINSTRUCTION HAS FAILED.
52	13	THE LR (LOAD REGISTER) MICROINSTRUCTION HAS FAILED.
54	14	THE TSN (TEST SIGNAL ON) MICROINSTRUCTION HAS FAILED.
56	15	THE SSN (SET SIGNAL ON) OR THE SSF (SET SIGNAL OFF) MICROINSTRUCTION HAS FAILED.
58	16	THE MICROPROGRAM WHICH TESTS MOVING MBAR (MESSAGE BUFFER ADDRESS REGISTER) TO CURAR (CURSOR ADDRESS REGISTER) HAS FAILED TO TERMINATE IN THE EXPECTED ADDRESS.
59	16	WHEN TRYING TO MOVE MBAR TO CURAR, THE CURAR DOES NOT CONTAIN THE EXPECTED DATA.
5A	18	AN HDB WAS LOADED WITH BAD PARITY. DURING THE FOLLOWING SNS COMMAND, AN HDB/EXT CHECK DID NOT OCCUR.
5B	18	AN OP-DECODE CHECK WAS EXPECTED AFTER DOING A LIO TO OP-DECODE REG. 15. IT DID NOT OCCUR.
5C	17	ALL LOCATIONS IN THE MESSAGE BUFFER WERE LOADED AND CHECKED FOR EXPECTED DATA. AN ERROR HAS OCCURRED IN THE MESSAGE BUFFER.
5D	18	AN OP-DECODE CHECK WAS EXPECTED AFTER DOING A LIO TO OP-DECODE REG. 05. IT DID NOT OCCUR.
5E	18	A MICRO-PROGRAM USING BAD PARITY IN HDB'S DID NOT STOP AT THE EXPECTED LOCATION.
5F	18	AN ATTACHMENT CHECK INDICATING BAD PARITY IN HDB'S DID NOT OCCUR AS EXPECTED.
60	18	A MICRO-PROGRAM USING BAD PARITY IN HDB'S DID NOT STOP AT THE EXPECTED LOCATION.
61	18	AN ATTACHMENT CHECK INDICATING BAD PARITY IN HDB'S DID NOT OCCUR AS EXPECTED.
62	18	BAD PARITY WAS PUT IN MBAR LOW AND A CONTROL STORE ADDRESS CHECK DID NOT OCCUR AS EXPECTED.
63	1A	DURING PHASE 1 OF THE CYCLE STEAL TESTS, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED ADDRESS.
64	1A	AFTER THE CYCLE STEAL TESTS, THE FIRST 2 BYTES CHANGED IN MAIN STORAGE WERE NOT = FFAA.
65	1A	AFTER THE CYCLE STEAL TESTS, THE SECOND 2 BYTES CHANGED IN MAIN STORAGE WERE NOT = 5528.
66	1A	AFTER THE CYCLE STEAL TESTS, THE SINGLE BYTES BEFORE AND AFTER THE AREA CHANGED WERE NOT = 00.
67	1A	THE 'STORE' CYCLE STEAL TESTS WERE COMPLETED OKAY, BUT AN ERROR OCCURRED WHILE TRYING TO 'FETCH' THE SAME INFORMATION BACK TO HDB 0F.
68	18	BAD PARITY WAS PUT IN MBAR HI AND A CONTROL STORE ADDRESS CHECK DID NOT OCCUR AS EXPECTED.
69	1B	AFTER AN SSF-C TO RESET TSN-9, TSN-9 STILL BRANCHED.
6A	1B	AFTER DOING A LIO TO HDB 1A, TSN-9 DID NOT BRANCH.
6B	18	A CONTROL STORE ADDRESS CHECK DID NOT OCCUR AS EXPECTED AFTER THE MICROCONTROLLER WAS ENABLED WITH THE DIAGNOSTIC NO. 2 LATCH ON.
6C	1B	AFTER TSN-9 WAS RESET, A LIO WAS DONE TO ALL HDB'S EXCEPT HDB 1A. TSN-9 BRANCHED AND IT SHOULD NOT HAVE.
6D	18	A CONTROL STORE WRITE DATA CHECK DID NOT OCCUR AS EXPECTED WHILE ATTEMPTING TO PUT BAD PARITY INTO THE MESSAGE BUFFER.
6E	1C	A FAILURE OCCURRED IN THE 1ST PHASE OF THE INTERRUPT TESTS. THIS INDICATES TSN-D OR SSN-C NOT FUNCTIONING PROPERLY.
6F	1C	AFTER THE MICROPROGRAM SET AN INTERRUPT, A TIO INDICATED THAT NO INTERRUPT WAS PENDING.
70	1C	AFTER ENABLING INTERRUPTS, NO INTERRUPT OR MORE THAN 1 INTERRUPT TOOK PLACE.
71	1C	AFTER THE INTERRUPT ROUTINE RESET THE INTERRUPT, A TIO SHOWED THAT AN INTERRUPT WAS STILL PENDING.
72	1C	AFTER AN INTERRUPT HAD BEEN RESET AND VERIFIED BY TIO, THE TSN-D MICROINSTRUCTION STILL BRANCHED.

SECTION 141--CONTINUED

ID	RTN	
74	18	BAD PARITY WAS WRITTEN INTO THE EVEN BYTE IN CONTROL STORE. WHEN THE MICROCONTROLLER WAS ENABLED, A CONTROL STORE DATA CHECK DID NOT OCCUR AS EXPECTED.
75	1D	AFTER A SIO NON-IMMEDIATE WAS ISSUED WITH THE MICROCONTROLLER ENABLED, A TIO DID NOT INDICATE THE ATTACHMENT WAS BUSY.
76	1D	THE FIRST PHASE OF THE MICROPROGRAM WAS NOT STOPPED AT THE EXPECTED ADDRESS, INDICATING A FAILURE OF BOS,3 (BRANCH ON SIO SERVICE REQUEST.)
77	1D	AFTER A SIO NON-IMMEDIATE WAS ISSUED, HDB 16 AND 17 DID NOT CONTAIN THE IR AND IQ BYTES.
78	1D	SSF-C FAILED TO TURN OFF SIO SERVICE REQUEST.
79	1D	AFTER THE MICROCONTROLLER WAS ENABLED, A TIO SHOWED THE ATTACHMENT BUSY BEFORE A SIO NON-IMMEDIATE HAD BEEN ISSUED.
7A	1D	AFTER SIO SERVICE REQUEST WAS TURNED OFF, A TIO SHOWED THAT THE ATTACHMENT WAS STILL BUSY.
7B	18	BAD PARITY WAS WRITTEN INTO THE ODD BYTE IN CONTROL STORE. WHEN THE MICROCONTROLLER WAS ENABLED, A CONTROL STORE AND HDB PARITY CHECK DID NOT OCCUR AS EXPECTED.
7C	1D	WHILE EXECUTING A MICROPROGRAM AND DOING A SIO NON-IMMEDIATE, HDB 2-3 DID NOT CONTAIN THE CORRECT VALUE.
7D	1D	WHILE EXECUTING A MICROPROGRAM AND DOING A SIO NON-IMMEDIATE, HDB 0-1 DID NOT CONTAIN THE CORRECT VALUE.
7E	1D	A SIO NON-IMMEDIATE ISSUED WHILE THE ATTACHMENT WAS BUSY DID NOT CAUSE THE CPU TO HANG UNTIL BUSY DROPPED.
80	1E	WHILE TRYING TO TRANSMIT DATA IN DIAGNOSTIC MODE, A FAILURE HAS OCCURRED INDICATING A PROBLEM WITH TSN-0 OR TSN-1.
82	1F	A FAILURE HAS OCCURRED WHILE TRYING TO WRAP A CONTROL WORD WITH ALL BITS ON.
84	20	A FAILURE HAS OCCURRED WHILE TRYING TO WRAP A CONTROL WORD WITH NO BITS ON.
86	21	A FAILURE HAS OCCURRED WHILE TRYING TO WRAP A CONTROL WORD WITH ALTERNATE BITS ON.
88	22	SAME AS HALT 86 IN ROUTINE 21, BUT THE OPPOSITE ALTERNATE BIT PATTERN IS USED.
8A	23	A FAILURE HAS OCCURRED WHILE EXERCISING THE TRANSMIT ZEROS CONTROLS (SSN-0).
8B	19	AN ERROR HAS OCCURRED WHILE EXERCISING CONTROL STORAGE.
8E	24	A FAILURE HAS OCCURRED WHILE EXERCISING THE DIAGNOSTIC FUNCTION TO BLOCK BIT 12 OF THE CONTROL WORD (SSN-6) INDICATING TROUBLE WITH SSN-6, PARITY CHECK CIRCUITS, OR TSN-B (TEST FOR RECEIVE CHECK).
90	25	WHILE CHECKING RECEIVE DATA MODE, A FAILURE WAS DETECTED IN MOVING MBAR TO CURAR WHEN BIT 3 (CURSOR) IS RECEIVED. TROUBLE IN SSN/SSF-B OR CURAR CONTROLS IS INDICATED.
93	26	A FAILURE HAS OCCURRED IN THE CONTROLS WHICH CAUSE BIT 3 OF THE I/O REG. TO BE TURNED ON WHEN MBAR = CURAR WHILE TRANSMITTING DATA.
94	27	LINE 0 APPEARS TO BE SELECTED WHEN IT IS NOT (WHILE DOING AN OUTSIDE WRAP, NO DRIVER WAS SELECTED BUT DATA WRAPPED JUST THE SAME).
95	27	A FAILURE HAS OCCURRED WHILE DOING 'OUTSIDE' DATA WRAPS WHICH INCLUDE THE CIRCUITRY IN THE LINE DRIVER/RECEIVER FOR LINE 0.
97	28	SAME AS HALT 95 EXCEPT THAT THE LINE DRIVER/RECEIVER FOR LINE 1 IS BEING USED. CAUTION - THIS HALT WILL BE SUPPRESSED IF THE CONFIGURATION SHOWS THAT LINE 1 IS NOT INSTALLED.
98	2A	WITH ATTACHMENT CHECK ON, THE I/O CHECK LIGHT WAS NOT ON.
99	29	ATTACHMENT RESET IS NOT RESETTING ALL THE SIGNALS THAT IT SHOULD.
9A	2A	DEPRESSING CHECK RESET DID NOT CAUSE THE I/O CHECK LIGHT TO GO OFF.
9C	2A	THIS HALT WILL OCCUR ONLY IF SSW 14 (SKIP LINE 0 --- 3277) IS OFF OR SSW 15 (SKIP LINE 1 -3284/87) IS OFF. IT INDICATES THAT THE LINE POLLED DOES NOT CONTAIN ZERO STATUS. THIS IS NOT NECESSARILY AN ERROR (3277 AID KEYS MAY HAVE BEEN DEPRESSED, ETC.). WHEN THIS HALT OCCURS, DETERMINE THAT THE DEVICE SELECTED BY SENSE SWITCHES IS ATTACHED, POWERED ON AND HAS CLEAR STATUS, COAXIAL CABLE CONNECTION HAS NOT FALLEN OFF, NO INFO PENDING, ETC. THIS HALT WILL NOT OCCUR IF SSW 14 AND SSW 15 ARE ON.
9E	2A	AN INVALID SIO, SNS, OR LIO DID NOT CAUSE A PROCESSOR CHECK.
9F	2B	A MANUALLY STORED MICROPROGRAM ENTERED BY THE CE DID NOT STOP AT THE EXPECTED LOCATION.

3.2.2

SECTION 144

HALT ID	RTN	MEANING OF ID / DESCRIPTION OF ERROR
01	ALL	MICRO-CODE NOT LOADED (CRT AVAILABILITY FLAG IS OFF). IF THIS HALT IS RESET, THE CRT AVAILABILITY FLAG WILL BE TURNED ON SO THE CE MAY PROCEED AT HIS OWN RISK. (OTHERWISE RUN SECTION 143 TO RELOAD CONTROL STORE.)
02	ALL	ATTACHMENT NOT READY AFTER IT HAS BEEN ENABLED.
03	ALL	STATUS ERROR OCCURRED. WHILE PERFORMING SOME TEST, THE STATUS RECEIVED DID NOT COMPARE TO THAT WHICH WAS EXPECTED. CHECK THE PRINTOUT FOR THE MISCOMPARE. AFTER THE EXPECTED AND RECEIVED STATUS PRINTOUT HAS BEEN GIVEN, A MESSAGE WILL BE OUTPUT WHICH INDICATES THE TROUBLESHOOTING MANUAL AND SYMPTOMS TO BE USED WHEN REPAIRING THE 3277,3284/87 (IF ANY OF THE RECEIVED STATUS INDICATES ANY VALID SYMPTOMS TO BE USED AS ENTRY POINTS).
05	01	DATA DID NOT COMPARE TO THAT WHICH WAS EXPECTED WHEN THE READ WAS DONE. EXPECTED AND RECEIVED DATA WILL BE INDICATED.
06	0B	KEYED INPUT DID NOT COMPARE TO THAT WHICH WAS EXPECTED (EXPECTED DATA INPUT ERROR). EXPECTED AND RECEIVED KEYED INPUT WILL BE INDICATED.
07	0C	INPUT ERROR OR KEY HIT OUT OF ORDER. AS THE INTERRUPTS ARE BEING RECEIVED FROM THE FUNCTION KEYS, A MISCOMPARE WAS DETECTED. EXPECTED AND RECEIVED KEY WILL BE INDICATED IN THE PRINTOUT.
08	02	ATTACHMENT DID NOT GO BUSY AFTER 17 INTERRUPTS WERE STACKED.
09	02	EXPECTED 17 INTERRUPTS BUT DID NOT RECEIVE INTERRUPT NUMBER XX. XX WILL CONTAIN THE DECIMAL NUMBER OF THE EXPECTED INTERRUPT.
0A	ALL	ATTACHMENT CHECK WAS DETECTED AFTER AN INTERRUPT WAS RECEIVED.
0C	ALL	UNEXPECTED INTERRUPT
0F	04	ATTACHMENT CHECK WHILE LOADING OR SENSING CONTROL STORE
10	ALL	TIMEOUT--EXPECTED INTERRUPT NOT RECEIVED. EITHER OPERATOR INTERVENTION WAS BEING WAITED FOR OR NO INTERRUPT WAS GENERATED AT THE TERMINATION OF AN OPERATION.
11	04	ATTACHMENT BUSY LONGER THAN 100 MILLISECONDS.
12	0F	DATA MISCOMPARE AFTER THE READ - DATA EXPECTED WAS THAT WRITTEN FROM ROUTINE '0E'.
13	0F	ROUTINE '0E' WAS NOT RUN IMMEDIATELY PRECEEDING THIS ROUTINE. THEREFORE THE READS IN THIS ROUTINE MAY BE INVALID.

4. DETAILED DESCRIPTION OF TESTS

4.1

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*************************************************************
*                                                           *
*                       SECTION 141                         *
*                                                           *
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NOTE: SSW05 (DISPLAY ON CRT) CAN NOT BE USED WHILE THIS SECTION IS RUNNING.

01 AFTER SYSTEM RESET, THE ATTACHMENT SHOULD HAVE NO CONDITIONS PENDING. THIS ROUTINE CHECKS WITH TIO'S THAT THE ATTACHMENT IS NOT READY, THAT NO INTERRUPTS ARE PENDING, THAT THE ATTACHMENT IS NOT BUSY, AND THAT THERE IS NO ATTACHMENT CHECK.

02 THIS ROUTINE CHECKS THE MAIN STORAGE DATA ADDRESS REGISTER (CRTAR) TO MAKE SURE THAT NO BITS ARE STUCK ON OR OFF. THE PATTERNS LOADED ARE AA55 AND 55AA. THEN IT IS LOADED WITH 0101 AND A LIO OF FFFF DONE TO THE OP DECODE REGISTERS, HDB'S AND CONTROL STORE. AT THE END OF EACH LIO, CRTAR IS CHECKED TO ASSURE THAT IT STAYS AT 0101.

03 THIS ROUTINE FIRST LOADS THE OP DECODE REGISTERS, AND AGAIN CHECKS FOR NO CONDITIONS PENDING AS IN ROUTINE 01. THEN, ALL THE 32 HDB'S ARE LOADED AND SENSED WITH PATTERNS 0000, FFFF, AA55, 55AA, 0202 AND THE ACTUAL HDB ADDRESS (00,01-----1E,1F) TO CHECK ALL BITS AND HDB ADDRESSING.

TO PRINT OUT THE HDB'S AT EACH STEP OF THE TEST, SET SSW 10 ON.

04 THIS ROUTINE CHECKS THAT THE MICROPROGRAM INSTRUCTION ADDRESS REGISTER (MIAR) IS INCREMENTED PROPERLY. THE MIAR IS DUMPED INTO HDB 1F EACH CYCLE SO IT CAN BE SENSED (ONLY THE LO 8 BITS). LIO'S ARE DONE TO CONTROL STORAGE (DATA UNIMPORTANT) AND THE MIAR CHECKED TO BE SURE THAT IT INCREMENTS BY ONE EACH TIME.

05 THIS ROUTINE CHECKS THE CONTROL STORAGE BY LOADING AND SENSING ALL POSITIONS WITH THE FOLLOWING PATTERNS:

```
PART 1 : 0000

PART 2 : FFFF

PART 3 : 0100-01FF IN 1ST 256 WORDS
         0200-02FF IN 2ND 256 WORDS
         0400-04FF IN 3RD 256 WORDS
         0800-08FF IN 4TH 256 WORDS

PART 4 : 0001-FF01 IN 1ST 256 WORDS
         0002-FF02 IN 2ND 256 WORDS
         0004-FF04 IN 3RD 256 WORDS
         0008-FF08 IN 4TH 256 WORDS
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TWO PASSES ARE MADE FOR EACH PATTERN. TO PRINT OUT CONTROL STORAGE AT EACH STEP, SET SSW 12 ON.

06 THIS ROUTINE CHECKS THE BOS,0 (UNCONDITIONAL BRANCH) AND BOS,3 (BRANCH ON I/O SERVICE REQUEST). FIRST, A PATTERN OF UNCONDITIONAL BRANCHES IS LOADED IN CONTROL STORAGE. THE MICROCONTROLLER IS THEN STARTED FOR THE FIRST TIME AND, AFTER A FIXED LENGTH OF TIME, IT IS STOPPED. IF THE BRANCH IS WORKING PROPERLY, A SNS WILL YIELD A PREDICTABLE VALUE ALLOWING OPERATION TO BE CHECKED. THEN BOS,3 INSTRUCTIONS ARE LOADED AND CHECKED THAT THEY DO BRANCH WHEN SIO SERVICE REQUEST IS ON AND DO NOT BRANCH IF IT IS OFF.
CAUTION: SINCE PRESSING THE STOP BUTTON STOPS CPU INSTRUCTIONS BUT DOES NOT STOP THE MICROCONTROLLER, AN ERROR WILL RESULT IF THE STOP BUTTON IS PRESSED DURING THE TIME ROUTINE 06 IS RUNNING.

07 THIS ROUTINE CHECKS THE SHIFT LEFT (SL) MICROINSTRUCTION BY LOADING 00, FF, AA AND 55 INTO HDB'S AND THEN DOING A SL TO EACH ONE LOADED. THE HDB'S ARE THEN CHECKED TO SEE THAT THEY NOW ARE 00, FF, 55 AND AA.

08 THIS ROUTINE CHECKS ALL CONDITIONS OF THE BOC (BRANCH ON CONDITION) INSTRUCTION. THIS IS DONE BY SHIFTING A SINGLE BIT THROUGH AN HDB TO GENERATE CONDITIONS 1 (HI 4 BITS = 0) AND 2 (LO 4 BITS = 0), AND THEN SHIFTING NO BITS TO GET CONDITION 3 (ALL 8 BITS = 0).

09 THIS ROUTINE CHECKS THE SBN (SET BITS ON) INSTRUCTION. HDB'S ARE LOADED WITH 0000, 55AA AND 55AA. USING THE SBN INSTRUCTION, 0000 IS CHANGED TO 55AA, 55AA IS CHANGED TO FFFF, AND 55AA IS CHANGED TO F5AF.

0A THIS ROUTINE CHECKS THE SBF (SET BITS OFF) INSTRUCTION. HDB'S ARE LOADED WITH FFFF AND 55AA. USING THE SBF INSTRUCTION, THEY ARE CHANGED TO 55AA AND 0480.

0B THIS ROUTINE CHECKS THE IC (INSERT CHARACTER) INSTRUCTION. HDB'S ARE INITIALIZED TO FFFF AND 00FF AND THEN, USING THE IC INSTRUCTION, THEY ARE CHANGED TO 55AA AND FF00.

0C THIS ROUTINE CHECKS THE TBN (TEST BITS ON) INSTRUCTION. BIT PATTERNS ARE LOADED AND THE TBN INSTRUCTION TRIED FOR SEVERAL COMBINATIONS.

0D THIS ROUTINE CHECKS THE TBF (TEST BITS OFF) INSTRUCTION. BIT PATTERNS ARE LOADED AND THE TBF INSTRUCTIONS TRIED FOR SEVERAL COMBINATIONS. THE TBFR (TEST BITS OFF REG. TO REG.) WHICH IS THE SAME EXCEPT THAT THE MASK COMES FROM AN HDB IS ALSO TRIED.

0E THIS ROUTINE CHECKS THE CI (COMPARE IMMEDIATE) INSTRUCTION. BIT PATTERNS ARE LOADED AND THEN CHECKED USING THE CI INSTRUCTION TO GENERATE ALL POSSIBLE CONDITION BRANCHES.

0F THIS ROUTINE CHECKS THE CIR (COMPARE IMMEDIATE REGISTER) INSTRUCTION. BIT PATTERNS ARE LOADED AND THE CIR INSTRUCTION USED TO GENERATE ALL POSSIBLE CONDITION BRANCHES.

10 THIS ROUTINE CHECKS THE XR (EXCLUSIVE 'OR' REGISTER) INSTRUCTION. BIT PATTERNS ARE LOADED AND THEN CHANGED USING THE XR INSTRUCTION AND CHECKED FOR CORRECT RESULTS.

11 THIS ROUTINE CHECKS THE BR (BRANCH REGISTER) INSTRUCTION. PATTERNS ARE LOADED AND BRANCHES SET UP TO GO FROM ADDRESSES IN THE 1ST 256 WORDS TO THE 3RD 256 WORDS, FROM THE 2ND TO THE 3RD, FROM THE 3RD TO THE 1ST, FROM THE 2ND TO THE 1ST, FROM THE 3RD TO THE 3RD AND FROM THE 1ST TO THE 1ST.

12 THIS ROUTINE CHECKS THE INC (INCREMENT REGISTER) INSTRUCTION. AN HDB IS INCREMENTED FROM 00-FF AND FROM FF-00. EACH STEP IS CHECKED.

13 THIS ROUTINE CHECKS THE LR (LOAD REGISTER) INSTRUCTION. ONLY THE BASIC INSTRUCTION WHICH LOADS FROM ONE HDB TO ANOTHER HDB IS CHECKED. EXTERNALS WILL BE CHECKED LATER.

14 THIS ROUTINE CHECKS THE BASIC TSN (TEST SIGNAL ON) INSTRUCTION. ONLY TSN'S WHICH ARE IN A KNOWN QUIESCENT STATE ARE CHECKED. THE OTHERS ARE CHECKED LATER.

15 THIS ROUTINE CHECKS THE SSF/SSN (SET SIGNAL OFF/ON) INSTRUCTION. IT DOES THIS BY MANIPULATING BITS 2, 3, AND 13 OF THE I/O REG. AND USING TSN'S TO CHECK THE RESULTS. THIS ALSO GIVES FURTHER TESTING OF TSN'S. OTHER SSN'S AND SSF'S ARE TESTED LATER.

16 THIS ROUTINE CHECKS MBAR (MESSAGE BUFFER ADDRESS REG.) AND CURAR (CURSOR ADDRESS REG.) HARDWARE. IT ALSO GIVES FURTHER TESTING TO LR AND SSN INSTRUCTIONS. MBAR IS SET TO VARIOUS PATTERNS AND THEN MOVED TO CURAR. THE VALUES USED ARE 7FF, 000, 555 AND 2AA. THE BOS,1 INSTRUCTION WHICH BRANCHES WHEN MBAR IS EQUAL TO CURAR IS ALSO TESTED.

17 THIS ROUTINE CHECKS THAT THE ENTIRE 512 BYTES OF THE MESSAGE BUFFER ARE FUNCTIONING PROPERLY. IT ALSO GIVES A FURTHER CHECK OF THE LR INSTRUCTION INVOLVING EXTERNALS. THE FOLLOWING PATTERNS ARE LOADED AND CHECKED: FF, AA, 55, AND INCREMENTED DATA (1ST 256 BYTES = 00-FF, 2ND 256 BYTES = 01-FF,00). MESSAGE BUFFER ADDRESSING IS ALSO CHECKED.

18 THIS ROUTINE CHECKS ALL OF THE ATTACHMENT CHECK CIRCUITS. OP-DECODE, HDB/EXT, CONTROL STORE DATA, CONTROL STORE ADDRESS AND CONTROL STORE WRITE DATA ERRORS ARE FORCED AND CHECKED FOR PROPER INDICATION.

19 THIS ROUTINE IS A COMPLETE EXERCISE OF ALL OF CONTROL STORAGE INCLUDING THAT PART USED AS THE MESSAGE BUFFER. IT DOES THIS BY PUTTING INCREMENTING DATA IN EACH BYTE. 256 PASSES ARE MADE SO THAT EACH BYTE WILL HAVE ALL COMBINATIONS OF DATA WRITTEN IN IT. THE DATA IS WRITTEN AND READ AND CHECKED BY ADDRESSING ALL OF CONTROL STORE WITH MBAR IN A MICROPROGRAM. THIS ROUTINE IS DONE IN TWO PHASES. IN THE FIRST PHASE, THE MICROPROGRAM IS LOADED AND EXECUTED IN THE 3RD 256 WORDS AND THE FIRST 1024 BYTES OF CONTROL STORAGE ARE EXERCISED. IN THE SECOND PHASE, THE MICROCODE IS LOADED AND EXECUTED IN THE FIRST 256 WORDS AND THE SECOND 1024 BYTES OF CONTROL STORE ARE EXERCISED. SINCE THIS ROUTINE IS RATHER LENGTHY, IT CAN BE BYPASSED BY SETTING ON SENSE SWITCH '1C'.

1A THIS ROUTINE CHECKS THAT THE CYCLE STEAL HARDWARE SSN-9, SSN-8, AND TSN-8 IS WORKING PROPERLY. DATA FFAA5528 IS FIRST PUT INTO MAIN STORAGE USING STORE CYCLE STEAL REQUESTS. IT IS THEN READ BACK INTO THE ATTACHMENT BY USING FETCH CYCLE STEAL REQUESTS. MAIN STORAGE IS ALSO CHECKED TO BE SURE THE BYTE BEFORE AND AFTER THE CYCLE STEAL AREA USED REMAINS UNCHANGED.

SECTION 141--CONTINUED

1B THIS ROUTINE CHECKS TSN-9 WHICH TELLS WHETHER HDB 1A HAS BEEN LOADED OR NOT. TSN-9 IS FIRST RESET BY SSF-C AND CHECKED FOR NO BRANCH. HDB 1A IS THEN LOADED WITH A LIO AND TSN-9 IS CHECKED TO BE SURE IT DOES BRANCH.

1C THIS ROUTINE CHECKS THE HARDWARE INVOLVED IN TAKING INTERRUPTS (TSN-D, SSN-C, SIO'S THAT ENABLE AND DISABLE AND RESET INTERRUPTS). TSN-D IS FIRST CHECKED FOR NO BRANCH. SSN-C THEN SETS AN INTERRUPT REQUEST AND TSN-D CHECKS THAT IT DOES BRANCH. A TIO SHOULD THEN SHOW AN INTERRUPT PENDING. A SIO ENABLES THE INTERRUPT AND A CHECK IS MADE TO BE SURE ONLY ONE INTERRUPT HAS TAKEN AND THEN RESET. TSN-D IS AGAIN CHECKED TO BE SURE IT DOES NOT BRANCH.

1D THIS ROUTINE CHECKS THAT WHEN A SIO NON-IMMEDIATE IS ISSUED, THE IR/IQ BYTES ARE LOADED INTO HDB 16-17, AND THAT ATTACHMENT BECOMES BUSY WHEN THE SIO SVC REQ. LATCH COMES ON. IT ALSO CHECKS THAT SSF-C WILL RESET THE SIO SVC REQ. LATCH. A TEST IS MADE TO DETERMINE THAT HDB'S MANIPULATED DURING IQ/IR CYCLES ARE HANDLED CORRECTLY. ALSO, A TEST IS MADE TO BE SURE THAT THE CPU WILL HANG IF A SIO NON-IMMEDIATE IS ISSUED WHILE THE ATTACHMENT IS BUSY.

1E THIS ROUTINE CHECKS THAT WHEN IN DIAGNOSTIC MODE, TSN-0 (TRANSMIT WORD READY) AND TSN-1 (RECEIVE WORD READY) WILL FUNCTION PROPERLY AND THAT A 13-BIT CONTROL WORD CAN BE WRAPPED WITHIN THE ATTACHMENT. NO CHECK IS MADE UPON THE DATA BEING WRAPPED.

1F IN DIAGNOSTIC MODE, A 13-BIT CONTROL WORD CONTAINING ALL 1'S IS WRAPPED AND CHECKED FOR THE CORRECT RESULT. THIS IS REPEATED 255 TIMES.

20 SAME AS ROUTINE 1F EXCEPT THAT ALL 0'S (EXCEPT FOR BIT 1 WHICH MUST ALWAYS BE ON) ARE USED.

21 SAME AS ROUTINE 1F EXCEPT THAT AN ALTERNATE BIT PATTERN IS USED.

22 SAME AS ROUTINE 1F EXCEPT THAT THE OPPOSITE ALTERNATE BIT PATTERN IS USED.

23 IN DIAGNOSTIC MODE, THE TRANSMIT ZEROS HARDWARE IS CHECKED. (SSN-0 SHOULD CAUSE 13 ZEROS TO BE TRANSMITTED INSTEAD OF THE DATA IN THE I/O REG.) SSN-0 IS TURNED ON AND THE I/O REG. IS LOADED TWICE. AT THE END OF 13 CYCLES, RECEIVE WORD READY MUST NOT BE ON (INDICATES ZEROES WERE TRANSMITTED). THEN, 13 MORE CYCLES LATER, RECEIVE WORD READY MUST COME ON INDICATING THAT DATA WAS TRANSMITTED. THE DATA IS THEN CHECKED TO BE SURE THAT IT IS THE SAME AS THAT TRANSMITTED.

24 THIS ROUTINE CHECKS THAT SSN-6, WHICH IS USED TO BLOCK BIT 12 OF THE I/O REG. (PARITY), IS FUNCTIONING. MOREOVER, IT CHECKS THAT PARITY ERRORS IN RECEIVED DATA CAN BE DETECTED AND INDICATED PROPERLY. ALL BITS ARE USED IN BOTH THEIR 0 AND 1 STATES TO TEST THE PARITY CHECK CIRCUITS.

25 THIS ROUTINE CHECKS THAT WHEN THE ATTACHMENT IS RECEIVING DATA WITH SSN-B (RECEIVE DATA MODE) ACTIVATED, MBAR WILL BE MOVED TO CURAR WHEN A CURSOR BIT (BIT 3) IS RECEIVED. THE VALUES OF MBAR MOVED ARE 0AA AND 155. CURAR IS THEN RESET TO ZERO AND RECEIVE DATA MODE IS TURNED OFF. THE TEST IS THEN REPEATED TO BE SURE MBAR DOES NOT GET TRANSFERRED TO CURAR IN THIS CASE.

26 THIS ROUTINE TESTS THAT A CURSOR (BIT 3) IS TRANSMITTED WHEN MBAR = CURAR. IT IS DONE BY TRANSMITTING DATA IN DIAGNOSTIC MODE AND CHECKING THAT BIT 3 IS ALWAYS OFF UNLESS MBAR = CURAR. ADDRESSES WHERE BIT 3 IS INJECTED ARE 0AA AND 155.

27 THIS ROUTINE CHECKS THE LINE 0 DRIVER/RECEIVER. ALL PREVIOUS DATA WRAPS HAVE BEEN PERFORMED BY BYPASSING THE DRIVER/RECEIVER CARD ITSELF. THIS TEST INCLUDES THE DRIVER/RECEIVER.

28 SAME AS ROUTINE 27 EXCEPT THAT THE LINE 1 DRIVER/RECEIVER IS CHECKED IF IT IS INSTALLED.

29 THIS ROUTINE CHECKS THAT TSN-0, TSN-1, TSN-E, TSN-B, SSN-F, AND BOS,3 ARE ALL RESET BY ATTACHMENT RESET.

2A THE FIRST PART OF THIS ROUTINE WILL TRANSMIT A POLL TO THE 3277 IF SSW 14 IS OFF AND TO THE 3284/87 IF SSW 15 IS OFF. THE ANSWER EXPECTED BACK IS CLEAR STATUS (ZEROES). HOWEVER, IF THE DEVICES ARE NOT POWERED UP WITH CLEAR STATUS (3277 MAY HAVE AN AID INTERRUPT PENDING. 3284 COVER MAY BE UP, OUT OF FORMS ETC.). CORRECT THE PROBLEM (POWER UP OR RESET) AND RERUN. TO BYPASS POLLING THE 3277, TURN ON SSW 14. TO BYPASS POLLING THE 3284/87, TURN ON SSW 15.

IF SSW16 IS TURNED ON, IT WILL POLL AND RECEIVE VARIOUS COMBINATIONS OF BITS BACK FROM THE UNIT. THIS IS DONE AS FOLLOWS:

A. WITH CLEAR STATUS, THE ROUTINE SHOULD LOOP IN ROUTINE 2A WITH NO ERRORS. (SSW01 MUST BE ON TO LOOP THE ROUTINE. ALSO, TO BYPASS THE SECOND PART OF THIS ROUTINE, TURN ON SSW02 AT THE SAME TIME). NOW TURN ON SSW16 TO START THE POLLING.

CLEAR STATUS FOR THE 3277 (OBTAINED BY POWERING OFF AND ON) IS ALL BITS OFF EXCEPT BIT 1.
CLEAR STATUS FOR 3284/87 (OBTAINED BY POWERING THE PRINTER ON AND HAVING IT READY TO PRINT ON LINE) IS BITS 1,2,12 ON, ALL OTHERS OFF.

B. DEPRESS A PF (OR ANY OTHER AID INTERRUPT CAUSING KEY) ON THE 3277. AN ERROR PRINTOUT AND HALT WILL OCCUR. THE RECEIVED DATA ON THE PRINTOUT (IF PROGRAM CAN RUN THAT FAR) IS THE STATUS BITS RECEIVED FROM THE UNIT.

C. RESET THE HALT AND THE PROGRAM WILL RESUME. HOWEVER THE PROGRAM WILL NOW CHECK THE RECEIVED DATA FOR BEING THE SAME AS THAT PRINTED IN B ABOVE. ANY CHANGE WILL RESULT IN ANOTHER ERROR PRINTOUT.

TO TRY ANOTHER COMBINATION OF BITS, TRY THE FOLLOWING:
A. DEPRESS RESET ON THE 3277 AND ANOTHER EPROP PRINTOUT WILL OCCUR.

B. DEPRESS ANOTHER AID KEY AND RESET THE HALT. ANOTHER PRINTOUT WILL OCCUR SHOWING THE NEW RESPONSE.

C. RESET THE HALT AND THE PROGRAM SHOULD CONTINUE TO RUN.

TABLE OF 3277 AID INTERRUPTS FOLLOWS BELOW:

	DATA RECEIVED IN I/O REGISTER												
KEY BIT	1	2	3	4	5	6	7	8	9	10	11	12	13
CLEAR	1	0	1	0	0	0	0	1	1	0	1	0	0
PA-1	1	0	0	0	0	1	0	1	1	0	0	1	0
CANCEL	1	0	0	0	0	1	0	1	1	1	0	0	0
TEST REQ	1	0	0	0	0	1	1	0	0	0	0	0	0
ENTER	1	0	0	0	0	1	1	1	1	0	1	1	0
PF-1	1	0	0	0	0	1	1	0	0	0	1	1	0
PF-2	1	0	0	0	0	1	1	0	0	1	0	1	0
PF-3	1	0	0	0	0	1	1	0	0	1	1	0	0
PF-4 - PF-12	1	0	0	0	0	1	1	X	X	X	X	P	0

WHERE XXXX = BINARY EQUIVALENT OF KEY NUMBER AND P = 0/1 TO CAUSE ODD PARITY ON ALL 13 BITS.

THE ONLY STATUS OTHER THAN CLEAR,WHICH IS BITS 1,2,12 ON, ALL OTHERS OFF THAT IS EASILY OBTAINABLE FOR 3284/87 IS THE NOT READY CONDITION (BITS 1, 2, 7 ON, ALL OTHERS OFF) WHICH CAN BE OBTAINED BY LIFTING THE COVER.

IF SSW01 AND SSW17 ARE TURNED ON, ROUTINE 2A WILL GO INTO A TIGHT LOOP WHICH WILL CONTINUOUSLY POLL THE SELECTED UNIT WITHOUT THE DELAY REQUIRED BY DCP OVERHEAD AND LOADING OF CONTROL STORAGE.

SSW16 AND SSW17, TOGETHER WITH SSW 01,03,04,06 AND 14 OR 15 PROVIDE A CONVENIENT MEANS FOR TROUBLESHOOTING AND SCOPING. THE SELECTED UNIT WILL BE CONTINUOUSLY POLLED AND WILL GIVE A PREDICTABLE RESPONSE EACH TIME.

THE SECOND PART OF ROUTINE 2A WHICH CAN BE BYPASSED WITH SSW02 SET ON TESTS VARIOUS FUNCTIONS REQUIRING MANUAL INTERVENTION.
THE FUNCTIONS TESTED ARE:
- LIGHTING THE I/O CHECK LIGHT
- SYSTEM RESET
- CHECK RESET
- INVALID I/O INSTRUCTIONS (INVALID SIO, SNS AND LIO)

IN THIS ROUTINE, THE RIGHTMOST CONSOLE SWITCH IS USED TO PROVIDE 'YES' OR 'NO' ANSWERS TO THE PROGRAM (0 = 'NO', 1-F = 'YES').

SECTION 141--CONTINUED

2B THIS ROUTINE MAY BE MANUALLY SELECTED BY THE CE TO INSERT HIS OWN LIMITED MICROPROGRAMS IF DESIRED. IN ORDER TO USE THIS ROUTINE, SECTION 141 MUST BE CAPABLE OF RUNNING AT LEAST TO THE END OF ROUTINE 05 ERROR FREE. THIS INSURES THAT THE OP-DECODE REGISTERS CAN BE LOADED AND THAT THE HDB'S AND CONTROL STORAGE ARE ALL RIGHT.

THE CE'S MICROPROGRAM MUST BE MANUALLY ENTERED INTO MAIN STORAGE. THERE IS ROOM FOR A MAXIMUM OF 32 CONTROL WORDS. THE FIRST WORD MUST BE PLACED IN MAIN STORAGE LOCATION 3FC0-3FC1. THE REST FOLLOW IN SUCCESION. WITH NO PROGRAM INSERTED, MAIN STORAGE 3FC0-3FFF CONTAINS 32 BOS,0 CONTROL WORDS. EACH BRANCHES TO ITSELF. THE CE STORES HIS PROGRAM OVER THIS AS REQUIRED. THE PROGRAM THUS ENTERED IN STORAGE IS THEN ENABLED FOR ABOUT 518 CYCLES AND THEN DISABLED. A PROPER MICROPROGRAM WILL HALT AT A PREDICTABLE LOCATION AND A SENSE OF CONTROL STORAGE WILL GIVE PREDICTABLE RESULTS IF THE PROGRAM EXECUTED PROPERLY. IF THE PROGRAM DID NOT STOP AT THE EXPECTED LOCATION, A 9F HALT WILL OCCUR. THE CE MUST ALSO ENTER THE EXPECTED HANG ADDRESS (00-1F) IN MAIN STORAGE LOCATION 3FBF. THE FOLLOWING IS AN EXAMPLE OF A SIMPLE PROGRAM THAT WILL LOAD HDB 02 WITH X'01', SHIFT IT LEFT ONCE, INCREMENT IT AND TEST IT FOR CONTAINING THE CORRECT RESULT (03). IF THE RESULT IS INCORRECT, THE MICROPROGRAM WILL HANG AT CONTROL STORE ADDRESS 005. IF THE RESULT IS CORRECT, THE MICROPROGRAM WILL HANG AT ADDRESS 006.

PROGRAM STEP DESCRIPTION	M.S ADDR	C.S. ADDR	CONTENTS
INSERT '01' IN HDB 02	3FC0-3FC1	000	7201
SHIFT IT LEFT 1 BIT	3FC2-3FC3	001	0240
INCREMENT BY ONE	3FC4-3FC5	002	0280
TEST HDB 02 FOR '03'	3FC6-3FC7	003	E203
BRANCH TO ADDR 006 IF OK	3FC8-3FC9	004	9C06
HANG AT ADDR 005 IF NOT	3FCA-3FCB	005	5005
HANG AT ADDR 006 IF OK	3FCC-3FCD	006	5006

TO LOAD AND RUN THE ABOVE PROGRAM:
A. LOAD AND RUN SECTION 141 (MUST RUN ERROR FREE PAST ROUTINE 05).
B. SINCE THE PROGRAM IS WRITTEN TO HANG AT CONTROL STORE ADDRESS 006, STORE A '06' AT MAIN STORE 3FBF.
C. STORE THE MICRO-WORDS (CONTENTS) IN MAIN STORAGE (M.S ADDR). THESE MICRO-WORDS WILL BE LOADED BY ROUTINE 2B IN SEQUENTIAL CONTROL STORE LOCATIONS (C.S. ADDR). THE REST OF CONTROL STORE WILL BE AUTOMATICALLY FILLED WITH BOS,0 TO THE ADDRESS SO THE MICROPRORAM WILL HANG IN THESE WORDS IF IT GETS THERE.
D. SELECT AND RUN ROUTINE 2B.
E. A NORMAL TERMINATE INDICATES CORRECT OPERATION.
F. A 9F HALT INDICATES THE PROGRAM DID NOT RUN AS EXPECTED. THE ACTUAL AND EXPECTED CONTROL STORE CONTENTS WHERE THE MICROPROGRAM STOPPED OR HUNG WILL BE PRINTED OUT.
G. THE ROUTINE CAN BE LOOPED IN THE NORMAL MANNER TO SCOPE SIGNALS.

2C THIS ROUTINE MAY BE MANUALLY SELECTED TO CAUSE THE CONTENTS OF CONTROL STORAGE AND/OR MESSAGE BUFFER TO BE PRINTED OUT. THE DUMP IS IN 256 WORD (512 BYTE) INCREMENTS. MIAR INDICATES THE ACTUAL CONTROL STORE WORD (16 BITS) ADDRESS AND MBAR INDICATES THE ACTUAL BYTE ADDRESS. NORMALLY, CONTROL STORE OCCUPIES THE FIRST 768 WORDS. MESSAGE BUFFER IS CONTAINED IN THE LAST 256 WORDS (512 BYTES).

TO SUPPRESS PRINTING 1ST 256 WORDS TURN ON SSW 18.
TO SUPPRESS PRINTING 2ND 256 WORDS TURN ON SSW 19.
TO SUPPRESS PRINTING 3RD 256 WORDS TURN ON SSW 1A.
TO SUPPRESS PRINTING 4TH 256 WORDS TURN ON SSW 1B.
IF AN ATTACHMENT CHECK OCCURS, THE ADDRESS AND DATA THAT CAUSED THE FIRST ONE IS PRINTED OUT.

2D RESERVED FOR FUTURE USE.

2E THIS ROUTINE IS MANUALLY SELECTED TO PROVIDE A PROGRAM USED TO CHECK OUT THE CE TEST BOX. INSTRUCTIONS FOR USE OF THIS ROUTINE ARE INCLUDED WITH THE INSTRUCTIONS FOR USE OF THE CE TEST BOX.

2F THIS ROUTINE MAY BE MANUALLY SELECTED TO CAUSE THE CONTENTS OF ALL 32 HDB'S TO BE PRINTED OUT.

4.2 SECTION 143 3277 MICROCODE LOADER

THIS PROGRAM LOADS THE 3277 CONTROL STORE WITH THE MICROCODE. THE MICROCODE DATA DECK ID IS FC0.

4.2.1 PROGRAM LOADING

4.2.1.1 LOADING FROM DISK

ONCE SECTION 143 IS LOADED, IT WILL AUTOMATICALLY BRING IN THE MICROCODE DATA DECK FC0.

4.2.1.2 LOADING FROM CARDS

THE MICROCODE DECK (ID = FC0) MUST BE THE NEXT DECK TO BE READ IN AFTER THE 3277 MICROCODE LOADER DECK (ID = 143). THE MICROCODE LOADER WILL HALT WITH -F1- PRIOR TO READING IN THE MICROCODE DECK (ID = FC0). RESETTING THE HALT WILL START THE LOADING OF CONTROL STORE.

4.2.1.3 LOADING WITH SENSE SWITCH 10 ON FROM DISK OR CARDS

WHEN SECTION 143 IS LOADED, THE FOLLOWING INFORMATION WILL BE PRINTED PRIOR TO -F0- HALT:

```
-                                                                          -
-   3277 MICRO-CODE LOADER PROGRAM                                         -
-                                                                          -
-   SELECT OPTION BY PUTTING ONE OF FOLLOWING VALUES INTO DATA SWITCHES    -
-   AND RESET HALT                                                         -
-                                                                          -
-   01 - LOAD CONTROL STORE, SENSE CONTROL STORE, AND PRINT OBJECT CODE    -
-                                                                          -
-   02 - LOAD AND SENSE CONTROL STORE ONLY                                 -
-                                                                          -
-   03 - SENSE AND PRINT CONTENTS OF CONTROL STORE                         -
-                                                                          -
```

AFTER SELECTING OPTION ON DATA SWITCHES, RESET HALT -F0-.

4.2.2 PROGRAM EXECUTION

4.2.2.1 SENSE SWITCH 10 OFF

PROGRAM DEFAULTS TO OPTION 02 - LOAD AND SENSE CONTROL STORE ONLY (SEE EXPLANATION 4.2.2.2.2)

4.2.2.2 SENSE SWITCH 10 ON

4.2.2.2.1 OPTION 01 - LOAD CONTROL STORE, SENSE CONTROL STORE, AND PRINT OBJECT CODE

THE MICROCODE DECK (FC0) IS READ INTO THE SYSTEM/3 MEMORY. THE 3277 CONTROL STORE IS THEN LOADED WITH THE COMPLETE MICROPROGRAM. THE MICROCODE IS THEN SENSED FROM THE CONTROL STORE AND COMPARED WITH THE MICROCODE THAT WAS LOADED. THE SENSED MICROCODE IS THEN PRINTED OUT. IF DATA COMPARES, SECTION TERMINATES. IF NOT, ERROR DUMP & RETRY USING OPTION 5.

4.2.2.2.2 OPTION 02 - LOAD AND SENSE CONTROL STORE ONLY

THE MICROCODE DECK (FC0) IS READ INTO THE SYSTEM/3 MEMORY. THE 3277 CONTROL STORE IS THEN LOADED WITH THE COMPLETE MICROPROGRAM. THE MICROCODE IS THEN SENSED FROM THE CONTROL STORE AND COMPARED WITH THE MICROCODE THAT WAS LOADED. IF DATA COMPAPES, SECTION TERMINATES. IF NOT, ERROR DUMP AND RE-TRY USING OPTION 5.

4.2.2.2.3 OPTION 03 - SENSE AND PRINT 3277 CONTROL STORE

THE MICROCODE DECK (FC0) IS READ INTO THE SYSTEM/3 MEMORY. THE CONTENTS OF THE 3277 CONTROL STORE IS SENSED AND COMPARED TO THE MICROCODE IN THE DATA DECK (FC0). THE INFORMATION IS PRINTED OUT IN A DOUBLE COLUMN. THE LEFT COLUMN CONTAINS MICPOCODE FROM THE MICROCODE DECK (FC0). THE RIGHT COLUMN CONTAINS MICROCODE SENSED FROM THE 3277 CONTROL STORE. IF THE TWO LINES OF MICROCODE DO NOT COMPARE, A DOLLAR SIGN ($) IS ENTERED TO THE RIGHT OF THE LINE IN ERROR.

```
-                                                                          -
- ADDR      CODE READ INTO CORE                CODE SENSED FROM 3277    ERP -
-                                                                          -
- 0000  0000000100020003000400050006000 7  00000001000200030004000500060007      -
- 0008  00080009000A000B000C000D000E000F  00080009000A000B000C000D000E000F      -
- 0010  00100011001200130014001500160017  0010001100120013001400150016FFFF  $   -
- 0018  00180019001A001B001C001D001E001F  FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF  $   -
-                                                                          -
```

4.2.2.2.4 OPTION 04 - PRINT 3277 MICROCODE DECK IMAGE FROM SYSTEM/3 CORE

THIS OPTION IS AVAILABLE ONLY IF A LOADING ERROR HAS OCCURRED. THE MICROCODE DECK WHICH WAS LOADED IS TOO LARGE FOR THE SYSTEM 3277 CONTROL STORAGE. SETTING THE DATA SWITCHES TO 04 AND RESETTING -E1- HALT WILL DUMP THE 3277 MICROCODE DECK IMAGE FROM SYSTEM/3 CORE.

4.2.2.2.5 OPTION 05 - RETRY LOADING 3277 CONTROL STORE

THIS OPTION IS AVAILABLE ONLY IF A LOADING ERROR HAS OCCURRED. SETTING DATA SWITCHES TO 05 AND RESETTING -E2- HALT WILL RELOAD THE 3277 CONTROL STORE WITH THE MICROCODE ALREADY IN SYSTEM/3 MEMORY. OPTION 05 IS LIKE OPTION 02 EXEPT THE SOURCE CODE IS ALREADY IN SYSTEM/3 MEMORY.

4.3

```
************************************************************
*                                                          *
*                      SECTION 144                         *
*                                                          *
************************************************************
```

NOTE: A. IF SECTION 141 HAS JUST BEEN RUN, SECTION 143 MUST BE EXECUTED BEFORE THIS SECTION SO THE MICRO-CODE MAY BE RESTORED.

B. THIS USERS GUIDE DOES NOT PROVIDE SERVICE AID INFORMATION RELATED TO THE USE OF THE TEST PATTERNS IN ROUTINES 05 - 0A. REFER TO THE 3277 OR 3284/87 TROUBLESHOOTING MANUALS FOR THIS INFORMATION.

C. ALL TEST PATTERNS (ROUTINES 05 - 0A) WAIT APPROXIMATELY ONE MINUTE FOR AN INTERRUPT FROM THE TEST REQUEST KEY OR THE CANCEL KEY. IF AN INTERRUPT IS NOT RECEIVED IN THIS TIME, A PROGRAM TIMEOUT WILL OCCUR AND THE NEXT TEST PATTERN WILL BE INITIATED. THEREFORE, THE CANCEL KEY SHOULD BE PRESSED TO AVOID THE TIMEOUT AND LEAVE THE TEST PATTERN AVAILABLE FOR USE WITH THE TROUBLESHOOTING MANUAL.

01 WRITE/READ ALL DATA TEST. THIS ROUTINE DOES A WRITE OF X'00' TO X'FF' (256 BYTES) AND THEN DOES A READ OF THE SAME INFORMATION. CERTAIN DATA WILL BE EXPECTED TO BE FOLDED WHEN READ.

IF SSW24 IS ON, A 480 BYTE FIELD OF DATA WILL BE WRITTEN AND THEN READ FROM THE 3284/87. A NON-PRINT ATTRIBUTE CHARACTER SHOULD KEEP THE DATA FROM ACTUALLY BEING WRITTEN BY THE 3284/87. IF DATA IS WRITTEN, RUN SECTION 141. IF THERE ARE NO ERRORS IN 141, REFER TO THE 3284/87 TROUBLESHOOTING MANUAL.

02 INTERRUPT STACKING TEST. THIS ROUTINE WILL STACK 17 INTERRUPTS BY ALTERNATING WRITE AND READ COMMANDS (THE READ COMMAND SHOULD STACK PROGRAM ERROR STATUS). AFTER THE 17TH COMMAND, THE TIO IS USED TO ENSURE THAT THE ATTACHMENT REMAINS BUSY. AFTER THIS IS CHECKED, INTERRUPTS ARE ENABLED SO THAT THE 17 STACKED INTERRUPTS MAY BE PRESENTED. STATUS FROM THE INTERRUPTS WILL ALTERNATE BETWEEN X'0000' AND X'0808'.

03 MBAR AND CURAR GREATER THAN 480. A WRITE COMMAND WITH MBAR = 481 IS ISSUED WITH STATUS OF X'0808' (PROGRAM ERROR) EXPECTED. THE ABOVE SEQUENCE IS THEN REPEATED WITH CURSOR = 481 AND THE SAME ERROR STATUS CHECKED.

04 PARITY GENERATION TEST. CONTROL STORE IS MODIFIED SO THAT THE GENERATION OF PARITY IN THE CONTROL WORD WILL BE BLOCKED. (CRT AVAILABILITY FLAG IS TURNED OFF FOR THIS PORTION OF THE TEST). NOW VARIOUS SEQUENCES OF PARITY GENERATION ARE CHECKED, THE FIRST OF WHICH IS THE CURSOR. THE BUFFER IS SET TO X'F7' AND THE CURSOR SET TO LOCATION 1 SO THAT IT WILL BE THE CAUSE OF THE TRANSMIT CHECK (EXPECTED STATUS FROM BAD PARITY). THIS IS FOLLOWED BY A UNIT INTERRUPT INDICATING DEVICE CHECK. AFTER REFRESHING THE BUFFER, A TRANSMIT CHECK IS CAUSED BY USING BAD DATA (X'F6') IN LOCATION 8. THIS IS REPEATED FOR BAD DATA X'01' AND ALSO FOR X'FF' (BAD DATA IS DEFINED AS THAT WHICH REQUIRES THE PARITY BIT TO BE ON). EACH TRANSMIT CHECK IS FOLLOWED BY A DEVICE CHECK FROM THE UNIT. NOW THE 3284/87 WILL BE CHECKED FOR DETECTING BAD PARITY. THIS IS DONE SIMILARILY TO THE 3277 EXCEPT A TRANSMIT CHECK WILL BE EXPECTED STATUS WITH NO SECOND INTERRUPT GIVING THE DEVICE CHECK. NOTE THAT SSW21 MAY BE SET TO BYPASS CHECKING THE 3284. AFTER THE ABOVE HAS BEEN COMPLETED, CONTROL STORE IS RESTORED SO THAT PARITY MAY BE GENERATED AND THE CRT AVAILABILITY FLAG IS TURNED BACK ON.

05 INFORMATIONAL TEST PATTERN. THIS IS THE FIRST OF THE STANDARD 3270 TEST PATTERNS. THIS PATTERN EXPLAINS THAT TO OBTAIN SUCCEEDING TEST PATTERNS, PRESS THE TEST REQUEST KEY. IF A PARTICULAR PATTERN IS TO BE USED WITH THE TROUBLE SHOOTING MANUAL, THE CANCEL KEY MAY BE PRESSED TO LEAVE THE PATTERN DISPLAYED, BUT THE SECTION WILL BE TERMINATED. IN THIS MANNER THE TIMEOUT MAY BE AVOIDED SO THAT THE TEST PATTERN MAY BE USED WITH THE TROUBLESHOOTING MANUAL. IF THE 3284/87 IS DEFINED AS AVAILABLE(VIA THE UDT), THE TEST PATTERNS WILL BE OUTPUT TO THE PRINTER UNDER VARIOUS LINE CONTROLS. SSW20 MAY BE USED TO BYPASS DISPLAYING ON THE CRT OR SSW21 MAY BE USED TO BYPASS PRINTING FOR 3284/87. THIS APPLIES TO ALL THE TEST PATTERN ROUTINES

06 ALL DATA KEYS PATTERN. THIS PATTERN MAY BE USED TO TEST ALL DATA KEYS PLUS SOME OTHER 3277 FEATURES. (SEE 4.6.2)

07 ALIGNMENT TEST PATTERN MAY BE USED TO ADJUST THE CRT. (SEE 4.6.3)

08 BASIC PRINTER PATTERN (SEE 4.6.4)

09 UNIVERSAL CHARACTERS PATTERN (SEE 4.6.5)

0A NEW LINE FUNCTION PATTERN (SEE 4.6.6)

0B ALL DATA KEYS TEST. MESSAGE IS OUPUT ON THE CRT INDICATING ALL DATA KEYS SHOULD BE PRESSED IN LOWER CASE. UPON DETECTION OF THE TEST REQUEST KEY, A READ IS PERFORMED TO CHECK FOR THE CORRECT ENCODE FROM EACH KEY. THIS SEQUENCE IS THEN REPEATED FOR UPPER WITH THE SAME TESTING BEING DONE.

0C FUNCTION KEYS TEST. A MESSAGE IS OUTPUT ON THE CRT INDICATING THE ORDER IN WHICH THE FUNCTION KEYS SHOULD BE PRESSED. AS INTERRUPTS ARE RECEIVED FROM THE KEYS, THE STATUS IS CHECKED FOR THE CORRECT AID BITS. IF IT IS CORRECT, THE CURSOR IS ADVANCED ONE POSITION TO INDICATE THE KEY TESTED ALL RIGHT.

0D TERMINATION ROUTINE. UNDER NORMAL TERMINATION, THIS ROUTINE WILL CLEAR THE SCREEN, UNLOCK THE KEYBOARD, STOP THE MICRO-PROCESSOR, AND TERMINATE THE SECTION.

0E THIS ROUTINE MUST BE SELECTED VIA DCP 'F20E' TO BE RUN. IT WILL LOOP ON WRITING 480 BYTES OF DATA TO THE 3277. THIS DATA WILL CONSIST OF THE MESSAGE 'ROUTINES 0E AND 0F LOOP ON WRITING AND READING 480 BYTES OF DATA' REPEATED 6 TIMES. IF SSW23 IS ON, THE DATA SWITCHES MAY BE SET TO A SPECIFIC VALUE FOR THE DATA TO BE WRITTEN.

IF SSW24 IS SET, THE DATA WILL BE WRITTEN TO THE 3284 RATHER THAN THE 3277. HOWEVER THE END OF MESSAGE(X'39') ATTRIBUTE WILL BE IN BUFFER POSITION 1 SO NO PRINTING WILL BE DONE (UNLESS SSW23 WAS SELECTED).

0F THIS ROUTINE MUST ALSO BE SELECTED VIA DCP 'F20F' AND MUST NOT BE USED UNLESS ROUTINE 0E WAS RUN PREVIOUSLY. THE ROUTINE WILL LOOP ON READING THE 480 BYTES WRITTEN BY ROUTINE 0E WITH ERRORS NOTED BY DATA MISCOMPARES. AS WITH ROUTINE 0E, IF SSW24 IS ON, THE READS WILL BE TO THE 3284/87. OTHERWISE, THEY WILL BE TO THE 3277.

IT MUST BE NOTED THAT SOME CHARACTERS ARE FOLDED AS THEY ARE READ FROM THE CRT BUFFER AND TRANSFERRED TO MAIN STORE. THEREFORE IF SSW23 WAS ON IN ROUTINE 0E AND ONE OF THESE TYPES OF CHARACTERS WAS WRITTEN, A 'DATA MISCOMPARE' WILL BE NOTED ON THE READ. HOWEVER SENSE SWITCHES 03 AND 06 (BYPASS ERROR PRINTING AND HALTING) MAY BE SET TO CONTINUE LOOPING ON THE 'READ'.

4.4 3277 MICROCODE DECK (ID = FC0)--NOTE THAT THIS DECK WILL NORMALLY RESIDE ON DISK. HOWEVER, IF IT IS RECEIVED FOR AN UPDATE, IT WILL BE IN THE FOLLOWING FORMAT:

THE FIRST CARD IN THE DECK IS THE DATA DECK HEADER CARD. THE FUNCTION OF THIS CARD IS TO MAKE THE MICROCODE DECK CONFORM TO THE DIAGNOSTIC PROGRAMMING STANDARDS. THE HEADER CARD DEFINES THE REST OF THE DECK AS DATA. IT CONTAINS THE PART NUMBER, EC NUMBER, PROGRAM NUMBER, AND EC LEVEL.

THE DATA DECK HEADER CARD IS REQUIRED TO BE THE FIRST CARD WHEN THE FC0 DECK IS USED WITH 143 OR FC1. THE 'H' CARD, THE SECOND CARD IN THE DECK, IS IGNORED WHEN THE MICROCODE DECK (FC0) IS USED WITH SECTION 143 OR WITH SECTION FC1.

THE DATA DECK HEADER CARD MUST BE REMOVED WHEN THE FC0 DECK IS USED WITH THE IOCS PROGRAM. THE 'H' CARD CONTAINS INFORMATION REQUIRED BY THE IOCS PROGRAM TO LOAD THE MICROCODE DECK (FC0) TO DISK.

THE 39 'T' CARDS CONTAIN THE 3277 MICROCODE.

THE 'E' CARD IS THE 'LAST CARD' OF THE 3277 MICROCODE DECK (FC0).

4.5 PROGRAM TO UPDATE MICROCODE ON SYSTEM PACK (ID = FC1)

THIS PROGRAM WILL BE USED TO UPDATE THE 3277 MICROCODE ON HTE SYSTEM PACK FROM THE DIAGNOSTIC INPUT DEVICE (INPUT DEVICE IS DISK IF RUNNING FROM DISK). -FC1- WILL READ 3277 MICROCODE (ID = FC0) INTO CORE. IT WILL THEN OUTPUT THE FOLLOWING THREE ITEMS (STATEMENT 2 IS BY-PASSED IF THE ANSWER TO QUESTION 1 IS F1) USING THE CRT/KEYBOARD FOR INPUT.

1. SYSTEM PACK RUNS FROM THE 5444/3340 SIMULATED AREA OF R1 OR F1? (ENTER R1 OR F1).
2. PLACE THE SYSTEM PACK ON R1/D2, POWER UP DISK AND PRESS ENTER.
3. GIVE THE NAME OF YOUR MICROCODE OBJECT FILE.
   IT WILL DEFAULT TO $$MCRO IF NO NAME IS GIVEN.

AFTER THE QUESTIONS HAVE BEEN ANSWERED, THE MICROCODE IS WRITTEN ON THE SYSTEM PACK AND THE SECTION IS TERMINATED.

NOTE: IF BOTH 3340 AND 5444 ARE DEFINED IN THE UDT, SSW 2D IS USED TO SELECT 3340 AND SSW 2E IS USED TO SELECT 5444, TO DEFINE WHERE THE SYSTEM PACK RESIDES.

4.6 TEST PATTERNS

4.6.1 INFORMATIONAL DISPLAY - ROUTINE 5

```
                                        COLUMN
         0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
 ROW     1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
  1     |_        T E S T   P A T T E R N   S E Q U E N C I N G                        |
  2     |                                                                              |
  3     | 1 .   P R E S S   T E S T   R E Q U E S T   T O   C A L L   N E X T          |
  4     |                                                                              |
  5     |     S E Q U E N T I A L   P A T T E R N .   S E C T I O N   W I L L          |
  6     |                                                                              |
  7     |     T E R M I N A T E   O N   L A S T   P A T T E R N .                      |
  8     |                                                                              |
  9     | 2 .   P R E S S   C N C L   K E Y   T O   D I S C O N N E C T   C P U        |
 10     |                                                                              |
 11     |     A N D   L E A V E   P A T T E R N   F O R   O F F - L I N E   U S A G E .|
 12     |                                                                              |
         ------------------------------------------------------------------------------
```

NOTES ON ROUTINE 5

1. THIS IS AN INFORMATIONAL DISPLAY WHICH WILL BE OBTAINED FROM ROUTINE 7. NO OTHER ACTION NEED BE TAKEN WITH THIS DISPLAY OTHER THAN FOLLOWING THE DIRECTIONS GIVEN.

2. IF THE CANCEL KEY IS PRESSED, THE CURRENT DISPLAY WILL BE KEPT, BUT THE SECTION BEING EXECUTED WILL TERMINATE. THE KEYBOARD WILL BE RESET SO THAT DATA KEY FUNCTIONS MAY BE USED. THIS WILL ALLOW THE OPERATOR TO MAKE ADJUSTMENTS, ETC., USING THE DISPLAY AND THE CORRECT TROUBLESHOOTING MANUAL WITHOUT REGARD TO THE PROGRAM TIMEOUT.

3. THE CURSOR SHOULD APPEAR IN THE UPPER LEFT-HAND CORNER OF THE DISPLAY (ROW 1, COLUMN 1). THE CURSOR IS REPRESENTED IN THIS DISPLAY AND ANY SUCCEEDING DISPLAYS BY THE CHARACTER '_'.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 0000000001111111111222222222233333333334
       1234567890123456789012345678901234567890
   ROW
    1        TEST PATTERN SEQUENCING
    2
    3  1. PRESS TEST REQUEST TO CALL NEXT
    4
    5    SEQUENTIAL PATTERN. SECTION WILL
    6
    7    TERMINATE ON LAST PATTERN.
    8
    9  2. PRESS CNCL KEY TO DISCONNECT CPU
   10
   11    AND LEAVE PATTERN FOR OFF-LINE USAGE.
   12
```

4.6.2 TEST PATTERN 1 - ROUTINE 6

```
                                      COLUMN
       0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
 ROW   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
  1  |                                                                                |
  2  |                                                                                |
  3  |A0 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  AC N O N   D I S P L A Y|
  4  |                                                                                |
  5  |80_C O P Y   A B O V E   I N   T H I S   L I N E       80 I N S E R T   C K     |
  6  |A0                                                                              |
  7  |A0 | @ # $ %4A & * ( ) _ +5A :7F < > ? - = ¬5E ' /                              |
  8  |                                                                                |
  9  |88 C O P Y   A B O V E   I N   T H I S   L I N E  A0                            |
 10  |A0                                                                              |
 11  |                                                                                |
 12  |--------------------------------------------------------------------------------|
```

NOTES TEST PATTERN 1 - ROUTINE 6

1. THE CURSOR WILL BE INSERTED IN ROW NUMBER 5 SUPERIMPOSED WITH THE FIRST CHARACTER. AT THIS POINT, THE ALPHABET SHOULD BE COPIED EXACTLY AS IT APPEARS IN ROW 3.
2. IN ROW 9, COPY THE SPECIAL CHARACTERS LINE EXACTLY AS IT APPEARS IN ROW 7.
3. HEX 4A IN ROW 7 WILL APPEAR AS THE CENT SIGN.
4. HEX 5A IN ROW 7 WILL APPEAR AS AN EXCLAMATION POINT.
5. HEX 7F IN ROW 7 WILL APPEAR AS QUOTE MARKS.
6. HEX 5E IN ROW 7 WILL APPEAR AS A SEMI-COLON.
7. NOTE THAT THE INFORMATION IN ROW 3 ENTITLED 'NON DISPLAY' SHOULD NOT APPEAR ON THE SCREEN. THIS IS TO CHECK THE HEX AC NON DISPLAY CONTROL CHARACTER TO ENSURE IT INHIBITS DISPLAYING.
8. ATTRIBUTE CHARACTERS (SUCH AS THE 'A0' IN ROW 3) ACTUALLY APPEARS AS BLANKS ON THE SCREEN. THEY ARE ILLUSTRATED IN THESE PRINTOUTS SO THE CE MAY KNOW WHERE THEY ARE IN RELATIONSHIP TO THE DATA ON THE SCREEN. ALL ATTRIBUTE CHARACTERS ARE EXPLAINED IN SECTION 5.2.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 0000000001111111111222222222233333333334
       1234567890123456789012345678901234567890
  ROW
   1
   2
   3    ABCDEFGHIJKLMNOPQRSTUVWXYZ
   4    COPY ABOVE IN THIS LINE     INSERT CK
   5
   6    |@#$% &*()_+ : <>?-=¬ '/
   7
   8    COPY ABOVE IN THIS LINE
   9
  10
  11
  12
```

NOTES ON THE PRINTER OUTPUT

1. IN ROW 7 BETWEEN THE % AND & SHOULD PRINT THE CENT SIGN.
2. IN ROW 7 BETWEEN THE + AND : SHOULD PRINT THE EXCLAMATION POINT.
3. IN ROW 7 BETWEEN THE : AND < SHOULD PRINT THE QUOTE MARKS.
4. IN ROW 7 BETWEEN THE ¬ AND ' SHOULD PRINT THE SEMI-COLON.

4.6.3 TEST PATTERN 2 - ROUTINE 7

```
                                          COLUMN
        0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
 ROW    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
  1    |E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E|
  2    |H                                                                             H|
  3    |H                                                                             H|
  4    |H                                                                             H|
  5    |H                                                                             H|
  6    |H                                     O O                                     H|
  7    |H                                     O O                                     H|
  8    |H                 T E S T   P A T T E R N   F O R   3 2 7 7 - 1               H|
  9    |H                               A L I G N M E N T                             H|
 10    |H               *80_U N P R O T E C T E D   D A T A         A0 *              H|
 11    |H                                                                             H|
 12    |E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E|
```

NOTES TEST PATTERN 2 - ROUTINE 7

1. THE CURSOR WILL BE SUPERIMPOSED WITH THE 'U' IN UNPROTECTED, ROW 10.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 0000000001111111111222222222233333333334
       1234567890123456789012345678901234567890
   ROW
    1  EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE
    2  H                                      H
    3  H                                      H
    4  H                                      H
    5  H                                      H
    6  H                  OO                  H
    7  H                  OO                  H
    8  H         TEST PATTERN FOR 3277-1      H
    9  H                ALIGNMENT             H
   10  H        * UNPROTECTED DATA      *     H
   11  H                                      H
   12  EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE
```

4.6.4 TEST PATTERN 3 - ROUTINE 8

```
                                   COLUMN
        0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
  ROW   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
   1   |A0 F O R   6 4   C H A R A C T E R   P R I N T   D A T A   S H O U L D   S T A R|
   2   | T   N E X T   L I N E   H E R E   - - - - - - > C H E C K I N G   P R O G R A M|
   3   |   T A B / E R A S E   U N P R O T .   T O   A D D R / D U P / F I E L D   M A R|
   4   | K   O R D E R S                                                                |
   5   |                                                                                |
   6   |                                                                                |
   7   |_B81 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1|
   8   |                                                                                |
   9   |88 A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A|
  10   |                                                                    *5E 5 9     |
  11   |A0 B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B|
  12   | B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B  |
        --------------------------------------------------------------------------------
```

NOTES TEST PATTERN 3 - ROUTINE 8

1. THE CURSOR WILL APPEAR IN THE FIRST POSITION OF ROW 7, SUPERIMPOSED WITH THE ATTRIBUTE CHARACTER 'B8' (WHICH WILL APPEAR AS A BLANK ON THE SCREEN).
2. HEX 5E IN ROW 10 WILL APPEAR AS A SEMI-COLON ON THE DISPLAY SCREEN.
3. NOTE THAT THIS DISPLAY IS USED MAINLY TO CHECK PRINTER FUNCTIONS (IF ONE IS AVAILABLE).

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 0000000001111111111222222222233333333334444444444555555555566666
       1234567890123456789012345678901234567890123456789012345678901234
  ROW
   1    FOR 64 CHARACTER PRINT DATA SHOULD START NEXT LINE HERE ------>
   2   CHECKING PROGRAM TAB/ERASE UNPROT. TO ADDR/DUP/FIELD MARK ORDERS
   3
   4                                                    111111111111111
   5   111111111111111111111111
   6    AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
   7              * 59  BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
   8   BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
```

NOTES ON THE PRINTER OUTPUT

1. IN ROW 7 A SEMI-COLON WILL BE PRINTED BETWEEN THE * AND THE 5.

4.6.5 TEST PATTERN 4 - ROUTINE 9

```
                                         COLUMN
        0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
 ROW    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
  1    | A B C D E F G H I8A < ( + | & J K L M N O P Q R9A ) 9E ¬                      A0|
  2    | S T U V W X Y Z   % _ > ? : # @ ' =BF   . $ * - / , 0 1 2 3 4 5 6 7 8 9      80|
  3    | A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9      A0|
  4    | A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9      80|
  5    |   & - /   & - /                                                              60|
  6    |4A . < ( + |5A $ * )5E ¬   , % _ > ? : # @ ' =7F                              80|
  7    |CA . < ( + |DA $ * )DE ¬   , % _ > ? : # @ ' =FF                              A0|
  8    | N / L   C H E C K 5 5 5 5 5                                                    |
  9    | E O M   C H E C K 9 9                                                          |
 10    |                                                                              80|
 11    |_                                                                               |
 12    |--------------------------------------------------------------------------------|
```

NOTES ON TEST PATTERN 4 - ROUTINE 9

1. IN ROW 1 HEX 8A WILL DISPLAY AS THE CENT SIGN.
2. IN ROW 1 HEX 9A WILL DISPLAY AS THE EXCLAMATION POINT.
3. IN ROW 1 HEX 9E WILL DISPLAY AS THE SEMI-COLON.
4. IN ROW 2 HEX BF WILL DISPLAY AS THE QUOTE MARKS.
5. IN ROW 6 HEX 5A WILL DISPLAY AS THE EXCLAMATION POINT.
7. IN ROW 6 HEX 4A WILL DISPLAY AS THE CENT SIGN.
10. IN ROW 6 HEX 7F WILL DISPLAY AS QUOTE MARKS.
12. IN ROW 6 HEX 5E WILL DISPLAY AS A SEMI-COLON.
11. IN ROW 7 HEX FF WILL DISPLAY AS QUOTE MARKS.
13. IN ROW 7 HEX DE WILL DISPLAY AS A SEMI-COLON.
6. IN ROW 7 HEX DA WILL DISPLAY AS THE EXCLAMATION POINT.
8. IN ROW 7 HEX CA WILL DISPLAY AS THE CENT SIGN.
9. THE CURSOR WILL BE PLACED IN THE FIRST POSITION OF ROW 11.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

1. THIS PATTERN WILL BE PRINTED AT 132 CHARACTERS PER LINE. THEREFORE THE FIRST LINE WILL CONTAIN THE INFORMATION ABOVE DOWN THROUGH THE 'L' IN ROW 4, COLUMN 12. THE SECOND LINE OF PRINT WILL START WITH THE 'M' FROM ROW 4, COLUMN 13 AND CONTINUE THROUGH THE QUOTE MARKS FROM ROW 7, COLUMN 24. THE THIRD LINE OF PRINT WILL START WITH THE 16 BLANKS FROM ROW 7 FOLLOWED BY 'N/L CHECK'. FIVE NEW LINE PRINTER CONTROL CHARACTERS WILL CAUSE 4 LINES OF BLANKS TO APPEAR FOLLOWED BY THE LAST LINE OF PRINT WHICH WILL CONTAIN 26 BLANKS TERMINATING WITH 'EOM CHECK'.

4.6.6 TEST PATTERN 5 - ROUTINE A

```
                                    COLUMN
        0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
  ROW   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
   1   |_N E W   L I N E   F U N C T I O N   C H E C K 5 N E W   L I N E   F U N C T I O|
   2   |N 5 N E W   L I N E 5 N E W 5 N E W   L I N E 5 N E W   L I N E   F U N C T I O|
   3   |N 5 N E W   L I N E   F U N C T I O N   C H E C K 58C T H I S   D A T A   N O T|
   4   |  V I S I B L E / E O M   A N D   N / L   I G N O R E D 5 980 E N D - O F - M E|
   5   |S S A G E - T E R M I N A T E S   P R I N T 9 5 2 N D   E O M   L I N E   N O T|
   6   |O N   P R I N T E R   O U T P U T 9                                            |
   7   |                                                                               |
   8   |                                                                               |
   9   |                                                                               |
  10   |                                                                               |
  11   |                                                                               |
  12   |                                                                               |
        -------------------------------------------------------------------------------
```

NOTES ON TEST PATTERN 5 - ROUTINE A

1. NOTE THAT THIS DISPLAY HAS A PORTION WHICH SHOULD NOT BE VISIBLE AT THE DISPLAY STATION. (BEGINNING IN ROW 3, -8CTHIS DATA NOT VISIBLE/EOM AND N/L IGNORED 5 9- WILL NOT BE VISIBLE.)
2. NOTE ALSO THAT VARIOUS PRINTER FUNCTIONS ARE BEING CHECKED BY THIS TRANSMISSION. IF ATTACHED, CHECK THE PRINTER OUTPUT TO ENSURE THAT THESE FUNCTIONS HAVE BEEN CORRECTLY EXECUTED.
3. THE CURSOR WILL BE SUPERIMPOSED WITH THE 'N' IN 'NEW LINE FUNCTION CHECK' IN ROW 1.
4. NOTE THAT THIS DISPLAY IS USED MAINLY TO CHECK PRINTER FUNCTIONS (IF ONE IS AVAILABLE).

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 00000000011111111112222222222333333333344444444445555555555666666666677777777778
       12345678901234567890123456789012345678901234567890123456789012345678901234567890
  ROW
   1   NEW LINE FUNCTION CHECK
   2   NEW LINE FUNCTION
   3   NEW LINE
   4   NEW
   5   NEW LINE
   6   NEW LINE FUNCTION
   7   NEW LINE FUNCTION CHECK
   8                                                  END-OF-MESSAGE-TERMINATES PRINT
```

5.0 GENERAL INFORMATION

5.1 INTERRUPT CONDITION REGISTER (HDB 1C-1D)

SNS BIT	OP END INTERRUPT	UNIT INTERRUPT 3277	UNIT INTERRUPT 3284/87
0	0	1	1
1 2 3	DEVICE ADDR. 000 = LINE 0 = 3277 001 = LINE 1 = 3284/87	0 0 0	0 0 1
4	ANY ERROR	ANY ERROR	ANY ERROR
5	TRANSMIT CHECK ERROR	TRANSMIT CHECK ERROR	TRANSMIT CHECK ERROR
6	RECEIVE CHECK ERROR	RECEIVE CHECK ERROR	RECEIVE CHECK ERROR
7	DEVICE CHECK ERROR	DEVICE CHECK ERROR	DEVICE CHECK ERROR
8	CONTROL CHECK ERROR	CONTROL CHECK ERROR	CONTROL CHECK ERROR
9			EQUIP CHECK ERROR
A	PRINTER DID NOT GO BUSY ERR.	BITS B-F CONTAIN AID	
B	NOT READY/NO RES. ERROR	AID	PRINTER WENT NOT RDY
C	PROGRAM ERROR	AID	
D	PRINTER BUSY ERROR	AID	
E		AID	
F		AID	PRINTER WENT NOT BUSY

NOTE THAT 'NOT READY/NO RESPONSE ERROR' MAY ALSO BE CALLED 'INTERVENTION REQUIRED/DEVICE NOT AVAILABLE' IN THE TROUBLE SHOOTING MANUALS.

AID DEFINITION IS AS FOLLOWS:

BITS	B	C	D	E	F	DEFINITION
	0	1	1	0	0	PA-1 KEY
	0	1	1	0	1	CLEAR KEY
	0	1	1	1	0	CANCEL KEY
	1	0	0	0	0	TEST REQUEST KEY
	1	0	0	0	1	PF-1 KEY
	T	H	R	U		THRU
	1	1	0	0	1	PF-9 KEY
	1	1	0	1	0	PF-10 KEY
	1	1	0	1	1	PF-11 KEY
	1	1	1	0	0	PF-12 KEY
	1	1	1	0	1	ENTER KEY

5.2 ATTRIBUTE CHARACTERS

THESE ATTRIBUTE CHARACTERS ARE USED AS PART OF THE CHARACTER STRING DURING A WRITE TO DEFINE CERTAIN FIELDS. THE ATTRIBUTES ARE NOT VISIBLE ON THE CRT AND DATA CANNOT BE ENTERED FROM THE KEYBOARD OVER THE ATTRIBUTE POSITIONS. ATTRIBUTES ARE DEFINED AS FOLLOWS:

```
BIT 0        ALWAYS A 1
BIT 1        ALWAYS A 0
BIT 2        IF 0, = UNPROTECTED.  IF 1, = PROTECTED.
BIT 3        IF 0, = ALPHAMERIC.  '1' SHOULD NOT BE USED.
BIT 4 AND BIT 5
             00   NORMAL DISPLAY
             01   NORMAL DISPLAY
             10   INTENSIFY
             11   NON DISPLAY, NON PRINT
BIT 6        RESERVED
BIT 7        MODIFIED DATA TAG (MDT)
             IF 0, FIELD HAS NOT BEEN MODIFIED.
             IF 1, FIELD HAS BEEN MODIFIED.
```

5.3 COMMANDS

5.3.1 SIO

SIO COMMANDS TO THIS ATTACHMENT ARE DIVIDED INTO TWO CLASSIFICATIONS: 1) SIO-IMMEDIATE, AND 2) SIO. SIO-IMMEDIATE COMMANDS WILL BE EXECUTED IMMEDIATELY AND NO OP-END INTERRUPT WILL OCCUR. SIO COMMANDS INCLUDE DATA TRANSFER (USUALLY) AND THEREFORE REQUIRE TIME FOR THE ADAPTER TO COMPLETE THEM. UPON COMPLETION, AN OP-END INTERRUPT WILL BE GENERATED. (IN THE CASE OF PRINT COMMANDS TO THE 3284/87, A SECOND INTERRUPT WILL OCCUR UPON COMPLETION OF PRINTING.)

EXPLANATION OF SIO	Q CODE 0	1	2	3	4	5	6	7	IR BYTE 0	1	2	3	4	5	6	7
SIO IMMEDIATE (NO OP-END INTERRUPT)																
SIO IS IMMEDIATE	0	0	0	1	1	0	0	0								
DISABLE/ENABLE ATTACHMENT									1	0/1	X	0	0	0	X	X
DISABLE/ENABLE MICROCONTROLLER									1	X	0/1	0	0	0	X	X
DISABLE/ENABLE INTERRUPTS									X	X	X	0	0	0	1	X
RESET INTERRUPT REQUESTS									X	X	X	0	0	0	1	X
SIO (NON IMMEDIATE - OP-END INTERRUPT)																
ATTACHMENT ADDRESS	0	0	0	1												
SIO IS NON-IMMEDIATE					0											
LINE ADDRESS						X	X	X								
LINE ZERO--3277						0	0	0								
LINE ONE--3284/87						0	0	1								
CONTROL ONLY									0	0	0					
READ (WITH CONTROL)									0	1	0					
WRITE (WITH CONTROL)									1	0	0					
ERASE UNPROTECTED (WITH CONTROL)									1	1	0					
NO CONTROL (UNLOCK KEYBOARD)												0	0	0	0	0
USE BUFFER ADDR REG AND COUNT REG												1				
POTENTIAL EXPANSION (MUST BE ZERO)													0	0		
SOUND ALARM IF BIT IS 1 (3277 ONLY)															X	
UNLOCK/LOCK KEYBOARD (3277 ONLY)																0/1
PRINTER FORMAT (3284/87 ONLY)															X	X
PRINTER FORMAT = NL & EM CONTROL															0	0
PRINTER FORMAT = 40 CHAR PRINT LINE															0	1
PRINTER FORMAT = 64 CHAR PRINT LINE															1	0
PRINTER FORMAT = 80 CHAR PRINT LINE															1	1

5.3.2 LIO

THE LOAD I/O COMMAND INITIATES THE TRANSFER OF TWO BYTES OF DATA FROM MAIN STORAGE TO A DESTINATION AREA IN THE CPU LOAD STORAGE REGISTERS (LSRS) OR THE 3277 ATTACHMENT. IF THE ATTACHMENT IS IN A 'BUSY' STATE WHEN A LIO COMMAND IS ISSUED, THE LIO WILL NOT BE ACCEPTED UNTIL THE ATTACHMENT GOES TO NOT BUSY. FOLLOWING IS A DESCRIPTION OF THE LIO 'Q' CODES:

Q BITS 0 THRU 7 0 1 2 3	4 5 6 7	DESCRIPTION
0 0 0 1		ATTACHMENT ADDRESS
	0 0 0 0 THRU 0 1 1 1	32 HDB REGISTERS (LOW HALF OF HDB UNLESS ATTACHMENT IS ENABLED)
	1 0 0 0	CONTROL STORAGE
	1 0 0 1	OP DECODE REGISTER
	1 0 1 0	INVALID
	1 0 1 1	CRT DATA ADDRESS REGISTER (CPU LSR)
	1 1 0 0	INVALID

LIO WITH IQ = 10 (ATTACHMENT ENABLED)
MESSAGE BUFFER ADDRESS REGISTER--THIS COMMAND IS USED PRIOR TO A PARTIAL READ OR WRITE OF THE ATTACHMENT BUFFER AND AFFORDS A MESSAGE BUFFER STARTING ADDRESS FOR THE DATA TRANSFER TO OR FROM MAIN STORAGE. IT IS USED ONLY FOR A SIO (NON-IMMEDIATE) WRITE OR READ WITH IR BIT 3 ON. THE VALUE LOADED MUST BE HEX 0000-01DF.

LIO WITH IQ = 12 (ATTACHMENT ENABLED)
COUNT REGISTER--THIS COMMAND IS USED PRIOR TO A PARTIAL READ OR WRITE OF THE ATTACHMENT BUFFER AND AFFORDS A COUNT OF BYTES TO BE TRANSFERRED TO OR FROM MAIN STORAGE. IT IS USED ONLY FOR A SIO (NON-IMMEDIATE) WRITE OR READ WITH IR BIT 3 ON. VALUE LOADED MUST BE IN HEX.

LIO WITH IQ = 15 (ATTACHMENT ENABLED)
CURSOR ADDRESS REGISTER--THIS COMMAND MAY BE USED TO PROVIDE THE ADDRESS OF THE CURSOR POSITION SO THAT ON A SUBSEQUENT WRITE COMMAND THE CURSOR BIT CAN BE INSERTED ACCORDINGLY IN THE OUTPUT DATA STREAM. THE VALUE LOADED MUST BE HEX 0000-01DF. IF PRIOR TO A PARTIAL WRITE COMMAND THIS LIO IS NOT ISSUED TO PROVIDE THE CURSOR ADDRESS, THE CURSOR POSITION WILL NOT BE CHANGED. IF PRIOR TO A TOTAL WRITE COMMAND THIS LIO IS NOT ISSUED TO PROVIDE THE CURSOR ADDRESS, THE CURSOR WILL BE PLACED IN THE FIRST BUFFER POSITION.

********************LAST PAGE********************

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To Run 3340 micro tests from Diskette
(other than drive (use disk load)
put in Diskette 1 (Red Box) num 41
& upper func sel & output from 3741
until A2 halt,
~~num & alpha reset x2~~
Put in diskette #3
num 41 func sel upper & output from 3741
Start CPU + START CPU
enter micro in 3340 dev.

1. PROGRAM SUMMARY

1.1 BRIEF PROGRAM DESCRIPTIONS

SECTION ID	SECTION NAME AND DESCRIPTION	APPLICABLE SENSE SWITCHES
C11	3340/3344 CONTROL STORE TEST THIS SECTION TESTS THE MICROPROCESSOR CONTROL STORAGE AND CONTROL STORE DATA PATHS.	
C12	3340/3344 FUNCTION TEST THIS SECTION TESTS AT THE SYSTEM LEVEL THE 3340/3344 I/O INSTRUCTION SET (SEEK, READ, WRITE, SCAN, ETC.).	11, 12, 13, 14, 1A, 1B, 1C, 1D, 21, 22, 23, 24, 26, 2F
C14	3340/3344 MICROPROCESSOR TEST THIS SECTION TESTS THE 3340/3344 ATTACHMENT MICROPROCESSOR DATA PATHS AND MICRO INSTRUCTION SET.	2F
C15	3340/3344 ATTACHMENT TEST THIS SECTION TESTS THE HARDWARE USED TO INTERFACE WITH THE SYSTEM/3 CHANNEL AND TO A LIMITED EXTENT THE 3340/3344 SUBSYSTEM CONTROLLER INTERFACE.	2F
C16	3340/3344 MICRODIAGNOSTIC LOADER THIS SECTION LOADS THE 3340 OR 3344 MICRO-DIAGNOSTIC ROUTINES AS REQUESTED FROM THE CE PANEL IN CONJUNCTION WITH PROGRAM FA1. C16 PROVIDES CAPABILITY TO LOAD THE MICRO-DIAGNOSTICS FROM THE 3340 DRIVE 1 OR ANY OF THE ALTERNATE LOAD DEVICES.	1E,27,2F
C17	3340/3344 ATTACHMENT MICROCODE LOADER THE PURPOSE OF THIS SECTION IS TO LOAD THE ATTACHMENT MICROCODE (SECTION FA0) INTO ATTACHMENT CONTROL STORAGE.	
C18	3340/3344 FRIENDS TEST THIS SECTION ALLOWS THE USER TO DEFINE AND EXECUTE HIS OWN SEQUENCE OF 3340 I/O COMMANDS.	10, 20, 21, 22, 23, 24, 25, 2F
C19	3340 ADAPTER MANUAL OPERATIONS PGM (AMOP) THIS SECTION ALLOWS THE USER TO EXERCISE MANUAL CONTROL OVER THE 3340/3344 ATTACHMENT MICROPROCESSOR.	
C1A	3340/3344 CONTROLLER INTERFACE PROBE LOOP THIS SECTION IS USED WITH A PROCEDURE IN THE 3340/3344 MAP CHARTS FOR CHECKING CABLE CONTINUITY ON THE 3340/3344 CONTROLLER INTERFACE.	
C1B	3340/3344 DATA MODULE SCAN PROGRAM THIS SECTION PROVIDES THE CAPABILITY TO CHECK AN ENTIRE DATA MODULE OR HEAD/DISK ASSEMBLY FOR DEFECTIVE TRACKS AND ANALYZE ALTERNATE TRACK ASSIGNMENTS.	1A, 1B, 1C, 1D, 1F
C1C	3340/3344 INITIALIZER THIS SECTION PROVIDES THE CAPABILITY TO FORMAT A 3340 DATA MODULE OR A 3344 HEAD/DISK ASSEMBLY. IT ALSO ALLOWS RESTORATION OF HOME ADDRESS FLAGS THAT ERRONEOUSLY INDICATE A DEFECTIVE TRACK.	1A, 1B, 1C, 1D, 28, 29

FA0	3340 OR 3340/3344 ATTACHMENT MICROCODE THIS SECTION CONTAINS THE NECESSARY FUNCTIONAL MICROCODE TO EXECUTE THE 3340/3344 DISK I/O INSTRUCTION SET.	
FA1	3340/3344 MICRODIAGNOSTIC CONTROL PROGRAM THIS PROGRAM COMMUNICATES WITH PROGRAM C16 TO LOAD MICRODIAGNOSTIC ROUTINES REQUESTED BY THE CE VIA THE 3340 CE PANEL AND PROVIDES CONTROL AND ERROR INFORMATION TO THE CE PANEL FOR USE BY THE CE WHEN USING THE 3340 AND/OR 3344 MLM PACKAGE.	
FA2 THROUGH FA5	3340 DIAGNOSTIC MICROCODE THESE SECTIONS CONTAIN THE MICROCODE TO DIAGNOSE PROBLEMS IN THE 3340 MODELS A2, B2, OR B1. THE PROGRAMS ARE LOADED INTO MAIN STORAGE A SECTION AT A TIME BY PROGRAM C16 AND LOADED INTO CONTROL STORAGE AN OVERLAY AT A TIME USING C16 AND FA1. THE NUMBER OF SECTIONS LOADED BY C16 BEFORE ANY EXECUTION TAKES PLACE DEPENDS ON THE SEQUENCE OF MICRODIAGNOSTIC DECKS IN THE HOPPER (IF CARD DEVICE) AND THE ROUTINE CALLED BY THE CE. THE 3340 MICRODIAGNOSTICS MAY BE LOADED FROM THE 3340 DRIVE 1 USING THE CE DATA MODULE. (THE CONTROLLER AND DRIVE 1 MUST BE FUNCTIONAL). WHEN LOADING FROM THE 3340, ALL DIAGNOSTIC SECTIONS (FA1-FA5) WILL BE INITIALLY LOADED INTO MAIN STORAGE PRIOR TO THE EXECUTION OF ANY MICRODIAGNOSTIC.	
FA6 & FA7	3340/3344 IPL LOADER AND MICROCODE THESE SECTIONS ARE LOADED INTO THE PROPER TRACKS OF THE DATA MODULE OR HEAD/DISK ASSEMBLY BY SECTION FC2 TO CREATE THE IPL BOOTSTRAP RECORDS. FA6 AND FA7 ARE USED TO LOAD THE FUNCTIONAL MICROCODE (FA0) ON A HARD OR SOFT IMPL.THESE SECTIONS ARE NOT EXECUTED DURING THE DIAGNOSTIC PROCEDURES.	
FA8 THROUGH FAA	3344 DIAGNOSTIC MICROCODE THESE SECTIONS CONTAIN THE MICROCODE TO DIAGNOSE PROBLEMS IN THE 3344 DRIVES. THESE PROGRAMS ARE LOADED BY PROGRAM C16 AND MAY BE LOADED FROM THE ALTERNATE LOADER OR FROM DRIVE 1 USING THE CE DATA MODULE. WHEN LOADING FROM THE 3340, MICRO-DIAGNOSTIC SECTIONS (FA1,FA8-FAA) ARE LOADED INITIALLY INTO MAIN STORAGE PRIOR TO ANY MICRODIAGNOSTIC EXECUTION IF SENSE SWITCH 27 IS ACTIVE.	

1.2 SECTION SENSE SWITCH OPTIONS

SWITCH	SWITCH FUNCTION (WHEN ON)	APPLICABLE PROGRAM SECTION(S)
10	INHIBIT PRINT/DISPLAY OF RESIDUAL DDDF	C18
11	INHIBIT TESTING ON DRIVE 1	C12
12	INHIBIT TESTING ON DRIVE 2	C12
13	INHIBIT TESTING ON DRIVE 3	C12
14	INHIBIT TESTING ON DRIVE 4	C12
1A	USE DRIVE 1 ONLY	C12, C1B
1B	USE DRIVE 2 ONLY	C12, C1B
1C	USE DRIVE 3 ONLY	C12, C1B
1D	USE DRIVE 4 ONLY	C12, C1B
1E	WHEN ACTIVE, NORMAL DCP PROCEDURES ARE USED TO TERMINATE SECTION C16. WHEN THE 3340 IS USED TO LOAD THE MICRODIAGNOSTICS THE FUNCTIONAL MICROCODE WILL BE RELOADED BY A SIO IPL COMMAND BEFORE EXITING TO DCP.	C16
1F	READ HOME ADDRESS AND R0 RECORDS ONLY	C1B
20	INHIBIT WRITE HOME ADDRESS	C18
21	INHIBIT WRITE TESTING ON DRIVE 1	C12, C18
22	INHIBIT WRITE TESTING ON DRIVE 2	C12, C18
23	INHIBIT WRITE TESTING ON DRIVE 3	C12, C18
24	INHIBIT WRITE TESTING ON DRIVE 4	C12, C18
25	OVERRIDE WRITE HOME ADDRESS PREREQUISITES (THIS WILL BYPASS THE READ HOME ADDRESS COMMAND AND THE MICROCODE WILL WRITE X'00' FOR THE SKIP DISPLACEMENT BYTES)	C18
26	WHEN ACTIVE, ROUTINE 0E WILL COMPARE THE CYLINDER AND HEAD BYTES READ FROM THE HOME AREA AGAINST THE EXPECTED VALUES AFTER COMPLETION OF A RDHA COMMAND. THIS SWITCH APPLYS ONLY TO THE 3340/3344 VERSION OF THE FUNCTION TEST (C12).	C12
27	IF THIS SWITCH IS ON PRIOR TO LOADING SECTION FA1, THE SWITCH ALLOWS LOADING OF THE 3344 MICRODIAGNOSTICS FROM THE CE DATA MODULE WHEN 3344 DRIVES ARE ATTACHED.	C16
28	WHEN THIS SWITCH IS ON ANY VALID CYLINDER ADDRESS CAN BE ENTERED AS A STARTING ADDRESS. ENTER VCCC INTO THE CPU CONSOLE SWITCHES, WHERE V IS 3344 LOGICAL VOLUME (IGNORED ON 3340), AND CCC IS ANY DECIMAL NUMBER FROM 000 THROUGH 209.	C1C
29	WHEN THIS SWITCH IS ON THE WRITE HOME ADDRESS PREREQUISITES ARE OVERRIDDEN AND A FORCED WRITE HA IS PERFORMED ON THOSE TRACKS THAT ARE FLAGGED DEFECTIVE AND WHOSE SKIP DISPLACEMENT VALUES ARE BETWEEN HEX 0000 AND 011E.	C1C
2F	ENABLE LINKAGE TO AMOP (SECTION C19) (SEE SECTION 4.3.3 FOR USAGE RESTRICTION)	C12, C14, C15, C16, C18

1.3 SPECIAL 3340/3344 PROGRAM OPERATING PROCEDURES

ALL OF THE 3340/3344 DIAGNOSTIC PROGRAM SECTIONS OPERATE UNDER CONTROL OF THE DIAGNOSTIC CONTROL PROGRAM (DCP). NORMAL OPERATING PROCEDURES APPLY EXCEPT AS NOTED IN THE FOLLOWING PARAGRAPHS.

1.3.1 INITIAL PROGRAM LOAD (IMPL) DEVICE

THE 3340 WILL NORMALLY BE USED AS THE DIAGNOSTIC LOADING DEVICE UNLESS THE 3340 IS NON-FUNCTIONAL OR IS UNRELIABLE. WHEN KNOWN 3340 PROBLEMS EXIST THE ALTERNATE LOADER SHOULD BE USED TO LOAD THE 3340/3344 DIAGNOSTIC SECTIONS. THIS PREVENTS MISLEADING ERROR SYMPTOMS THAT COULD OCCUR AS THE RESULT OF TRYING TO TEST THE DEVICE FROM WHICH PROGRAMS ARE BEING LOADED. THE CE IS DIRECTED TO FOLLOW THE STRATEGY OUTLINED IN THE ATTACHMENT MAPS WHEN THERE IS ANY DOUBT.

1.3.2 SYSTEM CHECK OUT (NO 3340/3344 PROBLEMS SUSPECTED)

THE 3340 MAY BE USED AS THE PROGRAM LOAD DEVICE TO LOAD ALL THE 3340/3344 DIAGNOSTIC SECTIONS. ANY 3340/3344 PROGRAM WHICH IS LOADED FROM THE 3340 MUST BE ALLOWED TO RUN TO NORMAL COMPLETION SO THAT THE FUNCTIONAL MICROCODE CAN BE RESTORED BEFORE THE SECTION TERMINATES. WHEN MICRODIAGNOSTICS ARE RUN FROM THE 3340, SENSE SWITCH 1E MUST BE SET TO LOAD THE FUNCTIONAL MICROCODE PRIOR TO TERMINATION OF PROGRAM C16. IF PROBLEMS ARE ENCOUNTERED WHEN LOADING 3340/3344 PROGRAMS FROM THE 3348 CE DATA MODULE, THE USER SHOULD IMMEDIATELY REVERT TO THE ALTERNATE LOAD DEVICE FOR CONTINUED 3340/3344 CHECK-OUT. REFER TO SECTION 4.5 FOR MORE DETAILED PROCEDURES ON LOADING THE MICRO-DIAGNOSTICS.

1.3.3 LOADING MULTIPLE PROGRAMS

THE 3340/3344 DIAGNOSTIC PROGRAMS ARE ORGANIZED SO THAT TWO OR MORE SECTIONS MAY SIMULTANEOUSLY RESIDE IN MAIN STORAGE. THIS PERMITS FREQUENTLY USED SECTIONS TO BE SAVED IN MAIN STORAGE RATHER THAN BEING REPEATEDLY LOADED. FOR EXAMPLE, SECTIONS C12, C18, C19, C1A, AND C1B ALL REQUIRE THAT SECTION C17 BE RUN TO LOAD THE ATTACHMENT MICROCODE. THUS, ONCE LOADED, SECTION C17 IS RETAINED IN A RESERVED AREA OF MAIN STORAGE AND IS AUTOMATICALLY RUN WHENEVER NEEDED BY OTHER SECTIONS. BECAUSE OF THIS ORGANIZATION, H5 AND/OR HD HALTS MAY SOMETIMES OCCUR WHILE RUNNING 3340 PROGRAMS. THESE HALTS REQUIRE USER INTERVENTION AS DESCRIBED IN PARAGRAPH 1.3.4 BELOW.

1.3.4 H5 AND HD HALTS (LOWER CASE D IN HD)

OCCURRENCE OF EITHER OF THESE HALTS DURING EXECUTION OF A 3340/3344 DIAGNOSTIC SECTION GENERALLY INDICATES THAT THE SECTION BEING RUN IS ATTEMPTING TO LOAD ANOTHER SECTION FROM THE ALTERNATE LOAD DEVICE. WHEN THIS OCCURS, A PRINTED MESSAGE WILL PRECEDE THE HALT. TO CONTINUE THE USER MUST LOAD THE REQUIRED SECTION VIA THE ALTERNATE LOAD DEVICE. MAKE THE LOAD DEVICE READY, AND RESET THE HALT. OTHER H5 AND HD HALTS (NO PRINTOUT) SHOULD BE HANDLED USING NORMAL DCP OPERATING PROCEDURES.

1.3 SPECIAL 3340/3344 PROGRAM OPERATING PROCEDURES (CONTINUED)

1.3.5 3277 CRT/KEYBOARD

SECTIONS C18 AND C19 USE THE 3277 CRT/KEYBOARD AS THE PRIMARY MEANS OF COMMUNICATION WITH THE USER. THE 3277 MICROCODE MUST BE LOADED PRIOR TO LOADING EITHER OF THESE SECTIONS. (ALSO SEE 1.3.6 BELOW)

1.3.6 SENSE SWITCHES 05 AND 08

IT IS HIGHLY RECOMMENDED THAT SENSE SWITCHES 05 AND 08 BE OFF WHEN RUNNING 3340/3344 DIAGNOSTIC SECTIONS. LOADING OF THE 3277 MICROCODE WILL BE REQUIRED IF EITHER OF THESE SWITCHES IS SET ON. IN ADDITION, MAP CHARTS MAY REPEATEDLY REFER TO PRINTOUTS THAT WILL BE LOST IF SENSE SWITCH 05 IS ON.

1.3.7 LOADING THE ATTACHMENT MICROCODE

SECTION C17 LOADS THE ATTACHMENT MICROCODE (SECTION FA0) INTO CONTROL STORAGE. WHEN LOADING FROM ALTERNATE LOADER, SECTION FA0 SHOULD BE PLACED IN THE ALTERNATE LOADER DIRECTLY BEHIND SECTION C17. ALTHOUGH IT MAY BE RUN INDEPENDENTLY, SECTION C17 (AND FA0) IS USUALLY NOT LOADED AND RUN UNTIL REQUIRED BY SOME OTHER DIAGNOSTIC SECTION. SEE PARAGRAPHS 1.3.3 AND 1.3.4 ABOVE FOR ADDITIONAL INFORMATION.

1.3.8 CE DATA MODULE

THE CE DATA MODULE IS INTENDED TO BE USED PRIMARILY AS A STORAGE DEVICE FOR DIAGNOSTIC PROGRAMS. DURING THE DIAGNOSTIC PROCEDURES, THE DATA MODULES WHICH WERE MOUNTED AT THE TIME OF INITIAL FAILURE SHOULD BE USED. THIS WILL ALLOW THE DATA MODULES TO BE TESTED ALONG WITH THE REST OF THE SYSTEM.

1.3.9 3340/3344 FUNCTION TEST - SECTION C12

SECTION C12 NORMALLY TESTS ALL THE DRIVES AT THE SAME TIME. IF AN ERROR IS DETECTED ON ONE DRIVE, THE PROGRAM CONTINUES RUNNING UNTIL THE FAILING OPERATION HAS BEEN TRIED ON ALL OTHER DRIVES BEING TESTED. THUS, BY THE TIME AN ERROR HALT OCCURS, THERE WILL HAVE BEEN ONE ERROR PRINTOUT FOR EACH DRIVE THAT FAILED. IT IS IMPORTANT IN THE 3340/3344 DIAGNOSTIC PROCEDURES, TO KNOW WHICH DRIVES ARE FAILING AND HOW MANY DRIVES ARE FAILING. IF SECTION C12 CANNOT BE RUN ON ALL DRIVES AT THE SAME TIME, THEN IT SHOULD BE RE-RUN AS MANY TIMES AS NECESSARY, USING ONE OR TWO DRIVES AT A TIME, UNTIL SUFFICIENT INFORMATION HAS BEEN GATHERED.

1.3.10 CE CYLINDER INITIALIZATION

SECTION C12 CONTAINS A SPECIAL ROUTINE WHICH MAY BE USED TO INITIALIZE THE CE CYLINDER ON ANY DATA MODULE OR HDA. THIS ROUTINE SHOULD BE USED ONLY WHEN THERE IS A POSITIVE INDICATION THAT FACTORY WRITTEN CE CYLINDER INFORMATION HAS BEEN ALTERED.

THE PROCEDURE REQUIRED FOR USE OF THIS SPECIAL ROUTINE IS AS FOLLOWS:

A. MOUNT THE DEFECTIVE DATA MODULE ON ANY DRIVE KNOWN TO BE OPERATING ERROR FREE (RUN C12 USING A GOOD DATA MODULE TO VERIFY).

B. LOAD SECTION C12 (IF NOT ALREADY LOADED).

C. SET THE APPROPRIATE SENSE SWITCH (1A-1D) TO SELECT THE DRIVE ON WHICH THE DEFECTIVE DATA MODULE IS MOUNTED.

D. SELECT ROUTINE 10 (F210 IN DATA ENTRY SWITCHES).

E. START SECTION C12 (0XXX IN THE SWS). AN 'HE' HALT INDICATES THAT THE INITIALIZATION WAS SUCCESSFULL.

1.3.11 3340/3344 MICRODIAGNOSTIC ROUTINES

SECTION C16 CONTROLS THE LOADING OF 3340 OR 3344 MICRODIAGNOSTIC SECTIONS (FA1-FA5 OR FA1,FA8-FAA) INTO CONTROL STORAGE. THE CE CAN USE THE 3340 AS A LOADER IF THE CONTROLLER AND DRIVE 1 ARE FUNCTIONAL. THE MICRODIAGNOSTICS FOR BOTH THE 3340 AND THE 3344 RESIDE ON DISK. REFER TO SECTION 4.5 FOR MORE DETAILED PROCEDURES ON LOADING THE 3340/3344 MICRODIAGNOSTIC SECTIONS.

1.3.12 3340/3344 FRIENDS TEST - SECTION C18

THIS SECTION USES THE 3277 CRT/KEYBOARD AS THE PRIMARY MEANS OF COMMUNICATION WITH THE USER (SEE 1.3.4 ABOVE). IT CAN, FOR THE MOST PART, BE OPERATED BY USING THE KEYBOARD TO RESPOND TO PROMPTING MESSAGES APPEARING ON THE CRT SCREEN. THE USER IS ASSUMED TO BE FAMILIAR WITH THE I/O COMMAND SET. SECTION 4.7 IN THIS USER'S GUIDE CONTAINS DETAILED OPERATING INFORMATION FOR SECTION C18. THE USER IS PARTICULARLY CAUTIONED TO READ THAT SECTION BEFORE ATTEMPTING TO EXECUTE ANY 3340/3344 WRITE COMMANDS.

1.3.13 3340/3344 ADAPTER MANUAL OPERATIONS PROGRAM - SECTION C19

AMOP (SECTION C19) SERVES AS AN OPERATORS CONSOLE FOR THE 3340/3344 ATTACHMENT MICROPROCESSOR. IT'S PROPER USE REQUIRES DETAILED KNOWLEDGE OF MICROPROCESSOR OPERATION. IT SHOULD BE USED ONLY AFTER ALL OTHER DIAGNOSTIC METHODS HAVE FAILED. SECTION 4.8 IN THIS USER'S GUIDE CONTAINS OPERATING PROCEDURES FOR SECTION C19.

3. HALTS AND PRINTOUTS

3.1 ERROR HALTS (HALT CODES 00 THRU 9F HEX)

HALT CODE	CONDITION AND/OR ACTION REQUIRED	APPLICABLE PROGRAM SECTION(S)
01	A COMMON ERROR HALT. THIS HALT IS ALWAYS ACCOMPANIED BY AN ERROR PRINTOUT OR AN ERROR DISPLAY ON THE 3277 CRT. THE PRINTOUT OR CRT DISPLAY CONTAINS A BRIEF DESCRIPTION OF THE ERROR CONDITION AND/OR A FOUR DIGIT ERROR CODE. THE ERROR CODE (IF USED) REFERS TO AN ENTRY IN THE 'ERROR CODE DICTIONARY' IN THE MAP CHARTS WHERE ADDITIONAL INFORMATION MAY BE FOUND. WHERE APPROPRIATE, PRINTOUTS WILL INCLUDE ADDITIONAL INFORMATION RELATING TO THE ERROR CONDITION DETECTED (CONTROL/DATA FIELDS, SENSE DATA, ETC.).	C11, C12, C16, C17, C18, C1A, C1B, C1C
51	A SOLID ATTACHMENT ERROR CONDITION WAS DETECTED. THIS HALT IS ALWAYS ACCOMPANIED BY AN ERROR PRINTOUT. THE PRINTOUT CONTAINS A FOUR DIGIT ERROR CODE AND MAY CONTAIN UP TO EIGHT BYTES OF ADDITIONAL (VARIABLE) ERROR INFORMATION. THE ERROR CODE REFERS TO AN ENTRY IN THE 'ERROR CODE DICTIONARY' IN THE 3340 MAP CHARTS WHERE ADDITIONAL INFORMATION (INCLUDING DESCRIPTIONS OF 'VARIABLE' ERROR BYTES) MAY BE OBTAINED. RESETTING THIS HALT WILL CAUSE THE PROGRAM TO LOOP THE TEST THAT DETECTED THE ERROR CONDITION. SYSTEM RESET IS REQUIRED TO TERMINATE THE LOOP.	C14, C15
52	THIS HALT HAS THE SAME MEANING AS HALT CODE 51 EXCEPT THAT THE ERROR CONDITION DETECTED WAS NOT SOLID (DID NOT OCCUR EVERY TIME THE TEST WAS RUN). RESETTING THE HALT WILL CAUSE THE FAILING TEST TO BE LOOPED BUT THE RESULTS OF PROBING OR SCOPING PROCEDURES MAY BE UNDEPENDABLE. THE ERROR CONDITION DOES EXIST AT THE TIME THIS HALT OCCURS, SO STATIC (NO LOOP) PROBING PROCEDURES MAY BE USED.	C14, C15
53	THIS HALT HAS THE SAME MEANING AS HALT CODES 51 AND 52 EXCEPT THAT THE ERROR CONDITION OCCURRED ONLY ONCE (FIRST TIME TEST WAS RUN) AND COULD NOT THEREAFTER BE REPRODUCED. RESETTING THIS HALT WILL CAUSE THE FAILING TEST TO BE LOOPED BUT IT IS HIGHLY IMPROBABLE THAT PROBING OR SCOPING PROCEDURES WILL YIELD CORRECT RESULTS.	C14, C15
77	3277 CRT/KEYBOARD NOT READY OR ERROR CONDITION DETECTED. RESET THE HALT TO RETRY. IF CONDITION PERSISTS, RELOAD THE 3277 MICROCODE OR GO TO 3277 MAP CHARTS.	C18, C19

3.2 NON-ERROR HALTS (HALT CODES A0 THRU FF HEX)

HALT CODE	CONDITION AND/OR ACTION REQUIRED	APPLICABLE PROGRAM SECTION(S)
E0	A COMMON PROGRAM HALT FOR USER RESPONSE. SEE PROMPTING MESSAGE ON 3277 CRT SCREEN. ENTER REQUIRED RESPONSE VIA KEYBOARD AND PRESS ENTER KEY. IF KEYBOARD IS LOCKED, PRESS START THEN RETRY KEYBOARD ENTRY.	C18
E1	THIS HALT OCCURS WHEN SENSE SWITCH 28 IS TURNED ON. AT THIS TIME, ANY VALID CYLINDER ADDRESS CAN BE ENTERED ON THE CPU CONSOLE SWITCHES. SEE DESCRIPTION OF SENSE SWITCH 28.	C1C
E2	INVALID SETTING OF SENSE SWITCHES 11 THRU 14 AND/OR 1A THRU 1D. EITHER MUTUALLY EXCLUSIVE SWITCHES HAVE BEEN SET OR TESTING HAS BEEN INHIBITED ON ALL DRIVES. RESET CONFLICTING SWITCHES AND RESET THE HALT TO CONTINUE.	C12, C1B, C1C
E4	THE USER MUST SPECIFY THE DRIVE TO BE USED BY SETTING THE APPROPRIATE SENSE SWITCH. SENSE SWITCHES 1A THRU 1D SELECT DRIVES 1 THRU 4 RESPECTIVELY. SET ONE SWITCH ONLY AND RESET THE HALT TO CONTINUE. SENSE SWITCHES 11 THRU 14 SHOULD BE OFF.	C12, C1B, C1C
E8	THE PROGRAM SELECTED CANNOT BE LOADED AND RUN FROM THE 3340. USE THE ALTERNATE LOADER.	C16
F1	CAUTION MESSAGE IS PRINTED OUT PRIOR TO THIS HALT WARNING THAT ALL CUSTOMER DATA ON THE SELECTED DRIVE WILL BE DESTROYED. RESET HALT TO CONTINUE.	C1C

3.3 PRINTOUTS

THE FOLLOWING PRINTOUTS MAY OCCUR WITHOUT AN ACCOMPANYING HALT:

PRINTOUT AND DESCRIPTION	APPLICABLE PROGRAM SECTION(S)
'LOADING SECTION XXX' THE SECTION BEING RUN IS IN THE PROCESS OF LOADING ANOTHER DIAGNOSTIC SECTION. XXX IS THE ID OF THE SECTION BEING LOADED.	C11, C12, C14, C15, C16, C17, C18, C19, C1A, C1B
'START 3340 MICROCODE LOADER' THE SECTION BEING RUN HAS STARTED EXECUTION OF THE 3340 MICROCODE LOADER (SECTION C17).	C11, C12, C14, C15, C17, C18, C19, C1A, C1B
'3340 MICROCODE SUCCESSFULLY LOADED' SECTION C17 HAS SUCCESSFULLY COMPLETED LOADING THE ATTACHMENT MICROCODE. CONTROL WILL BE RETURNED TO THE SECTION THAT STARTED SECTION C17 EXECUTION.	C11, C12, C14, C15, C17, C18, C19, C1A, C1B
'START 3340 CONTROL STORE TEST' ATTACHMENT CONTROL STORE TEST HAS BEEN STARTED. CE PANEL SWITCHES WILL HAVE NO EFFECT UNTIL THE TEST IS COMPLETE (APPROXIMATELY 90 SECONDS).	C11
'END CS TEST - CORRECTABLE SINGLE BIT ERRORS - RCS XXXX, LCS YYYY' CONTROL STORE TEST HAS BEEN SUCCESSFULLY COMPLETED. XXXX AND YYYY ARE THE TOTAL NUMBER OF CORRECTABLE SINGLE BIT ERRORS DETECTED IN RIGHT AND LEFT CONTROL STORE RESPECTIVELY. THIS PRINTOUT IS PROVIDED FOR CE INFORMATION ONLY. IT DOES NOT GENERALLY INDICATE A NEED FOR CORRECTIVE ACTION.	C11
'TEST IS LOOPING' TEST IS BEING LOOPED FOR PROBING AND/OR SCOPING PROCEDURES. SYSTEM RESET MAY BE REQUIRED TO TERMINATE THE LOOP.	C14, C15, C1A
'SECTION RE-STARTED' TEST LOOP HAS BEEN TERMINATED AND THE DIAGNOSTIC SECTION RE-STARTED.	C14, C15
'SECTION C19 READY' SECTION C19 (AMOP) HAS BEEN SUCCESSFULLY LOADED. SEE DETAILED PROGRAM DESCRIPTION FOR SECTION BEING RUN FOR AMOP LINKAGE CONTROLS.	C12, C14, C15, C16
'MICRO-DIAGNOSTICS READY' SECTION C16 HAS SUCCESSFULLY LOADED SECTION FA1 INTO CONTROL STORE. WHEN USING ALTERNATE LOADER ENSURE THAT SECTIONS FA2 THRU FA5 (3340) OR FA8 THRU FAA (3344) ARE IN HOPPER IF CARD DEVICE OR SELECT PROPER DISKETTE IF 3741 IS USED. CONTINUE OPERATION OF THE MICRO DIAGNOSTIC ROUTINES FROM THE 3340 CE PANEL (SEE 3340 OR 3344 MICRO MLM).	C16
'RECOVERED AFTER X RETRIES' SECTION C12 DETECTED AN ERROR CONDITION BUT RECOVERED AFTER RETRYING THE FAILING OPERATION X TIMES. THE PRINTOUT PRECEDING THIS MESSAGE DESCRIBES THE ERROR CONDITION DETECTED. PROGRAM OPERATION WILL CONTINUE TO NORMAL COMPLETION UNLESS A SOLID FAILURE IS SUBSEQUENTLY DETECTED.	C12
'INITIALIZATION TO BE PERFORMED ON DRIVE X' SECTION C1C ROUTINE 01 HAS BEGUN REFORMATTING 3340 DATA MODULE OR 3344 HEAD/DISK ASSEMBLY.	C1C
'FLAG RESTORE TO BE PERFORMED ON DRIVE X' SECTION C1C ROUTINE 02 HAS BEGUN RESTORING HOME ADDRESS FLAG BYTES.	C1C
'I VOL X, CYL XXX, HD XX - TOTAL ERRORS FROM STARTING ADDRESS XXX' SECTION C1C RUNNING NORMALLY. THIS MESSAGE PRINTS OUT EVERY TEN CYLINDERS.	C1C

3.3 PRINTOUTS (CONTINUED)

THE FOLLOWING PRINTOUTS ARE OUTPUT ONLY BY SECTION C1B:

PRINTOUT AND DESCRIPTION (SECTION C1B ONLY)

'START SCAN ON DRIVE X'

SECTION C1B (DATA MODULE SCAN) HAS STARTED CHECKING THE DATA MODULE MOUNTED ON DRIVE X. ALL TRACKS WILL BE READ IN SEQUENCE BEGINNING WITH CYLINDER 0, HEAD 0. AN ABNORMAL CONDITION DETECTED ON ANY TRACK WILL BE INDICATED BY ONE OF THE FOLLOWING PRINTOUTS.

'D CYL XXX, HD XX - FLAGGED DEFECTIVE - ASSIGNED ALTERNATE IS ...'

THE TRACK IS FLAGGED DEFECTIVE AND AN ALTERNATE HAS BEEN ASSIGNED. THE PRINTOUT INCLUDES THE ADDRESS OF THE ASSIGNED ALTERNATE TRACK. THE USER SHOULD VERIFY THAT THE ASSIGNED ALTERNATE IS PROPERLY FLAGGED ('A' PRINTOUT) AND THAT IT POINTS TO THIS DEFECTIVE PRIMARY TRACK.

'A CYL XXX, HD XX - FLAGGED ALTERNATE - DEFECTIVE PRIMARY IS ...'

THE TRACK IS FLAGGED AS AN ALTERNATE AND POINTS TO A DEFECTIVE PRIMARY TRACK. THE ADDRESS OF THE DEFECTIVE PRIMARY IS INCLUDED IN THE PRINTOUT. THE USER SHOULD VERIFY THAT THE PRIMARY TRACK IS FLAGGED DEFECTIVE ('D' PRINTOUT) AND THAT IT POINTS TO THIS ASSIGNED ALTERNATE TRACK.

'I CYL XXX, HD XX - FLAGGED ALTERNATE - POINTS TO ITSELF'

THE TRACK IS FLAGGED AS AN ALTERNATE BUT POINTS TO ITSELF RATHER THAN TO A DEFECTIVE PRIMARY TRACK. THIS INDICATES THAT THIS ASSIGNED ALTERNATE IS UNUSED.

'* CYL XXX, HD XX - FLAGGED DEFECTIVE - NO ALTERNATE ASSIGNED'

INCORRECT TRACK FORMAT. THE TRACK IS FLAGGED DEFECTIVE, BUT THE CCHH FIELD IN THE RECORD ZERO COUNT FIELD DOES NOT POINT TO AN ALTERNATE TRACK.

'* CYL XXX, HD XX - FLAGS INCONSISTENT - HA .., RO ..'

INCORRECT TRACK FORMAT. THE FLAG BYTE FROM THE EVEN HOME ADDRESS DOES NOT MATCH THE FLAG BYTE FROM THE EVEN RECORD ZERO COUNT FIELD. THE PRINTOUT INCLUDES THE FLAG BYTES FROM THE HA AND RO FIELDS (IN HEX).

'* CYL XXX, HD XX - INVALID HA - HAE ..., HAO ...'

INCORRECT TRACK FORMAT. AT LEAST ONE OF THE TWO HOME ADDRESS FIELDS ON THE TRACK IS INCORRECT. THE PRINTOUT INCLUDES BOTH HA'S (IN HEX).

'* CYL XXX, HD XX - INVALID RO - ROE ..., ROO ...'

INCORRECT TRACK FORMAT. AT LEAST ONE OF THE TWO RECORD ZERO COUNT FIELDS ON THE TRACK IS INCORRECT. THE PRINTOUT INCLUDES BOTH RO COUNT FIELDS (IN HEX).

'* CYL XXX, HD XX - ADAPTER CK - ...'

PROBABLE 3340 ATTACHMENT HARDWARE FAILURE. THE 24 'READ DIAG SENSE' BYTES ARE INCLUDED IN THE PRINTOUT. THIS IS NOT A DATA MODULE PROBLEM.

'* CYL XXX, HD XX - SEEK CHECK - ...'

THIS ERROR IS USUALLY CAUSED BY A HARDWARE FAILURE. HOWEVER, IF THE FAILURE OCCURS ONLY AT SPECIFIC TRACKS ON A SPECIFIC DATA MODULE, THEN IT IS PROBABLY CAUSED BY DATA MODULE DEFECTS. SPECIFIC TRACKS WHICH CAUSE THIS ERROR CAN BE FLAGGED DEFECTIVE AND ALTERNATES ASSIGNED. THE 24 'READ DIAGNOSTIC SENSE' BYTES ARE INCLUDED IN THE ERROR PRINTOUT.

'* CYL XXX, HD XX - DATA CHECK - ...'

IF THIS ERROR OCCURS ONLY ON SPECIFIC TRACKS ON A SPECIFIC DATA MODULE, THEN THOSE TRACKS ARE PROBABLY DEFECTIVE. SUCH TRACKS SHOULD NORMALLY BE FLAGGED DEFECTIVE AND ALTERNATES ASSIGNED. THE 24 'READ DIAGNOSTIC SENSE' BYTES ARE INCLUDED IN THE ERROR PRINTOUT.

'* CYL XXX, HD XX - UNIT CHECK - ...'

THIS ERROR IS PROBABLY CAUSED BY A HARDWARE FAILURE. THE 24 'READ DIAGNOSTIC SENSE' BYTES ARE INCLUDED IN THE ERROR PRINTOUT.

'END OF SCAN ON DRIVE X'

SECTION C1B (DATA MODULE SCAN) HAS COMPLETED CHECKING THE DATA MODULE MOUNTED ON DRIVE X.

4. DETAILED PROGRAM DESCRIPTIONS

4.1 SECTION C11 - 3340/3344 CONTROL STORE TEST

THIS SECTION TESTS THE ATTACHMENT CONTROL STORE AND THE CONTROL STORE DATA PATHS.

TESTING IS DONE IN FOUR PHASES:

THE FIRST PHASE TESTS CONTROL STORE DATA PATHS UP TO BUT NOT INCLUDING CONTROL STORE ITSELF. ANY ERROR IN THIS PHASE WILL RESULT IN AN IMMEDIATE ERROR HALT.

THE SECOND PHASE IS THE 'CONTROL STORE BIT PATTERNS TEST' IN WHICH DATA PATTERNS (ALL ZEROS, SHIFTING ONE, AND SHIFTING ZERO) ARE WRITTEN INTO EACH CONTROL STORE POSITION AND READ BACK FOR COMPARISON. CORRECTABLE SINGLE BIT ERRORS ARE LOGGED FOR A SUMMARY PRINTOUT. UNCORRECTABLE ERRORS RESULT IN AN IMMEDIATE ERROR HALT.

THE THIRD PHASE IS THE 'CONTROL STORE ADDRESSING TEST' IN WHICH EACH CONTROL STORE LOCATION IS LOADED WITH ITS OWN ADDRESS, INVERT (CORRECTION) IS USED IF NECESSARY. EACH LOCATION IS THEN SENSED TO INSURE THAT NO ADDRESSING ERRORS HAVE OCCURRED.

THE FOURTH PHASE IS AN EXTENSION OF THE 'CONTROL STORE ADDRESSING TEST' IN WHICH THE DISPLACEMENT AND BLOCK PORTION OF EACH CONTROL STORE ADDRESS WRITTEN IN THE THIRD PHASE IS INTERCHANGED. EACH CONTROL STORE LOCATION IS THEN READ BACK AND CHECKED FOR ADDRESSING ERRORS.

THE CONTROL STORE TEST WILL LOAD SECTIONS FA0 AND C17 IF DRIVE 1 IS USED AS THE PROGRAM LOAD DEVICE. SECTION C17 WILL THEN LOAD FA0 PRIOR TO TERMINATING SECTION C11.

4.2 SECTION C12 - 3340/3344 FUNCTION TEST

4.2.1 GENERAL

THE PRIMARY PURPOSE OF SECTION C12 IS TO DETECT ERRORS IN THE ATTACHMENT AND 3340/3344 SUBSYSTEM. IT DOES THIS BY USING ALL AVAILABLE FUNCTIONS SUCH AS SENSE, SEEK, READ, WRITE, ETC. USING THE STANDARD FUNCTIONAL MICROCODE.

SECTION C12 REQUIRES THAT SECTION C17 BE RUN TO LOAD THE ATTACHMENT MICROCODE. THIS IS NORMALLY ACCOMPLISHED BY PLACING SECTIONS C17 AND FA0 IN THE ALTERNATE LOADER DIRECTLY BEHIND SECTION C12. SECTION C12 WILL THEN LOAD AND EXECUTE SECTION C17 WHEN REQUIRED.

SECTION C12 NORMALLY TESTS ALL THE DRIVES AT THE SAME TIME. IF AN ERROR IS DETECTED ON ONE DRIVE, THE PROGRAM CONTINUES RUNNING UNTIL THE FAILING OPERATION HAS BEEN TRIED ON ALL OTHER DRIVES BEING TESTED. THUS, BY THE TIME AN ERROR HALT OCCURS, THERE WILL HAVE BEEN ONE ERROR PRINTOUT FOR EACH DRIVE THAT FAILED. SENSE SWITCHES 11-14 AND 1A-1D MAY BE USED TO EXCLUDE TESTING ON SELECTED DRIVES.

WRITE TESTING IS DONE ONLY ON C.E. CYLINDER (SEE NOTE) SO THAT THE SECTION MAY BE RUN ON CUSTOMER DATA MODULES. IF NECESSARY, SECTION C12 MAY BE RUN AGAINST A 'READ ONLY' DATA MODULE BY USING THE APPROPRIATE SENSE SWITCH (21-24) TO INHIBIT WRITE TESTING.

OUTPUT FROM C12 INCLUDES A FOUR DIGIT ERROR CODE AND, IF POSSIBLE, SENSE INFORMATION ABOUT THE ERROR.

4.2.2 DETAILED ROUTINE DESCRIPTIONS

ROUTINE 01 - READ STATUS COMMANDS TEST
A RECAL, A READ DIAGNOSTIC SENSE, AND A READ AND RESET BUFFERED LOG ARE ISSUED TO EACH DRIVE. THIS ROUTINE IS EXECUTED 10 TIMES.

ROUTINE 02 - CYLINDER 0 ACCESS TEST
READS HA & R0 COUNT EVEN ON ALL HEADS IN CYLINDER 0.

ROUTINE 03 - C.E. CYLINDER ACCESS TEST
READS HA & R0 COUNT EVEN ON ALL HEADS IN C.E. CYLINDER.

ROUTINE 04 - CYLINDER 0 READ DATA TRANSFER TEST
READS HA & R0 COUNT EVEN AND ODD, USING BOTH EVEN AND ODD MAIN STORAGE ADDRESSES AND USING ALL HEADS IN CYLINDER 0.

ROUTINE 05 - C.E. CYLINDER READ DATA TRANSFER TEST
READS HA & R0 COUNT EVEN, READS COUNT KEY DATA R0 EVEN AND READS A KNOWN GOOD 256 BYTE R1. ALL HEADS ARE USED IN C.E. CYLINDER AND BOTH EVEN AND ODD BEGINNING MAIN STORAGE ADDRESSES ARE USED.

ROUTINE 06 - WRITE DATA TRANSFER TEST
WRITE TESTING IS DONE BY WRITING R2 ON C.E. CYLINDER ON HEAD 0. EACH RECORD IS READ BACK, RESIDUAL KEY LENGTH AND DATA LENGTH AND RESIDUAL DDDF ARE CHECKED. BOTH ODD AND EVEN BEGINNING MAIN STORAGE ADDRESSES ARE USED. ROUTINE IS EXECUTED 10 TIMES.

ROUTINE 07 - WRITE HA TEST
A READ HA & R0 COUNT EVEN, A WRITE HA & R0 ODD, AND A READ HA & R0 ODD ARE DONE ON HEAD 0 IN C.E. CYLINDER.

ROUTINE 08 - HEAD WRITE/READ TEST
THE FOLLOWING COMMANDS ARE EXECUTED ON EACH HEAD IN C.E. CYLINDER -----
READ HA & R0 COUNT EVEN
WRITE COUNT KEY DATA R0 ODD
READ COUNT KEY DATA R1
WRITE KEY DATA R2
READ COUNT KEY DATA R21

THE PROGRAM THEN CHECKS RESIDUAL DDCF AND DDDF. NEXT R21 IS WRITTEN AND CHECKED AGAIN USING BOTH ODD AND EVEN BEGINNING MAIN STORAGE ADDRESSES. ALL HEADS ON C.E. CYLINDER ARE USED.

ROUTINE 09 - WRITE KEY DATA TEST
THE FOLLOWING COMMANDS ARE ISSUED ON EACH HEAD IN CE CYLINDER---
READ COUNT KEY DATA R1
WRITE COUNT KEY DATA R2 (N=38)
WRITE KEY DATA R2 (N=38)
READ KEY DATA R1 (N=9)
READ KEY DATA R11 (N=9)
READ KEY DATA R21 (N=9)
READ KEY DATA R31 (N=9)

PROGRAM CHECKS THE RESIDUAL DDDF FOR THE CORRECT VALUE AFTER EACH TEN RECORDS READ.

4.2 SECTION C12 - 3340/3344 FUNCTION TEST (CONTINUED)

ROUTINE 0A - SCAN FF DETECT TEST
A SCAN ARGUMENT OF ALL FF'S IS SET UP AND A SCAN READ OR EQUAL ON R1 IS EXECUTED. NO SCAN HIT IS EXPECTED. THE SCAN ARGUMENT IS THEN ALTERED SO A SCAN HIT IS EXPECTED AND THE COMMAND IS ISSUED AGAIN.

ROUTINE 0B - SCAN EQUAL TEST
A SCAN READ OR EQUAL COMMAND IS ISSUED WHICH WILL PRODUCE A SCAN HIT EQUAL CONDITION. BOTH EVEN AND ODD BEGINNING MAIN STORAGE ADDRESSES ARE USED.

ROUTINE 0C - SCAN HIGH OR EQUAL TEST
A SCAN READ OR HIGH OR EQUAL COMMAND IS ISSUED WHICH WILL PRODUCE A SCAN (NOT EQUAL) CONDITION. THE SCAN ARGUMENT IS ALTERED SO ALL BIT POSITIONS OF THE COMPARE CIRCUITS ARE TESTED.

ROUTINE 0D - WRITE REPEAT/READ VERIFY TEST
R2 OF C.E. CYLINDER HEAD 0 IS WRITTEN USING THE WRITE REPEAT COMMAND. THEN THE RECORD IS READ BACK USING THE READ VERIFY COMMAND.

ROUTINE 0E - CYLINDER SEEK TEST
512 SEEKS TO RANDOM CYLINDERS ARE EXECUTED. EACH SEEK IS FOLLOWED BY A READ HA AND R0 COUNT COMMAND TO VERIFY ACCESS POSITION.

ROUTINE 0F - READ IPL TEST
A READ IPL SIO IS ISSUED AND COMPLETION IS EXPECTED BEFORE A TIMEOUT PERIOD HAS EXPIRED. THE RESIDUAL DDDR IS CHECKED TO ENSURE THAT THE CORRECT NUMBER OF BYTES WERE TRANSFERED TO MAIN STORAGE.

ROUTINE 10 - C.E.CYLINDER RESTORE
THIS ROUTINE IS EXECUTED ONLY IF SPECIFICALLY REQUESTED, AND WILL RUN ON ONLY ONE DRIVE AT A TIME.
THE C.E.CYLINDER WILL BE COMPLETELY REFORMATTED.

NOTE: C.E. CYLINDER = 34 FOR 12 M BYTE PACK
209 FOR 70 M BYTE PACK
210 AND 211 LOGICAL VOLUME 4 FOR THE HDA

ROUTINE 11 - DATA MODULE OR HDA STATE ANALYSIS

THIS ROUTINE IS EXECUTED ONLY IF REQUESTED TO BY THE 3340/3344 ATTACHMENT MAPS. THE ROUTINE GENERATES MICRO ERROR STOPS BASED ON ANALYZING DRIVE STATUS DURING THE LOADING OR UNLOADING SEQUENCE. THE ROUTINE IS EQUIVALENT TO MICRO ROUTINES AC (3340) AND BA (3344) AND PROVIDES A MEANS OF GENERATING AN ERROR STOP WITHOUT LOADING THE 3340 OR 3344 MICRODIAGNOSTIC ROUTINES.

4.2.3 AMOP LINK OPTION SEE 4.3.3

4.3 SECTION C14 - 3340/3344 MICROPROCESSOR TEST

4.3.1 GENERAL

THESE DIAGNOSTIC TESTS USE STRINGS OF CONTROL INFORMATION WHICH DIRECT THE 'COMMON SVP INTERFACE CONTROL' SUBROUTINE IN THE DIAGNOSTIC TO ISSUE MANUAL CONTROLS TO THE DSA MICROPROCESSOR. SEE THE DSA TMD DIAGNOSTIC LIO-2 SVP SENSE TABLE AND DIAGNOSTIC LIO-1 CONTROL TABLE (SEE INSTRUCTION OPERATIONS, SENSE I/O) FOR THE CONTROL OPTIONS. THE MICROPROCESSOR IS NOT 'STARTED' OR 'RUNNING' DURING THESE MANUAL OPERATIONS. COMMAND STRINGS ARE ENCODED, SEE THE DIAGNOSTIC LISTING FOR A DESCRIPTION OF THIS FORMAT.

THE CONTROL STRINGS DESCRIBED ABOVE MAY BE USED TO LOAD DSA CONTROL STOR WITH SHORT MICROPROGRAMS THEN START THE DSA TO EXECUTE THE MICRO-PROGRAM. SUBSEQUENT CONTROL STRINGS ARE USED TO ANALYZE THE DSA STATUS AFTER THE MICROPROGRAM HAS COMPLETED.

THE DSA IS RESET AND INITIALIZED AT THE ENTRY TO EACH ROUTINE BY:

```
MICROPROGRAM RESET (FTR REG BIT 0)
RESET EXTERNAL REGS FTR, SCN, DST, DXC, FTG
TURN OFF 'SYSTEM RESET' (FHP REG BIT 0)
RESET MICROPROCESSOR CLOCK
SET 'INDEX' = X'14'
SET ALL MODE BUFFERS = X'00' (MODE BUFFERS FOR LEVELS 2(FILE) AND
                              7(CHAN) = X'10')
SET ALSB = ALL ZERO
SET ALSD = ALL ZERO EXCEPT ALSD 09=X'14', 11=X'F4', 13&15=X'54'
SET ZLS = ALL ZERO
SET DLS = ALL ZERO
SET CONTROL STOR 0000-0006 = 03A100,040000......040000
```

IF AN ATTACHMENT TEST HAS BEEN LOADED FROM THE 3340 SECTIONS C17 AND FA0 WILL BE LOADED PRIOR TO RUNNING ATTACHMENT DIAGNOSTIC ROUTINES. APPROPRIATE MESSAGES WILL BE PRINTED WHEN LOADING. IF AN ATTACHMENT TEST CONCLUDES NORMALLY IT WILL START C17 PRIOR TO TERMINATING TO RELOAD THE FUNCTIONAL MICROCODE.

4.3.2 DETAILED ROUTINE DESCRIPTIONS

RTN01 - LIO ACCEPTABILITY
TESTS THAT A LIO COMMAND TO A 3340 LSR CAN BE EXECUTED. 'DDDR' IS LOADED (LIO) THEN READ (SNS) IF ATTACHMENT BUSY IS NOT ACTIVE.

RTN03 - X REG TEST
TESTS THAT ALL X-REG (LINK REGISTER) BITS CAN BE SET AND RESET USING A RIPPLED PATTERN. TESTS THAT X-REG CHECK DOES NOT OCCUR.

RTN05 - K REG TEST
TESTS THAT K-REG BITS 1, 2, 4, 5, 6 & 7 CAN BE SET AND RESET. TESTS K-REG BIT 3 BY INHIBITING 'READ X-REG' CONTROL COMMAND.

RTN07 - OP REG TEST
TESTS THAT ALL OP-REG BITS CAN BE SET, RESET AND READ VIA THE 'SVP DATA BUS'. TESTS OP-REG 'INVERT' BIT AND OP-REG PARITY CHECKER.

RTN09 - B REG TEST
TESTS B-REG PARITY CHECKER THEN TESTS FOR B-REG PARITY CHECK WITH ODD AND EVEN PARITY DATA PATTERNS.

RTN0B - D REG TEST
READS D-REG DATA (ALL 1'S, ALL 0'S) VIA ALSD-IN-SW AND ALS-OUT-REG. TESTS FOR D-REG PARITY CHECK WITH ODD AND EVEN PARITY DATA PATTERNS ERROR 40B1 OR 40B2 LEAVES ZEROES OR ONES RESPECTIVELY GATED FROM OP-REG TO D-REG TO ALSD-IN-SW TO ALS-OUT-REG FOR PROBING.

RTN0F - ALS TEST (PART 1)
LOADS ALSB(0) USING SABI INSTRUCTION IN OP-REG (DATA = X'CE'). TEST THAT ALS DATA MOVED TO D-REG (INSTRUCTION DECODED OK) THEN READS ALSB(0) USING MANUAL CONTROL SENSE COMMAND.
TESTS ALSD(0) AS ABOVE THEN TESTS ALSB(0-31) AND ALSD(0-31). DATA IN EACH LOCATION = OWN ADDRESS (DATA = X'00' - X'9F).

RTN10 - ZLS TEST (PART 1)
LOADS ZLS(0) USING SZI INSTRUCTION FROM OP-REG (DATA = X'CE'). TESTS THAT ZLS DATA MOVED TO D-REG (INSTRUCTION DECODED OK) THEN TEST FOR ZLS PARITY CHECK. TESTS ZLS(0-31). ZLS DATA = OWN ADDRESS (DATA X'00' - X'1F').

RTN11 - COARSE CONTROL STOR TEST
DSA CONTROL STOR IS RIGOROUSLY TESTED ONLY BY DIAGNOSTIC C11 (SEE SECTION 4.1). THIS TEST PRECEDES THE USE OF CONTROL STOR BY THE ATTACHMENT TESTS.
CONTROL STOR LOCATION 0000 IS WRITTEN AND READ VIA ALL CONTROL STOR DATA IN BUFFERS (PRIMARY AND ALTERNATE FOR EACH LEVEL 000 - 110). DATA IS ALL ONES THEN ALL ZEROES FOR EACH PATH.

RTN12 - HOT TRAP BIT TEST
ATTEMPTS TO RESET TRAPS A, B & C BY RESETTING THE SCN, DST & FHF EX-TERNAL REGISTERS THEN TESTS THAT INDEX 'LINK' WORDS IN ALS ARE NOT AFFECTED WHEN THE TRAPS ARE ENABLED ONE AT A TIME. THIS IS THE FIRST TEST TO USE A RESIDENT (2 WORD) MICROPROGRAM.

RTN13 - ALS TEST (PART 2)
LOADS ALSB(00-31) WITH OWN ADDRESSES (DATA = 00 - 1F) TESTS THAT PROCESS AND ACCESS POINTERS ARE PROPERLY SETUP THEN READS ALSB USING ADDRESSES GENERATED FOR ALL POINTER/MODE COMBINATIONS AND ADDRESSING ALS VIA THE ACCESS POINTER, THE PROCESS POINTER THEN THE INDEX REG.
TESTS THE 'TIME SLICE' FLIP LATCH FOR SET/RESET.
TESTS 'ADDRESS EQUAL COMPARE' WITH RIPPLED PATTERNS IN CSAR AND D-REG.

RTN14 - ZLS TEST (PART 2)
LOADS ZLS LOCATIONS 0 - 31 WITH THEIR OWN ADDRESSES (DATA = X'00' - X'1F') THEN READS ZLS LOCATIONS 00 - 06 AS ADDRESSED BY THE PROCESS POINTER AND ZLS LOCATIONS 10 - 16 AS ADDRESSED BY THE POINTER AND 'BIT 0 -> ZLSAR' (MODE BUFFER FOR EACH POINTER = X'11').

RTN15 - BRANCH INSTRUCTION TEST
EXECUTE AN UNCONDITIONAL BRANCH THEN TEST THAT THE D-REG CONTAINS THE BRANCH DISPLACEMENT AND THE IAR CONTAINS THE BRANCH ADDRESS.
EXECUTE AN UNCONDITIONAL SUBROUTINE BRANCH (BU INST.) AND TEST D-REG AS BEFORE, ALSO TEST MIAR OR SIAR (ALTERNATELY) AND ACCESS POINTER FOR BRANCH ADDRESS AND 'SUBROUTINE MODE' (ON SUBROUTINE CYCLES).
EXECUTE BRANCH INSTRUCTION WITH BAD PARITY AND 'CHECK STOP O'RIDE' OFF THEN TEST THAT IAR DOES NOT ACQUIRE BRANCH ADDRESS.

RTN18 - DATA LOCAL STOR (DLS) TEST
LOAD THEN SENSE DLS LOCATIONS 00 - 63 (ADDRESSED BY 'R' BUS, DATA = OWN ADDRESS IE. X'00' - X'3F').
LOAD THEN SENSE ALL DLS LOCATIONS WITH DATA = X'FF'.

RTN1A - INSTRUCTION DECODE TEST (PART 1)
TEST 'SLKI' INSTRUCTION IN OP-REG THEN TEST 'IOP HALT' AND 'PREVENT-I/O' BITS IN ADAPTER SENSE BYTE 1.
TEST 'SABR' AND 'SADR' INSTRUCTIONS IN OP-REG.
TEST 'SZR' INSTRUCTION IN OP-REG.

4.3.2 DETAILED ROUTINE DESCRIPTIONS (SECTION C14 CONTINUED)

RTN1C - INSTRUCTION DECODE TEST (PART 2)
TEST 'SLKR' AND 'LLKR' INSTRUCTIONS IN OP-REG.

RTN1E - INSTRUCTION DECODE TEST (PART 3)
TEST 'LBI' INSTRUCTION IN OP-REG.
TEST 'MV' INSTRUCTION IN OP-REG.

RTN20 - ALU TEST
TEST 'AND', 'OR', 'EOR' AND 'ADD' FUNCTIONS OF ALU USING MANUAL CONTROL TO GATE DATA THROUGH THE DSA ALU AND FETCH RESULTS.

RTN26 - NO-OP INSTRUCTIONS TEST
TESTS THAT NO-OP INSTRUCTIONS ARE EXECUTED FROM CONTROL STOR (MICRO-PROCESSOR RUNNING). CONTROL STOR LOCATIONS 0000 - 0008 ARE LOADED WITH NO-OP INSTRUCTIONS THEN THIS 'MICROPROGRAM' IS EXECUTED ON ALL PROGRAM LEVELS (TIME SLICING). THE MIAR FOR EACH LEVEL IS THEN TESTED FOR THE CORRECT COMPLETION ADDRESS. THIS IS THE FIRST TIME THAT 'TIME SLICING' IS USED.

RTN28 - UNCONDITIONAL SUBROUTINE BRANCH (BU) INSTRUCTION TEST
TESTS 'BU' INSTRUCTION FUNCTION IN 'TIME SLICING' MODE BY LOADING 'BU' INSTRUCTIONS INTO CONTROL STOR LOCATIONS 0000 - 0008 THEN EXECUTING THIS 'MICROPROGRAM' ON ALL PROGRAM LEVELS. THE MIAR AND SIAR FOR EACH LEVEL IS THEN TESTED FOR THE CORRECT COMPLETION ADDRESS.

RTN2A - LOAD BYTE IMMEDIATE (LBI) INSTRUCTION TEST
TESTS 'LBI' INSTRUCTIONS USING ZONES 0 & 1 ON ALL PROGRAM LEVELS.

RTN2C - ALU IMMEDIATE OPERATIONS TEST
TESTS ALU OPS 'ANDI', 'ORI', 'EORI' AND 'ADDI' FOR DATA RESULTS AND 'BRANCH ON CONDITION' RESULTS USING MICROPROGRAM.

RTN2E - STORE/LOAD AND INCREMENT (SINC/LINC) INSTRUCTION TEST
TESTS 'SINC', 'LINC' AND 'SDEC' INSTRUCTIONS USING MICROPROGRAM.

RTN2F - TEST BIT ON/BIT OFF (TBON/TBOF) INSTRUCTION TEST
TEST 'TBON' THEN 'TBOF' INSTRUCTIONS USING MICROPROGRAM THAT SETS EACH BIT OF DLS REGISTER 00 IN TURN THEN BRANCHES AS REQUIRED.

4.3.3 AMOP LINK OPTION

THE ADAPTER MANUAL OPERATIONS PROGRAM (AMOP, C19) IS USED IN CONJUNCTION WITH OTHER DIAGNOSTIC PROGRAMS AS A MEANS CONTROLLING THE DSA MICROPROCESSOR WHILE THE ATTACHMENT AND/OR 3340 DRIVES ARE BEING TESTED. THE POINT AT WHICH AMOP GAINS CONTROL DEPENDS UPON THE DIAGNOSTIC PROGRAM BEING EXECUTED AND SENSE SWITCH COMBINATIONS (SEE AMOP POINT OF CONTROL BELOW).

USAGE OF AMOP -

SET SSW 2F AT ANY TIME AFTER LOADING C12,C14,C15,C16 OR C18. SET ADDRESS SWS 1 & 2 TO 8X (WHERE X IS 1,2 OR 3) TO LOAD C19 (IF NECESSARY) AND LINK FROM THE DIAGNOSTIC PROGRAM TO C19. THE ONLY EXCEPTION IS PROGRAM C18 WHICH REQUIRES USE OF THE PA1 KEY ON THE KEYBOARD. APPROPRIATE MESSAGES WILL BE PRINTED IF C19 IS LOADED. REFER TO SECTION 1.3.3 IF A HALT H5 OR HD (SMALL D) OCCURS WHEN LINKING TO AMOP USING AN ALTERNATE LOAD DEVICE.

USAGE RESTRICTION -

THE AMOP LINK OPTION SHOULD BE USED ONLY WHEN DIAGNOSING PROBLEMS THAT INVOLVE USING PROGRAM LISTINGS. THE PROGRAM LISTINGS REFERENCE THE USE OF CPU CONSOLE ADDRESS SWITCHES (SEE AMOP POINT OF CONTROL BELOW) TO CAUSE LINKAGE TO C19 AT PARTICULAR LOCATIONS WITHIN THE RESPECTIVE DIAGNOSTIC PROGRAM. NOTE: IF LINK TO C19 FROM C14 OR C15 IS DESIRED AND THE LOADER IS THE 3340, AMOP MUST BE LOADED PRIOR TO EXECUTION OF EITHER DIAGNOSTIC PROGRAM.

AMOP POINT OF CONTROL -

THE FOLLOWING TABLE OUTLINES AT WHAT POINT AMOP (C19) GAINS CONTROL WHEN RUN IN CONJUNCTION WITH THE VARIOUS DIAGNOSTIC PROGRAMS:

	SETTING OF LEFTMOST TWO ADDRESS SWS ON CPU CONSOLE		
PROGRAM ID	81	82	83
C12 (3340 FUNCTION TEST)	PRIOR TO ISSUANCE OF NEXT SIO COMMAND	AFTER COMPLETION OF NEXT SIO COMMAND	AFTER AN ERROR HAS BEEN DETECTED IN A COMMAND SEQUENCE
C14 & C15 (ATTACHMENT TESTS)	START OF NEXT TEST LOOP WITHIN A ROUTINE	PRIOR TO NEXT SVP CONTROL COMMAND SEQUENCE	AFTER THE NEXT SVP CONTROL COMMAND SEQUENCE
C16 (MICRO-DIAGNOSTIC LOADER)	AFTER THE NEXT OVERLAY HAS BEEN LOADED AND PRIOR TO ITS' EXECUTION	DIRECT BRANCH TO AMOP FROM C16 IDLE LOOP ROUTINE	AFTER EXECUTION OF LAST OVERLAY AND PRIOR TO LOADING OF NEXT OVERLAY
C18 (FRIENDS TEST)	LINK TO AMOP (C19) DOES NOT DEPEND UPON THE SETTING OF THE ABOVE ADDRESS SWS. LINK TO AMOP IS GAINED BY DEPRESSING PA1 KEY ON THE KEYBOARD.		

4.4 SECTION C15 - 3340/3344 ATTACHMENT TEST

4.4.1 GENERAL

SEE 4.3.1

4.4.2 DETAILED ROUTINE DESCRIPTIONS

RTN02 - EXTERNAL ADDRESS CHECKER TEST
EXTERNAL ADDRESS ERRORS ARE FORCED BY ADDRESSING AN EXTERNAL REGISTER WITH A BAD ZONE IN ZLS X'12'. ALL ADDRESS BITS ARE USED.
'IOP HALT' AND 'EXTERNAL ADDRESS CHECK' BITS ARE TESTED.
EXTERNAL ADDRESSES ARE TESTED WITH A GOOD ZONE IN ZLS, NO CHECK SHOULD OCCUR.
THIS ROUTINE USES A RESIDENT MICROPROGRAM.

RTN03 - SCAN OP REGISTER (SCN) TEST
SCN REG IS LOADED AND SENSED (DATA = X'00', X'FF', X'01' & X'55').
TEST FOR D-REG PARITY CHECKS.

RTN05 - FILE TRAP REGISTER (FTR) TEST
LOAD THEN SENSE THE FTR REG (DATA = X'00', X'FF', X'AA' & X'55').
TEST 'INVERT PARITY' MODE. TURN ON FTR BIT 6 TO FORCE PARITY CHECK.
FORCE PARITY CHECK ON SENSE SCN REG (FTR BIT 6 ON).

RTN07 - DATA TRANSFER CONTROL REGISTER (DXC) TEST
LOAD THEN SENSE DXC REG (DATA = X'00', X'FF' & X'01').

RTN09 - FILE TAG GATE (FTG) REGISTER TEST
LOAD THEN SENSE FTG REG (DATA = X'00', X'FF' & X'01').

RTN0B - FILE BUS OUT (FBO) REGISTER TEST
LOAD THEN SENSE FBO REG (DATA = X'00', X'FF' & X'01').

RTN0D - FILE TAG OUT (FTO) REGISTER TEST
LOAD THEN SENSE FTO REG (DATA = X'00', X'FF' & X'01')

RTN0F - REGISTER ADDRESS TEST
LOAD EXTERNAL REGISTERS FTG, FTO, FTR, FBO, SCN & DXC WITH THEIR OWN ADDRESSES THEN SENSE THEM TO TEST ADDRESSING.

RTN10 - TEST BIT ON (TBON) - TEST BIT OFF (TBOF) TEST (EXTERNAL)
TURN OFF EACH BIT IN THE FBO REG AND TEST FOR TBOF BRANCH. BIT 3 'OFF' CAUSES 'ALL' BITS TO BE TESTED FOR 'OFF'.
TURN ON EACH BIT IN THE FBO REG AND TEST FOR TBON BRANCH. BIT 3 'ON' CAUSES 'ANY' BIT TO BE TESTED FOR 'ON'.

RTN11 - HOT ERROR LATCH TEST
TURN ON 'RESET ERRORS' (FHF REG BIT 0) THEN RUN THE DSA MICROPROCESSOR ONE CYCLE TO STROBE ANY ERRORS INTO ERROR REGISTERS.
TEST THAT ADAPTER DIAG SENSE (ADS) REG BITS 3, 4, 5 & 7 ARE OFF.
TEST THAT HARD ERR SENSE (HES) REG BITS 0, 1, 2, 4 & 7 ARE OFF.

RTN12 - BUS OUT PARITY CHECKER TEST
PUTS BAD PARITY DATA IN FBO REG THEN TESTS FOR BOPAR ERROR.
TESTS THAT BOPAR ERRORS ARE RESET WHEN GOOD PARITY DATA IS LOADED.

RTN13 - TEST FO, FI AND FBI REGISTERS USING DIAGNOSTIC GATING
DATA PATTERNS ARE MOVED FROM FBO -> FO -> FI -> FBI REGS.
DATA IN FBI IS TESTED THEN BOPAR, FBI AND FI ERRORS ARE TESTED FOR (NONE SHOULD OCCUR).
TEST BUS-IN TO FBI BY SETTING DATA = X'AA' IN FBI THEN MOVING DATA = X'00' TO FI REG VIA BUS IN THEN MOVING FI TO FBI FOR TEST.

RTN15 - TEST FBI, FI AND FTO PARITY CHECKERS
TEST FI REG PARITY CHECKER USING FTR REG BIT 6 TO INVERT PARITY.
TEST 'CHECK RESET' (FTR REG BIT 0).
TEST FBI REG PARITY CHECKER (USE FBI ADDRESS '02').
TEST 'FBI ERROR INHIBIT' (FTG REG BIT 7).
TEST FBI REG PARITY CHECKER (USE FBI ADDRESS '0A').
TEST RESET OF 'ATTACHMENT BUSY' (DST REG BIT 0).
TEST RESET OF FHF REG BITS 0 AND 1.
TEST SET/RESET OF TAG BUS PARITY ERROR.

RTN17 - TEST DST REGISTER

RTN18 - TEST SB0, 'SEEK BUSY' AND SENSE BYTE 0 BITS 0 - 3
TEST THAT 'TIO' FOR SEEK BUSY DOES NOT BRANCH WHEN ALL SEEK BUSY OFF.
TEST THAT 'TIO' FOR NOT READY/UNIT CHECK DOES NOT BRANCH WHEN ALL OFF.
TEST 'TIO' FOR NOT READY/UNIT CHECK WILL BRANCH WHEN ON.
TEST 'TIO' FOR SEEK BUSY WILL BRANCH WHEN ON.

RTN19 - TEST SB1 REGISTER BITS 1, 2, 3, 4, 5 AND 'OP-END'
TEST SB1 REG BITS 1 & 4 SET AND RESET.
TEST THAT 'OP-END' (SB1 BIT 3) WON'T COME ON IF ENABLED BUT NOT SET.
TEST THAT 'OP-END' WON'T COME ON IF SET BUT NOT ENABLED.
TEST THAT 'OP-END' COMES ON WHEN SET AND ENABLED.
TEST THAT 'OP-END' COMES ON WHEN MICROPROCESSOR IS HALTED.
TEST 'DM ATTENTION' (BIT 5).

RTN1A - TEST THE FILE TRAP HARDWARE
A MICROPROGRAM IS STARTED TO TRANSFER TWO BYTES OF DATA (USING DIAGNOSTIC 'SYNC-IN') FROM FBI REG. THE PROGRAM IS RE-USED TO TEST-
  BOTH ODD AND EVEN TRANSFER
  THAT NO TRAPS OCCUR WHEN 'ALLOW FILE TRANSFER' IS OFF
  THAT NO TRAPS OCCUR WHEN FCT REG IS NOT SETUP
  THAT NO TRAPS OCCUR WHEN SCN REG BIT 7 (INHIBIT TRAPS) IS ON
A FILE TRANSFER ERROR IS FORCED TO TEST ADS REG BIT 3.
BRANCH TO 'TRAP A' PROGRAM IS TESTED.
TEST FILE WRITE CONTROLS ('ALLOW FILE XFER' - 'DATA TO FILE').

RTN1C - SCAN HARDWARE TEST
TEST 'SCAN CONTROL' HARDWARE, TRAP C CONTROLS AND SET TO 'FBO' & 'FO'
TEST HI/LO COMPARE LATCHES, RESULT LATCHES AND COMPARATOR.

RTN1D - FORCE RECYCLE TEST
START A MICROPROGRAM TO SIMULATE 'RECYCLE', AFTER FILE COUNT GOES TO ZERO SET 'FORCE RECYCLE' AND TEST ADS REG BIT 1. IF 'RECYCLE' WORKS TEST THAT THE DSADDR WAS PROPERLY INCREMENTED FOR THE SIMULATED 256 BYTE DATA TRANSFER.

RTN1F - CHANNEL DATA PATH TEST (SINGLE BYTE, PART 1)
TEST CO0/CO2 REGISTERS BY READING 'R' BYTE OF A SIO INSTRUCTION.
TEST BO0/CI0 REGISTERS BY READING AND UPDATING 'DDDR'.
TEST CHANNEL 'SUBTRACT' FUNCTION.
TEST THAT CI0 ONLY IS SENT TO LSR.
TEST CI PARITY CHECKER BY FORCING A 'PARITY CHECK'.

RTN20 - CHANNEL DATA PATH TEST (SINGLE BYTE, PART 2)
TEST DATA TRANSFER 'TO' DDDF THEN 'TO' DDCF.
TEST THAT PROGRAM LEVELS '110', '101' AND '011' IN CHANNEL INDEX DON'T ALLOW DATA TRANSFER.

RTN22 - CHANNEL DATA PATH TEST (255 BYTE XFER ODD & EVEN, TO AND FROM THE CHANNEL)
TEST 255 BYTE DATA TRANSFER 'TO' THE ATTACHMENT (DATA = 00 - FF).
TEST 255 BYTE DATA TRANSFER 'FROM' THE ATTACHMENT (DATA = 00 - FF)
TEST 'TO' - 'FROM' AS ABOVE WITH 'ODD' (STARTING WITH ODD ADDRESS) DATA TRANSFER.

RTN24 - TEST DIFFERENCE COUNTER
TEST DIFFERENCE COUNTER USING 130 BYTE DATA 'TRANSFER' (DIAG SYNC-IN).
TEST RCS PARITY CHECK.

4.4.3 AMOP LINK OPTION SEE 4.3.3

4.5 SECTION C16 - 3340/3344 MICRODIAGNOSTIC LOADER

4.5.1 DESCRIPTION

SECTION C16 LOADS THE 3340/3344 MICRODIAGNOSTIC MONITOR (FA1) INTO THE DSA AND CONTROLS THE SUBSEQUENT LOADING OF THE 3340 OR 3344 MICRO-DIAGNOSTIC ROUTINES. AFTER C16 IS LOADED IT WILL INITIALIZE THE DSA MICROPROCESSOR AND THE SYS/3 MAIN STORAGE MICRODIAGNOSTIC BUFFER AREAS PRIOR TO LOADING SECTION FA1. THE BEHAVIOR OF SECTION C16 AFTER SECTION FA1 IS LOADED DEPENDS UPON WHETHER THE 3340 IS USED AS THE LOADER. THE FOLLOWING PARAGRAPHS PROVIDE A DETAILED DESCRIPTION OF THIS BEHAVIOR.

4.5.2 PROCEDURES FOR LOADING THE MICRODIAGNOSTICS

SECTION C16 CAN LOAD EITHER THE 3340 OR 3344 MICRODIAGNOSTIC ROUTINES FROM THE ALTERNATE LOADER OR THE CE DATA MODULE PLACED ON DRIVE 1. IF THE ALTERNATE LOADER IS USED THEN SECTION C16 CONTROLS THE LOADING OF EITHER THE 3340 OR 3344 MICRODIAGNOSTICS. THE APPROPRIATE CARD DECKS (FA1-FA5 FOR THE 3340 OR FA1,FA8-FAA FOR 3344) SHOULD BE PLACED IN THE LOADER IMMEDIATELY BEHIND SECTION C16. SELECT THE APPROPRIATE DISKETTE IF THE 3741 IS THE ALTERNATE LOADER. AFTER SECTION C16 LOADS SECTION FA1, A MESSAGE 'MICRO DIAGNOSTICS READY' WILL BE PRINTED. MICRODIAGNOSTIC ROUTINES (3340 OR 3344) MAY THEREAFTER BE REQUESTED FROM THE 3340 CE PANEL AS DESCRIBED IN THE 3340 OR 3344 MICRO MLM. DURING OPERATION, THE MICRODIAGNOSTIC SECTIONS WILL BE LOADED INTO MAIN STORAGE AS REQUIRED. DURING USE OF THE MICRODIAGNOSTICS, THE USER SHOULD OCCASIONALLY CHECK THE SYS/3 CONSOLE FOR POSSIBLE ERROR OR OPERATOR INTERVENTION HALT. H5 AND/OR HD HALTS (OF THEY OCCUR) SHOULD BE HANDLED AS DESCRIBED IN SECTION 1.3.4.
IF THE 3340 IS USED AS THE LOADER (DRIVE 1 MUST BE FUNCTIONAL), SECTION C16 WILL EITHER LOAD THE 3340 OR THE 3344 MICRODIAGNOSTIC ROUTINES. AFTER SECTION C16 IS LOADED, THE 3340 MICRODIAGNOSTIC SET WILL BE LOADED BY DEFAULT IF SENSE SWITCH 27 IS NOT ACTIVE. IN DEFAULT MODE SECTION FA1-FA5 WILL BE LOADED INTO MAIN STORAGE(PROVIDED MAIN STORE IS GREATER THAN 48K) PRIOR TO RELEASING CONTROL TO THE CE PANEL ON THE 3340. ALL THE 3340 OR 3344 MICRODIAGNOSTIC ROUTINES CAN RESIDE IN MAIN STORAGE PROVIDED AMOP(C19) IS NOT RESIDENT. IF SENSE SWITCH 27 IS ACTIVE PRIOR TO LOADING FA1, THEN THE 3344 MICRO-DIAGNOSTICS WILL BE LOADED INTO MAIN STORAGE PRIOR TO RELEASING CONTROL TO THE 3340 CE PANEL.

NOTE: THE SETTING OF SENSE SWITCH 27 HAS EFFECT UPON INITIAL LOADING OF THE MICRODIAGNOSTICS ONLY. I.E. - IF THE CE NEGLECTS TO SET SENSE SWITCH 27, FA1-FA5 (3340 MICRO SET) WILL BE LOADED IN MAIN STORAGE AND THE REQUESTED MICRO ROUTINES CAN BE EXECUTED IF A 3340 DRIVE IS PLACED IN CE MODE. HOWEVER, IF A 3344 DRIVE IS PLACED IN CE MODE, ONLY THE DIAGNOSTIC SECTION THAT CONTAINS THE REQUESTED ROUTINE WILL BE LOADED. ANY ADDITIONAL MICRODIAGNOSTIC SECTIONS WILL BE LOADED ON AN AS REQUIRED BASIS.

WHEN A CE CALLS FOR A ROUTINE THAT IS NOT IN MAIN STORAGE (WHEN THE 3340 IS USED AS A LOADER), A 'SOFT IPL' WILL BE PERFORMED BY SECTION C16 TO LOAD THE FUNCTIONAL MICROCODE. THE FUNCTIONAL MICROCODE WILL CLEAR THE CE PANEL ON THE 3340 WHILE LOADING THE MICRODIAGNOSTIC SECTION WHICH CONTAINS THE REQUESTED ROUTINE. AFTER THE SECTION IS LOADED, C16 WILL OVERLAY THE MICROCODE (FA0) WITH DIAGNOSTIC (FA1) AND THE REQUESTED OVERLAY. THE NORMAL INDICATIONS ON THE 3340 CE PANEL WILL BE DISPLAYED. IF DRIVE 1 IS IN CE MODE AND SECTION C16 ISSUES A 'SOFT IPL' TO LOAD A MICRODIAGNOSTIC SECTION, AN ERROR WILL OCCUR ACCOMPANIED BY A MESSAGE TO REMOVE DRIVE 1 FROM CE MODE OR USE THE ALTERNATE LOADER. NORMAL RECOVERY IS BY REMOVING DRIVE 1 FROM CE MODE, DEPRESSING THE ATTENTION BUTTON ON DRIVE 1 AND RESETTING THE CPU HALT IF THE CE WISHES TO USE DRIVE 1 AS THE LOADER.

4.5 SECTION C16 - 3340/3344 MICRODIAGNOSTIC LOADER PROGRAM (CONTINUED)

4.5.3 PATCHING 3340 MICRODIAGNOSTICS

PATCHES FOR 3340 MICRODIAGNOSTICS ARE ENTERED INTO C16.
A PATCH AREA IS ESTABLISHED AT MAIN STORAGE LOCATION X'8000' WHEN C16 IS LOADED.
THE PATCH AREA IS SCANNED AFTER A MICRODIAGNOSTIC SECTION (FA1 - FA5) HAS BEEN LOADED AND REQUIRED PATCHES ARE INSERTED IN THE MICRODIAGNOSTIC CODE NOW IN MAIN STORAGE.

USE ANY PATCH OR 'REP' METHOD TO PATCH C16 LOC X'8000' - 80FF' AS FOLLOWS:
EACH PATCH IS FROM 6 - X BYTES (X = MULTIPLE OF 3).
EACH PATCH BUT THE FIRST MUST BE SEPARATED FROM THE LAST PATCH BY ANY NUMBER OF BYTES OF X'FF'.

EACH PATCH IS IN THE FOLLOWING FORMAT:

TO PATCH A MICRO INSTRUCTION -
1 ID. BYTE, 2 LOCATION BYTES, 3 OR MORE INSTRUCTION BYTES

EXAMPLE: PATCH 'AC0704000706FF'
WILL REPLACE THE INSTRUCTION IN MICRODIAGNOSTIC 'AC' AT ADDRESS '0704' WITH THE INSTRUCTION '000706'.

TO PATCH A MICRO DATA BYTE -
1 ID. BYTE, 2 LOCATION BYTES, 3 BYTES (BYTE 2 CONTAINS LEFT DATA, BYTE 3 CONTAINS RIGHT DATA)
(SEE NOTE)

NOTE: THE HI ORDER BIT OF THE FIRST DATA BYTE MUST BE 'ON'
THE HI ORDER BIT OF THE SECOND LOCATION BYTE MUST BE 'OFF' TO PATCH DATA LEFT, 'ON' TO PATCH DATA RIGHT.

EXAMPLE: PATCH 'AC070480EE00FF'
WILL REPLACE THE LEFT DATA BYTE IN MICRO DIAGNOSTIC OVERLAY 'AC' AT LOCATION '0704' WITH X'EE'.

4.5.4 PATCHING 3344 MICRODIAGNOSTICS

PATCHES FOR 3344 MICRODIAGNOSTICS OVERLAYS ARE ENTERED INTO SECTION C16 SIMILAR TO PATCHES FOR THE 3340 OVERLAYS ABOVE. HOWEVER, A DEVICE TYPE BYTE MUST BE PLACED IN FRONT OF THE ID BYTE IN THE FOLLOWING FORMAT:

TO PATCH A MICRO INSTRUCTION OR A DATA BYTE -
1 DEVICE TYPE BYTE, 1 ID BYTE, 2 LOCATION BYTES, 3 OR MORE INSTRUCTION OR DATA BYTES.

DEVICE TYPE BYTES
FOR 3340 - 'F0'
FOR 3344 - 'F4'
IF THE DEVICE TYPE IS MISSING, A 3340 PATCH IS ASSUMED.

4.5.5 AMOP LINK OPTION SEE 4.3.3

4.6 SECTION C17 - 3340/3344 ATTACHMENT MICROCODE LOADER

THIS DIAGNOSTIC SECTION LOADS THE FUNCTIONAL MICROCODE INTO MAIN STORAGE (IF NOT ALREADY IN MAIN STORAGE) FROM THE NORMAL PROGRAM AREA ON THE CE DATA MODULE. C17 ALSO PATCHES THE MICROCODE IF REQUIRED AND THEN LOADS THE MICROCODE INTO CONTROL STORAGE AND STARTS THE MICROPROCESSOR.

NOTE: ON AN IPL OPERATION FROM THE 3340 (HARD OR SOFT), C17 IS NOT USED TO LOAD THE MICROCODE FROM CYLINDER 0.

PATCHES FOR THE MICROCODE (FA0) MUST BE ENTERED INTO SECTION C17. A PATCH AREA IS ESTABLISHED AT MAIN STORE LOCATION X'7600' WHEN C17 IS LOADED. THE PATCH AREA IS SCANNED AFTER SECTION FA0 IS LOADED AND ANY REQUIRED PATCHES ARE INSERTED INTO THE MICROCODE BEFORE CONTROL STORE IS LOADED.

MICROCODE PATCHES MAY BE INSERTED ANYWHERE WITHIN THE MICROCODE PATCH AREA (MAIN STORE ADDRESSES 7600 - 76FF) IN SECTION C17. THE 'REP' METHOD FROM CARDS OR USING DD6 (3340 EDITOR) MAY BE USED TO INSERT THE PATCHES INTO THE PATCH AREA. IF MORE THAN ONE PATCH IS INSERTED, AT LEAST ONE BYTE OF 'FF' (HEX) MUST BE INSERTED BETWEEN PATCHES.

PROCEDURE FOR PATCHING THE MICROCODE LOADER (C17) -

INSTALL CE MODULE ON DRIVE 1 AND MAKE THE DRIVE READY AND IPL TO LOAD DCP AND 3277 MICROCODE.
AT THE 'HA' HALT CALL IN DD6 (3340 EDITOR).
RESET 'HA' HALT AFTER DD6 IS LOADED TO OBTAIN 'F0' HALT.
IF 'REP' METHOD IS FROM CARDS GO TO THE PROCEDURE FOR 'REP' METHOD FROM CARDS. OTHERWISE USE THE 'REP' METHOD USING THE 3277 CRT.

'REP' METHOD FROM CARDS -

AT 'F0' HALT SET APPROPRIATE SSW TO USE THE ALTERNATE LOADER (REFER TO PRINTOUT). PUT CARDS INTO THE HOPPER OF THE ALTERNATE LOADER AND MAKE READY IF NOT ALREADY DONE. CARDS SHOULD BE IN THE FOLLOWING SEQUENCE (REFER TO BLOCK 94 OF USERS GUIDE SECTION 1.1.4.6 FOR ADDITIONAL INFORMATION IF NECESSARY):

```
$REPC17
R ADDR ADDR,DATA (SEE DEFINITIONS BELOW)
E
/&
```

RESET CPU HALT TO READ IN CARDS TO ALTER SECTION C17 ON THE CE DATA MODULE AND OBTAIN ENDING HALT.

'R ADDR ADDR,DATA' DEFINITIONS:

```
(MICRO-INSTRUCTION PATCH)              .---FF IS USED TO SEPARATE TWO PATCHES
                                       |
                                       V
R ADDR XXXX,OYYYYY,OYYYYY,OYYYYY,FF,XXXX,OYYYYY
R ADDR XXXX,OYYYYY            A
    A       A                 |
    |       |                 |---COMMAS MAY BE USED OPTIONALLY
    |       |
    |       |---WHEN PATCHING A MICRO-INSTRUCTION, THIS WILL BECOME
    |           A 1 IN CONTROL STORAGE IF PARITY REQUIRES IT (DONE
    |           AUTOMATICALLY BY PROGRAM).
    |
    |---THE ADDRESS RANGE IS 7600 - 76F9 (HEX).

  XXXX = TWO BYTE CONTROL STORAGE ADDRESS
OYYYYY = THREE BYTE MICRO-INSTRUCTION
```

EXAMPLE:

```
R 7600 125D,000F78,FF,0F78,0C8402,09C4F0 --- WILL REPLACE THE MICRO-
                                              INSTRUCTION AT CONTROL
                                              STORAGE LOCATION 125D TO
                                              000F78 AND THE TWO
                                              MICRO-INSTRUCTIONS AT
                                              0F78 & 0F79 TO 0C8402
                                              AND 09C4F0 RESPECTIVELY.
```

```
(CONTROL STORAGE DATA BYTE PATCH)

R ADDR XXXX,8YYYYY,8YYYYY,8YYYYY
          A                A
          |                |
          |                |---MUST BE AN 8 TO INDICATE TO THE PROGRAM
          |                    THAT A DATA BYTE IS BEING PATCHED.
          |
          |---THIS BYTE (2ND) DETERMINES LEFT OR RIGHT CONTROL STORAGE
              PATCHING. IF THE HIGH ORDER BIT IS 0, LEFT CONTROL
              STORAGE IS PATCHED. IF THE BIT IS 1, RIGHT CONTROL
              STORAGE IS PATCHED.
```

OTHER INFORMATION FROM MICRO-INSTRUCTION PATCH APPLY HERE ALSO.

EXAMPLES:

```
R 7650 0604,800700,800300 -- WILL REPLACE THE TWO DATA BYTES (LEFT)
                             AT CONTROL STORAGE LOCATIONS 0604 AND
                             0605 WITH 07 AND 03.

R 76A0 0684,800006,800001 -- WILL REPLACE THE TWO DATA BYTES (RIGHT)
                             AT CONTROL STORAGE LOCATIONS 0684 AND
                             0685 WITH 06 AND 01.
```

'REP' METHOD USING THE CRT -

REFER TO BLOCK 94 OF USERS GUIDE FOR ADDITIONAL INFORMATION IF NECESSARY.
RESET 'F0' HALT IN SECTION DD6 AND TYPE IN $REPC17 AS THE OPTION.
HIT ENTER KEY TO OBTAIN SECOND OPTION.
TYPE IN THE DESIRED 'REP' INFORMATION (CRT INPUT LINES 10 & 11 MAY BE USED IF NECESSARY). THE FORMAT OF THE 'REP' INFORMATION IS IDENTICAL TO THAT FOR CARDS ILLUSTRATED ABOVE. AFTER ENTERING NECESSARY INFORMATION, ENTER E TO WRITE CHANGES TO C17 ON THE CE MODULE.
TERMINATE SECTION DD6.

IMPLEMENT CHANGES TO FA0 (ATTACHMENT MICROCODE) VIA C17 -

AFTER CHANGES HAVE BEEN MADE TO C17, SECTION FC2 (IPL FORMAT PROGRAM) MUST BE USED TO UPDATE THE MICROCODE (FA0) ON CYLINDER 0. SECTION FC2 LOADS C17 AND EFFECTIVELY LOADS AND PATCHES FA0 IN THE PROCESS.

USE THE FOLLOWING PROCEDURE TO UPDATE FA0 ON CYLINDER 0 OF THE CE MODULE:

LOAD SECTION FC2 AND FOLLOW INSTRUCTIONS VIA THE CRT.
CE DATA MODULE MUST BE ON D1.
SELECT D1 (TO UPDATE CE DATA MODULE) AND 'ID' FA0.
MAKE SURE THAT THE PROPER LEVEL OF FA0 IS INSTALLED ON CE DATA MODULE.
FOLLOW THE MESSAGES VIA THE CRT UNTIL CYLINDER 0 OF THE CE MODULE IS UPDATED.

TO UPDATE CUSTOMER PACKS MOUNT THE UPDATED CE MODULE (UPDATED C17 AND PROPER LEVEL OF FA0 MUST RESIDE IN DATA AREA OF CE MODULE) ON D1 AND CALL IN FC2. MOUNT THE CUSTOMER PACK ON D2 OR D3 AND MAKE THE DRIVE READY. FOLLOW INSTRUCTIONS VIA THE CRT SELECTING THE DRIVE TO BE UPDATED (D2 OR D3). THIS ACTION WILL UPDATE CYLINDER 0 OF THE CUSTOMER PACK.

4.6 SECTION C17 - 3340/3344 ATTACHMENT MICROCODE LOADER (CONTINUED)

PROCEDURE TO CHECK OUT PATCHES TO C17 (MICROCODE LOADER) -

THIS PROCEDURE IS USED TO VERIFY THAT THE PATCHES, WHICH WERE MADE TO C17 BY CARDS OR VIA THE CRT, WERE INSERTED INTO THE PATCH AREA (7600 - 76FF).

THE CE DATA MODULE WITH THE PATCHED C17 PROGRAM MUST BE INSTALLED ON D1. AFTER DCP IS BROUGHT IN FROM THE DISK, CALL IN PROGRAM C19 (AMOP). RESET 'HA' HALT AND KEY IN 'MPL' FROM THE KEYBOARD AND DEPRESS 'ENTER' KEY (THIS ACTION WILL CALL IN PROGRAM C17 AND FA0). TYPE IN THE FOLLOWING FROM THE KEYBOARD AFTER PROGRAM FA0 HAS BEEN LOADED:

D,MS,ADDR - WHERE ADDR IS THE MAIN STORAGE ADDRESS OF THE PATCH WHICH WAS INSERTED VIA CARDS OR CRT. THE PATCH AREA IS WRITTEN TO ALL HEX 'FF' IF NO PATCHES WERE INSERTED. CONTINUE AS NECESSARY TO CHECK INSTALLED PATCHES. THE PATCHED DATA OBSERVED SHOULD CORRESPOND WITH THAT READ FROM 'REP' CARDS OR INPUT VIA THE CRT.

D,CI,XXXX - WHERE XXXX IS THE CONTROL STORAGE ADDRESS MODIFIED BY THE PATCH. THE DATA AT THE ADDRESS SHOULD CORRESPOND TO THE CYYYYY DATA ENTERED VIA PATCHES.

AFTER VERIFYING PATCHES, TYPE IN 'G' AND DEPRESS 'ENTER' KEY (TO START MICROPROCESSOR). TO TERMINATE AMOP, TYPE IN 'T' & DEPRESS 'ENTER' KEY.

C17 USAGE:

WHEN LOADING PROGRAMS FROM THE 3340 CE MODULE, C17 IS USED BY THE FOLLOWING PROGRAMS:

C11, C12, C14, C15, C18, C19 (MPL OPTION) AND FC2.

4.7 SECTION C18 - 3340/3344 FRIENDS TEST

THIS SECTION USES THE 3277 CRT/KEYBOARD AS THE PRIMARY MEANS OF COMMUNICATION WITH THE USER. IT CAN, FOR THE MOST PART, BE OPERATED BY USING THE KEYBOARD TO RESPOND TO PROMPTING MESSAGES APPEARING ON THE CRT SCREEN. THE FOLLOWING INFORMATION IS INTENDED TO SUPPLEMENT THE OPERATOR PROMPTING MESSAGES. THE USER IS ASSUMED TO BE FAMILIAR WITH THE 3340 COMMAND SET.

THE FOLLOWING KEYS SERVE SPECIAL FUNCTIONS WHEN USED WITH SECTION C18:

ENTER - THIS KEY CAUSES THE PROGRAM TO READ THE CRT SCREEN AND PROCESS ANY INFORMATION ENTERED BY THE USER.

CLEAR - IF USED IMMEDIATELY AFTER STARTING OR RE-STARTING THE PROGRAM, THIS KEY WILL CAUSE THE SECTION TO BE TERMINATED. IF USED AT ANY OTHER TIME, IT WILL RE-START THE SECTION.

CNCL - IF USED DURING COMMAND ENTRY, THIS KEY WILL CANCEL ANY USER INFORMATION ENTERED ON THE SCREEN SINCE THE LAST OPERATION OF THE ENTER KEY. IF USED AT ANY OTHER TIME, IT WILL CAUSE A RETURN TO THE OPTION SELECTION MENU.

PA1 - IF SENSE SWITCH '2F' IS ON, THIS KEY WILL CAUSE CONTROL TO BE TRANSFERED TO AMOP (SECTION C19 - SEE 1.3.10). IF SENSE SWITCH '2F' IS OFF, THIS KEY WILL HAVE NO EFFECT.

THE FOLLOWING ABBREVIATIONS ARE USED IN OPERATING SECTION C18:

```
SEEK -- SEEK
RECAL - RECALIBRATE

RDHAE - READ HOME ADDRESS AND RECORD ZERO COUNT EVEN
RDHAO - READ HOME ADDRESS AND RECORD ZERO COUNT ODD
RDR00 - READ RECORD ZERO KEY-DATA ODD
RDCKD - READ COUNT-KEY-DATA
RDKD -- READ KEY-DATA
RDVKD - READ VERIFY KEY-DATA
RDDGN - READ COUNT KEY-DATA DIAGNOSTIC
RDSNS - READ DIAGNOSTIC SENSE DATA
RDLOG - READ AND RESET BUFFERED LOG

WRHAE - WRITE HOME ADDRESS AND RECORD ZERO COUNT EVEN
WRHAO - WRITE HOME ADDRESS AND RECORD ZERO COUNT ODD
WRR00 - WRITE RECORD ZERO KEY-DATA ODD
WRCCD - WRITE COUNT COMPRESSED DATA
WRCKD - WRITE COUNT-KEY-DATA
WRKD -- WRITE KEY-DATA
WRREP - WRITE REPEAT KEY-DATA

SCANE - SCAN EQUAL
SCANH - SCAN HIGH OR EQUAL
```

THE FOLLOWING NOTES APPLY TO THE COMMAND ENTRY PHASE OF C18 OPERATION:

A. IF THE KEYBOARD SHOULD LOCK AT ANY TIME, PRESS THE START KEY ON THE SYSTEM/3 OPERATORS CONSOLE.

B. A DEFAULT VALUE OF XX OR XXX INDICATES THAT THE PROGRAM WILL FILL IN THAT FIELD WITH AN APPROPRIATE VALUE DURING COMMAND EXECUTION.

C. VALUES SHOWN IN PARENTHESIS IN PROMPTING MESSAGES INDICATE THE VALID RANGE OF VALUES FOR THE SPECIFIED FIELD. THE USER MAY ENTER A VALUE OUTSIDE THAT RANGE IF HE WISHES TO FORCE AN ERROR CONDITION.

D. FOR MULTI-RECORD READ OR WRITE OPERATIONS, THE MAXIMUM VALID VALUE FOR NN WILL DEPEND ON THE AMOUNT OF MAIN STORAGE AVAILABLE. NN TIMES KL+DL CANNOT EXCEED THE AVAILABLE DDDF AREA. THE DDDF AREA WILL BE 16K BYTES ON A MACHINE HAVING 48K OF MAIN STORAGE OR 32K BYTES ON LARGER MACHINES.

E. THE PROGRAM TURNS ON SENSE SWITCHES 20 THRU 24 AT THE START OF COMMAND ENTRY TO PREVENT INADVERTENT WRITE OPERATIONS. TO ALLOW WRITE, THE APPROPRIATE SENSE SWITCHES MUST BE TURNED OFF AFTER COMMAND ENTRY HAS BEGUN. IT IS RECOMMENDED THAT ANY WRITE TESTING BE DONE ON THE CE TRACKS.

```
NOTE: C.E. TRACKS ARE: CYL 34 HEADS 18-19 ON 12 MB DATA MODULE
                       CYL 209 HEADS 8-19 ON 70 MB DATA MODULE
                       CYL 210 HEADS 0-19, AND CYL 211 HEADS 0-9
                       IN LOGICAL VOL 4 ON 3344
```

F. TO PROVIDE DATA FOR A WRITE OR SCAN OPERATION, THE FORMAT REQUIRED IS IN THE FORM OF DXYY WHERE:

```
 D = A DECIMAL NUMBER OF 1 TO 4 DIGITS
 X = SEPARATION CHARACTER, MEANS 'TIMES',
YY = DATA TO BE REPEATED, AN EVEN NUMBER OF HEX DIGITS.

FOR EXAMPLE: IF A WRKD TO CYLINDER 30, HEAD=0, R=1, N=3
             DXYY = 256X11, 256X2222, 32XA1B2C3D4E5F67788 IS
             SPECIFIED, A RDKD OF THE SAME LOCATION ON DISK WOULD
             SHOW THAT RECORD 1 WOULD HAVE ALL 1'S, RECORD 2 & 3 ALL
             2'S, AND RECORD 4 THE PATTERN 'A1B2C3D4E5F67788'
             REPEATED 32 TIMES TO FILL THE 256-BYTE RECORD.
```

4.8 SECTION C19 - 3340/3344 ADAPTER MANUAL OPERATIONS PROGRAM (AMOP)

AMOP (SECTION C19) SERVES AS AN OPERATORS CONSOLE FOR THE 3340 ATTACHMENT MICRO-PROCESSOR. ITS PROPER USE REQUIRES DETAILED KNOWLEDGE OF MICRO-PROCESSOR OPERATION. IT SHOULD BE USED ONLY AFTER ALL OTHER DIAGNOSTIC METHODS HAVE FAILED.

SECTION C19 USES THE 3277 CRT/KEYBOARD AS THE PRIMARY MEANS OF COMMUNICATION WITH THE USER. THE 3277 MICROCODE MUST BE LOADED BEFORE LOADING SECTION C19.

AFTER AMOP IS STARTED, ANY OF THE FOLLOWING COMMANDS MAY BE ENTERED VIA THE 3277 KEYBOARD:

A (ALTER) COMMANDS:	FUNCTION:
A,AC,YYYY	ALTER 'ADDRESS COMPARE STOP' TO ADRS YYYY
A,CI,YYYY,XXXXXX,XXXXXX,ETC.	ALTER CONTROL STOR MICROINSTRUCTION AT ADRS YYYY TO XXXXXX
A,CDL,YYYY,XX,XX,ETC. A,CDR,YYYY,XX,XX,ETC.	ALTER CONTROL STOR DATA L-LEFT OR R-RIGHT AT ADDRS YYYY TO XX
A,DLS,YY,XX	ALTER LOCAL REGISTER DATA IN DLS YY TO XX
A,ZLS,YY,XX	ALTER ZLS DATA IN ZLS YY TO XX
A,ALSB,YY,XX A,ALSD,YY,XX	ALTER ADDRESS LOCAL STOR B-BLOCK OR D-DIS PLACEMENT AT ADDRS YY TO XX
A,EAAA,XX	ALTER EXTERNAL REGISTER NAMED AAA TO XX (SEE 3340 TMD, EXTERNAL REGISTER TABLE, FUNCTIONAL UNITS, FOR REGISTER NAMES AND READABLE/WRITEABLE CONTROL).
A,MB,XX	ALTER DSA MODE BUFFER. XX = 8 BITS (XPPPXXMM) WHERE X=NOT USED, P = POINTER LEVEL, M = MODE BITS)
A,CSTP,X	X = 0 DO NOT INHIBIT CHECK STOP X = 1 INHIBIT CHECK STOP
A,MS,YYYY,XXXXX....	ALTER S/3 MAIN STOR AT ADDRS YYYY TO DATA XXXXX..... (UP TO 16 BYTES)

D (DISPLAY) COMMANDS:	FUNCTION:
D,CI,YYYY	DISPLAY CONTROL STOR MICROINSTRUCTIONS AT ADRS YYYY
D,CDL,YYYY D,CDR,YYYY	DISPLAY CONTROL STOR DATA L-LEFT OR R-RIGHT AT ADDRS YYYY
D,DLS,YY	DISPLAY LOCAL REGISTER (DLS) ADDRS YY
D,ZLS	DISPLAY ZLS
D,ALSU	DISPLAY ALS 0 - 15 (BLOCK & DISPLACEMENT)
D,ALSL	DISPLAY ALS 16 - 31
D,EAAA	DISPLAY EXTERNAL REGISTER NAMED AAA (SEE 3340 TMD, EXTERNAL REGISTER TABLE, FUNCTIONAL UNITS, FOR REGISTER NAMES AND READABLE/WRITEABLE CONTROL).
D,MB	DISPLAY DSA MODE BUFFERS 0 - 7
D,MS,YYYY	DISPLAY 16 BYTES OF MAIN STOR AT YYYY

CONTROL COMMANDS:	FUNCTION:
G	START THE DSA MICROPROCESSOR
G,XX	RUN THE DSA MICROPROCESSOR FOR XX CYCLES
(BLANK)	RUN THE DSA MICROPROCESSOR FOR ONE CYCLE
H	HALT THE MICROPROCESSOR
I	INHIBIT 'ADDRESS COMPARE STOP'
MPL	EXECUTE SIO SOFT IPL
P	PRINT CONTENT OF CRT SCREEN (EXCEPT WHERE 'P' IS POSITIONED)
T	TERMINATE C19

ERROR AND WARNING MESSAGES

ERR#	ERROR MESSAGE	DESCRIPTION/ACTION
1	INVALID COMMAND SPECIFIED	COMMAND NOT IN 'AMOP' COMMAND SET
2	NO COMMA/BLANK FOLLOWING COMMAND	COMMANDS MUST BE SEPARATED FROM OPERANDS BY A COMMA OR A BLANK
3	NOT USED	
4	REGISTER SPECIFIED CANNOT BE DISPLAYED	A REGISTER WAS SPECIFIED THAT CANNOT BE DISPLAYED
5	REGISTER SPECIFIED CANNOT BE ALTERED	REGISTER WAS SPECIFIED THAT CANNOT BE ALTERED
6	NO COMMA/BLANK FOLLOWING OPERAND	OPERANDS MUST BE SEPARATED FROM DATA OR ADDRESS FIELDS BY A COMMA OR A BLANK
7	UNDEFINED OPERAND FIELD	AN OPERAND WAS SPECIFIED THAT DOES NOT BELONG IN 'AMOP' OPERAND SET
8	INVALID EXTERNAL REGISTER SPECIFIED	A REGISTER WAS SPECIFIED THAT 'AMOP' DOES NOT RECOGNIZE
9	NO COMMA/BLANK IN DATA FIELD	DATA FIELD IN CLD/CDR OR CI OPERANDS MUST BE SEPERATED BY COMMAS. HOWEVER, THE LAST DATA FIELD MUST BE FOLLOWED BY AT LEAST ONE BLANK CHARACTER
10	CSTP OPERAND NOT FOLLOWED BY 1 OR 0	FAILED TO DETECT A 1 OR 0 FOLLOWING CSTP OPERAND 1 = INHIBIT CHECK STOP 0 = DO NOT INHIBIT CHECK STOP
11	BOUNDARY ALIGNMENT ON ADDRESS (CI) (CD)	BOUNDARY CROSSING WAS DETECTED WHEN STORING DATA IN CI OR CD OPERATION. DATA WILL NOT BE STORED IF: CI ADDRESS XX7F OR IF CD ADDRESS XX7F
12	ILLEGAL OPERAND FOLLOWING CMD	THE OPERAND SPECIFIED IS INCOMPATIBLE WITH THE COMMAND EXAMPLE: D,AC THE OPERATION IS ILLEGAL SINCE ADDRESS COMPARE CANNOT BE DISPLAYED
13	ODD # OF DIGITS IN (MS) STRING	THE DATA FIELD APPEARING WITH THE ALTER SYSTEM 3 MAIN STORE CONTAINS AN ODD # OF DIGITS
14	OPERAND/ADDRESS FIELD IS BLANK	EITHER A BLANK OPERAND FIELD OR ADDRESS FIELD WAS BLANK
15	NO VALUE GIVEN WITH ALTER REG CMD	NO VALUE WAS GIVEN FOLLOWING AN 'ALTER' REG COMMAND
16	IOP HALTED DUE TO CHECK STOP	CHECK STOP WAS ACTIVE WHEN AN AMOP COMMAND WAS ISSUED
17	IOP HALTED DUE TO ADDRESS COMP STOP	ADDRESS COMPARE STOP WAS ACTIVE
WARNING	WRAPAROUND OCCURRED ON CI ADRS	THE END OF A CONTROL STORAGE BLOCK (XX7F) WAS DETECTED. WHEN THE LAST BYTE IS READ, WRAPAROUND OCCURS TO THE BEGINNING OF THE BLOCK (XX00)
18	IOP HALTED DUE TO UNKNOWN REASON	

4.9 SECTION C1A - 3340/3344 CONTROLLER INTERFACE PROBE LOOP

THIS DIAGNOSTIC IS AN EXERCISER WHICH CAUSES THE CONTROLLER/INTERFACE LINES TO BE USED SO THAT PROBE PROCEDURES CAN ISOLATE PROBLEMS IN THE CABLES BETWEEN THE CONTROLLER AND THE ATTACHMENT.

THERE ARE NO ERROR HALTS (PROVIDING THE DSA FUNCTIONAL MICRO CODE CAN RUN).

THE SECTION WILL RUN CONTINUOUSLY UNTIL TERMINATED BY THE OPERATOR.

4.10 SECTION C1B - 3340/3344 DATA MODULE SCAN

THIS SECTION PROVIDES THE CAPABILITY TO CHECK AN ENTIRE DATA MODULE OR HEAD/DISK ASSEMBLY (HDA) FOR INCORRECTLY FORMATTED TRACKS OR DEFECTIVE RECORDS. THE PROGRAM ALSO PERFORMS AN ANALYSIS OF ALTERNATE TRACK ASSIGNMENTS.

EACH AVAILABLE TRACK ON THE DATA MODULE IS INDIVIDULALY CHECKED BEGINNING WITH CYLINDER 0, HEAD 0 AND PROCEEDING WITH SEQUENTIALLY HIGHER TRACK ADDRESSES UNTIL THE ENTIRE DATA MODULE OR HDA HAS BEEN CHECKED (CE CYLINDER IS NOT CHECKED).

EACH TRACK IS CHECKED BY READING THE HOME ADDRESSES AND RECORD ZERO COUNT FIELDS (BOTH EVEN AND ODD), CHECKING THESE FIELDS FOR VALIDITY, AND CHECKING FOR PROPER FLAGGING OF DEFECTIVE AND ALTERNATE TRACKS.

IN ADDITION, IF SENSE SWITCH '1F' IS OFF, ALL KEY AND DATA FIELDS ARE CHECKED ON EACH TRACK THAT IS NOT FLAGGED DEFECTIVE. THIS CHECKING IS DONE BY USE OF THE 'READ VERIFY' COMMAND (ECC CHECKING ONLY). NO DATA IS TRANSFERRED TO MAIN STORAGE.

IF, WHEN A TRACK IS CHECKED, ANY ABNORMAL CONDITION IS ENCOUNTERED, A BRIEF MESSAGE IS PRINTED DESCRIBING THE CONDITION. NO MORE THAN ONE SUCH MESSAGE WILL BE PRINTED FOR EACH TRACK CHECKED. IF MORE THAN ONE ABNORMAL CONDITION IS DETECTED FOR A GIVEN TRACK, ONLY THE MESSAGE DESCRIBING THE MOST SEVERE ERROR CONDITION WILL BE PRINTED. TRACK CHECKING, AND PRINTING WHEN REQUIRED, CONTINUES UNTIL THE ENTIRE DATA MODULE HAS BEEN CHECKED OR UNTIL AN ERROR CONDITION OCCURS OF SUCH SEVERITY THAT CONTINUED TESTING WOULD SERVE NO USEFULL PURPOSE.

EACH MESSAGE OUTPUT DURING THE DATA MODULE SCAN CONTAINS THE CYLINDER AND HEAD ADDRESS OF THE TRACK ON WHICH THE ABNORMAL CONDITION WAS DETECTED AND A BRIEF DESCRIPTION OF THE CONDITION DETECTED. IN ADDITION, EACH SUCH MESSAGE IS PREFACED BY A SINGLE CHARACTER WHICH PLACES THE MESSAGE IN A GENERAL CATAGORY AS FOLLOWS:

PREFACE	MEANING
D	THE TRACK IS PROPERLY FLAGGED AS DEFECTIVE.
A	THE TRACK IS PROPERLY ASSIGNED AS AN ALTERNATE TRACK.
I	INFORMATION MESSAGE ONLY.
*	ERROR CONDITION DETECTED.

A 'NORMAL' DATA MODULE WILL USUALLY RESULT IN AN EQUAL NUMBER OF 'D' AND 'A' PREFACED MESSAGES, ABOUT 20 OR 30 'I' PREFACED MESSAGES, AND NO '*' PREFACED MESSAGES. SECTION 3.3 IN THIS USER'S GUIDE MORE FULLY DESCRIBES MESSAGES THAT MAY BE PRINTED BY SECTION C1B.

4.11 SECTION C1C - 3340/3344 INITIALIZER

ROUTINE 01 - DISK INITIALIZER
THIS ROUTINE IS USED TO INITIALIZE A DATA MODULE OR AN HDA . STARTING AT CYLINDER 0, HEAD 0, THE HOME ADDRESS IS READ ON BOTH THE EVEN AND ODD SIDES. IF EITHER SIDE IS DEFECTIVE, THE PROGRAM INCREMENTS TO THE NEXT HEAD. IF NEITHER SIDE IS DEFECTIVE, THE PROGRAM WILL FORMAT BOTH SIDES BY ISSUING A WRITE-COUNT-COMPRESSED-DATA COMMAND WITH R=1 AND N=47. DATA FIELDS WILL BE WRITTEN WITH A X'00' DATA PATTERN.

ROUTINE 02 - HOME ADDRESS FLAG BYTE RESTORE
USED TO RESTORE HOME ADDRESS FLAG BYTES TO 00. IF A HARDWARE FAILURE HAS CAUSED AN EXCESSIVE NUMBER OF TRACKS TO BE FLAGGED DEFECTIVE, THIS ROUTINE CAN BE RUN TO RESTORE THESE FLAGS. ROUTINE STARTS AT CYL 000, HD 00 AND ISSUES A RDHAE AND RDHAO ON EACH HEAD IN EACH CYLINDER. IF A DEFECTIVE FLAG IS FOUND, AND THE SKIP DISPLACEMENT VALUE IS NOT BETWEEN HEX 0000 AND 011E, A WRHAE OR WRHAO IS ISSUED. SENSE SWITCH 29 ALLOWS A FORCED WRHAE OR WRHAO TO THOSE TRACKS THAT ARE FLAGGED DEFECTIVE AND WHOSE SKIP DISPLACEMENT VALUES ARE BETWEEN HEX 0000 AND 011E.
SENSE SWITCH 28 ALLOWS A STARTING CYLINDER ADDRESS OTHER THAN 000 TO BE USED.

4.12 SECTION FA0 - 3340/3344 ATTACHMENT MICROCODE

THIS SECTION CONTAINS THE FUNCTIONAL MICROCODE FOR THE 3340/3344 ATTACHMENT. SECTION FA0 MUST BE LOADED BY SECTION C17.

4.13 SECTIONS FA1 - MICRODIAGNOSTIC CONTROL PROGRAM

THIS PROGRAM INTERFACES BETWEEN SECTION C16 AND THE MICRODIAGNOSTIC OVERLAY WHICH IS RESIDENT IN CONTROL STORAGE. SECTION FA1 ALSO MONITORS THE CE PANEL ON THE 3340 FOR INPUT FROM THE CE AND DISPLAYS CONTROL AND ERROR INFORMATION FOR USE WITH THE 3340 AND/OR 3344 MLM PACKAGE.

4.14 SECTIONS FA2 THRU FA5 - 3340 DIAGNOSTIC MICROCODE

SECTIONS FA2 - FA5 CONTAIN THE NECESSARY MICRODIAGNOSTIC OVERLAYS TO SERVICE THE 3340/3344 CONTROLLER AND THE 3340 DRIVES. THE OVERLAYS CONTAINED IN THESE SECTIONS ARE RUN UNDER CONTROL OF SECTION FA1. AN OVERVIEW OF HOW EACH SECTION IS ORGANIZED INTO ROUTINES AND OVERLAYS FOLLOWS:

SECTION	ROUTINE(S)
FA2	A1 AND OVERLAYS 5B - 5D
	A2 AND OVERLAYS 50 - 57
	A3 AND OVERLAYS 36 & 40
	A5 AND OVERLAYS 37 & 34
	AD AND OVERLAYS 43 - 49
	32
FA3	AF AND OVERLAYS 39 - 3F
	A4 AND OVERLAYS 20 - 27
	AE AND OVERLAYS 2A - 2E
	B3
	32
	AC
FA4	A6 AND OVERLAYS 35, 33 & 31
	A7 AND OVERLAY 67
	A8 AND OVERLAYS 66, 68, 6A & 6B
	B1 AND OVERLAYS 4B & 4C
	B2 AND OVERLAY 30
	32
FA5	A0
	A9 AND OVERLAY 28
	AA AND OVERLAY 60
	AB AND OVERLAY 5F
	B0 AND OVERLAY 02
	B4
	B7
	32

THE INITIAL MICRODIAGNOSTIC OVERLAYS (A1,A2, ETC.) AND EACH OVERLAY (5B, 5C, ETC.) ARE IDENTIFIED WITHIN A SYS/3 DIAGNOSTIC SECTION BY A 'HEADER' CARD THAT HAS A X'70' IN CARD COLUMN 2. THE OVERLAY ID WILL BE FOUND IN CARD COLUMN 12 (80 COLUMN, COMPRESSED FORMAT).

4.15 SECTIONS FA8 THRU FAA - 3344 DIAGNOSTIC MICROCODE

SECTIONS FA8 - FAA CONTAIN THE NECESSARY MICRODIAGNOSTIC OVERLAYS TO SERVICE THE 3340/3344 CONTROLLER AND THE 3344 DRIVES. THE OVERLAYS CONTAINED IN THESE SECTIONS ARE RUN UNDER CONTROL OF SECTION FA1. AN OVERVIEW OF HOW EACH SECTION IS ORGANIZED INTO ROUTINES AND OVERLAYS FOLLOWS:

SECTION	ROUTINE(S)
FA8	A1 AND OVERLAYS 5B-5D
	A2 AND OVERLAY 50-57
	B8 AND OVERLAY 27-29 & 40-42
	AD AND OVERLAY 43-4B
	32
FA9	A5 AND OVERLAYS 37,34,33
	AF AND OVERLAY 38-3E
	B9 AND OVERLAY 20-26
	AE AND OVERLAY 2A-2F
	32
FAA	A7
	BA
	A0
	A9
	AA AND OVERLAY 60
	AB AND OVERLAY 5F
	B4
	BD AND OVERLAY 4F
	B0,B1,B2 AND OVERLAYS 61,62,6C AND 6D

THE INITIAL MICRODIAGNOSTIC OVERLAYS (A1,A2, ETC.) AND EACH OVERLAY (5B, 5C, ETC.) ARE IDENTIFIED WITHIN A SYS/3 DIAGNOSTIC SECTION BY A 'HEADER' CARD THAT HAS A X'70' IN CARD COLUMN 2. THE OVERLAY ID WILL BE FOUND IN CARD COLUMN 12 (80 COLUMN, COMPRESSED FORMAT).

4.16 SECTIONS FA6 AND FA7 - 3340/3344 IPL LOADER AND MICROCODE

THESE SECTIONS ARE USED BY DIAGNOSTIC SECTION FC2 TO CREATE STORAGE IMAGE IPL RECORDS ON A 3340 DATA MODULE OR 3344 HEAD/DISK ASSEMBLY. SEE DOCUMENTATION FOR DIAGNOSTIC PROGRAM FC2 (BLOCK 94) FOR ADDITIONAL INFORMATION.

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1.0 SECTION SENSE SWITCHES AND HALTS

SENSE SWITCH	OPTION IN EFFECT WHEN SWITCH IS ON	WHERE USED
10	BYPASS LOADING OF FUNCTIONAL MICROCODE FB0 INTO CONTROL STORE.	28C
15	LOOP INDEFINITELY ON TEST.	289
17	DELAY 10 SECONDS FOR OPERATOR RESPONSE WHEN 2780 IS REQUESTING DEVICE.	28A
20	ANALYZE ACCUMULATED ERROR DATA IF PROCESSOR CHECK OCCURRED, AND DEVELOP AN ACTION CODE.	281
21	PERFORM LINE DATA WRAP ON LINE 1. (ROUTINE 0B)	281
22	PERFORM LINE DATA WRAP ON LINE 2. (ROUTINE 0B)	281
23	DISABLE CE TRACE.	284, 289, 28A
24	DUMP CE TRACE.	284, 289, 28A
25	PREVENT CLEARING OF STATISTICS AFTER PRINTOUT.	28E
26	PERFORM INDICATOR LAMP TEST ON LINE 2. OTHERWISE, LINE 1 WILL BE TESTED. (ROUTINE 0C)	281

HALT ID	MEANING OF HALT	WHERE USED
01	COMMON HALT FOR ANY ERROR. FURTHER DEFINITION OF ERROR IS CONTAINED IN ASSOCIATED ERROR MESSAGE(S).	281, 284, 289, 28A, 28C
02	ERROR DETECTED INVOLVING CUSTOMER SYSTEM PACK WHILE ATTEMPTING TO OBTAIN STATISTICS OR UPDATE MICROCODE.	28E, FD5
E1	DISPLAY 1 IS WRITTEN ON THE CONSOLE CRT AND WAITING FOR OPERATOR RESPONSE.	284, 289, 28A, 28E, FD5
E2	DISPLAY 2 IS WRITTEN ON THE CONSOLE CRT AND WAITING FOR OPERATOR RESPONSE.	289
F1	HALT ASSOCIATED WITH MESSAGE INSTRUCTING OPERATOR TO PRESS 'SYSTEM RESET' BEFORE STARTING SECTION.	281
F2	HALT ASSOCIATED WITH MESSAGE INSTRUCTING OPERATOR TO REMOVE JUMPER FROM ADAPTER CARD AND PREPARE FOR CABLE DATA WRAP. (ROUTINE 0B)	281
F3	HALT ASSOCIATED WITH MESSAGE INSTRUCTING OPERATOR THAT STATISTICS WILL BE CLEARED IF SENSE SWITCH 25 IS NOT ON.	28E
F4	HALT ASSOCIATED WITH MESSAGE INSTRUCTING OPERATOR TO TURN ON SENSE SWITCH 26 TO TEST LINE 2 INDICATOR LAMPS.	281

3.0 DIAGNOSTIC SECTION 281 - ATTACHMENT TEST

3.1 SUMMARY

DIAGNOSTIC SECTION 281 IS USED TO TEST THE BSCC ATTACHMENT HARDWARE. THIS IS ACCOMPLISHED IN SEVERAL STAGES. DURING EACH STAGE, A NUMBER OF TESTS ARE PERFORMED BY FIRST INITIATING SOME ACTION BY THE S/3 CPU. AFTER EACH S/3 ACTION, PERTINENT SENSE BYTES ARE CHECKED FOR PROPER BIT CONFIGURATION, AND/OR PERTINENT TIO INSTRUCTIONS ARE PERFORMED FOR PROPER CONDITION MET.

THE FIRST STAGE IS TO CHECK OUT THE BSCC/CHANNEL INTERFACE WITH THE MICRO-PROCESSOR INACTIVE. THE SECOND STAGE IS TO CHECK OUT THE REMAINING BSCC/CHANNEL INTERFACE WITH THE MICRO-PROCESSOR ACTIVE. THE THIRD STAGE IS TO CHECK OUT THE MICRO-PROCESSOR ITSELF BY EXECUTING MICRO-INSTRUCTIONS. THE FOURTH STAGE IS TO CHECK OUT CONTROL STORE. THE FIFTH STAGE IS TO CHECK OUT THE LINE ADAPTERS.

THE ACTIONS INITIATED BY THE S/3 CPU INCLUDE I/O INSTRUCTIONS OR THE LOADING OF A MICRO-DIAGNOSTIC PROGRAM INTO THE MICRO-PROCESSOR CONTROL STORE. DIAGNOSTIC MICROCODE FD1 CONTAINS MANY INDIVIDUAL MICROCODE PROGRAMS CALLED SUBSECTIONS. EACH SUBSECTION IS COMPOSED OF AN IDENTIFYING HEADER RECORD, TEXT RECORDS, AND AN END RECORD. EACH SUBSECTION IS ASSEMBLED TO EXECUTE STARTING AT CONTROL STORE ADDRESS '0000'.

AS EACH SUBSECTION IS REQUIRED, IT IS CALLED IN BY SECTION 281 AND LOADED INTO CONTROL STORE BY THE IMPL (INITIAL MICRO PROGRAM LOAD) SEQUENCE WHERE IT EXECUTES. THE RESULTS OF THE SUBSECTION TEST ARE PASSED TO THE S/3 CPU WHERE IT IS EVALUATED. IF THE TEST INDICATES AN ERROR, A MESSAGE IS PRINTED OUT ON THE PRINTER. IF THE TEST INDICATES NO ERROR, NO MESSAGE IS PRINTED. IN EITHER CASE, SECTION 281 PROCEEDS WITH THE NEXT TEST UNLESS FURTHER TESTING IS ABORTED DUE TO AN UNCORRECTABLE HARDWARE ERROR.

FOR THOSE TESTS THAT MUST BE PERFORMED ON LINE 2, THEY ARE PERFORMED ONLY IF LINE 2 IS INSTALLED AND PROPERLY DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

3.2 NON-ERROR MESSAGES

3.2.1 INSTRUCTIONAL MESSAGES ARE PRINTED WHENEVER OPERATOR INTERVENTION IS REQUIRED.

3.2.2 AT THE BEGINNING OF EACH ROUTINE, A MESSAGE IS PRINTED THAT INDICATES THE ROUTINE ABOUT TO BE EXECUTED.

3.2.3 IF SECTION 281 EXECUTES TO COMPLETION WITHOUT ERROR, AN INFORMATIONAL MESSAGE IS PRINTED DENOTING THE LINE CONFIGURATION FOR EACH LINE.

3.3 ERROR MESSAGES AND ERROR CODES

3.3.1 THERE ARE A NUMBER OF ERROR CONDITONS THAT CAN BE DETECTED BY SECTION 281. THESE ERROR CONDITIONS ARE PRINTED OUT WHENEVER THE ERROR IS ENCOUNTERED. MOST OF THE ERROR CONDITIONS ARE NOT SEVERE ENOUGH IN THEMSELVES TO REQUIRE SECTION 281 TO STOP. ALL SIGNIFICANT ERROR DATA CONTAINED IN THE ERROR MESSAGES IS STORED AND ANALYZED AT THE COMPLETION OF THE LAST TEST. THE NUMBER OF ERROR MESSAGES PRINTED OUT PER ROUTINE IS LIMITED TO 10. THIS INFORMATION IS MORE THAN SUFFICIENT TO DEVELOP AN ACTION CODE USED IN THE BSCC MAP CHARTS.

3.3.2 THE ERROR MESSAGES ARE SIMILAR IN THAT THEY ARE OF THE FOLLOWING FORMAT:

```
ERROR 281-XX  TEST XX  XXX  XXXXXXXXXXXXXXXXXXXXXXXXXXXXX  EXPECTED - XXXXX    ACTUAL - XXXXX
          |         |  |_|  |_____________|_______________|             |___|               |___|
          |         |   |                 DESCRIPTION OF THE ERROR        |            WHEN PRINTED, THIS FIELD
          |         |   |                                                 |            CONTAINS THE VALUE
          |         |   TYPE OF FAILURE (SIO, SNS, TIO)                   |            ACTUALLY DETECTED DURING
          |         |                                                     |            THE TEST.
          |         TEST NUMBER WITHIN THE ROUTINE WHERE                  |
          |         THE ERROR WAS DETECTED.                               WHEN PRINTED, THIS FIELD
          |                                                               CONTAINS THE VALUE EXPECTED
          ERROR CODE ASSIGNED TO                                          DURING THE TEST.
          THE TYPE OF ERROR.
```

3.3.3 ERROR CODES

ERROR CODE	DESCRIPTION FIELD	EXPLANATION OF ERROR
01	FLAG REG/CYCLE STEAL DATA	A 'SNS' OF THE 'FLAG REG/CYCLE STEAL DATA' BUFFER WAS PERFORMED. CONTENTS OF THE BUFFER DID NOT COMPARE TO THE EXPECTED VALUE.
02	NOT READY/UNIT CHECK	A 'TIO' FOR 'NOT READY/UNIT CHECK' CONDITION WAS PERFORMED. EXPECTED CONDITION - TRUE, ACTUAL CONDITION - FALSE.
03	NOT READY/UNIT CHECK	A 'TIO' FOR 'NOT READY/UNIT CHECK' CONDITION WAS PERFORMED. EXPECTED CONDITION - FALSE, ACTUAL CONDITION - TRUE.
04	CONTROL STORE MODULE- ADDRESS- ____	CONTENTS OF GIVEN CONTROL STORE MODULE ADDRESS DID NOT COMPARE TO THE EXPECTED VALUE IN ROUTINE 05, TEST 01 ('5555' TEST).
05	UNEXPECTED INTERRUPT OCCURRED	AN UNEXPECTED INTERRUPT FROM THE BSCC ATTACHMENT OCCURRED.
06	WRITE CONTROL STORE OPERATION FAILED FOUR TIMES	FOUR UNSUCCESSFULL ATTEMPTS WERE MADE TO PERFORM THE IMPL (INITIAL MICRO PROGRAM LOAD) SEQUENCE.
07	READ OPERATION FAILED - SKIP THIS MODULE	THE READING OF ONE CONTROL STORE MODULE INTO S/3 MAIN STORE FAILED. THE NEXT CONTROL STORE MODULE WILL BE TESTED.
08	INSTRUCTION WAS REJECTED	A 'SIO' INSTRUCTION WAS REJECTED BY THE BSCC HARDWARE, AND A TIMEOUT OCCURRED.
09	INSTRUCTION WAS REJECTED	A 'LIO' INSTRUCTION WAS REJECTED BY THE BSCC HARDWARE, AND A TIMEOUT OCCURRED.
0A	INSTRUCTION WAS NOT REJECTED	A 'LIO' INSTRUCTION WAS NOT REJECTED AS EXPECTED BY THE BSCC HARDWARE.
0B	EXPECTED INTRPT DID NOT OCCUR	AN EXPECTED INTERRUPT FROM THE BSCC ATTACHMENT DID NOT OCCUR BEFORE THE TIMEOUT OCCURRED.
0C	STORE CYCLE STEAL DATA	AN ATTEMPT TO CYCLE STEAL A BYTE OF DATA ('55') INTO S/3 MAIN STORE FAILED.
0D	INCORRECT DATA TRANSFER	AN ATTEMPT TO TRANSFER A BYTE OF DATA ('55') THROUGH THE MICRO-TO S/3 BUFFER BY WAY OF A 'SNS' INSTRUCTION FAILED.
0E	MICRO INSTRUCTION FAILURE	EXECUTION OF A MICRO INSTRUCTION FAILED IN ROUTINE 04.
0F	INSTRUCTION WAS NOT REJECTED	A 'SIO' INSTRUCTION WAS NOT REJECTED AS EXPECTED BY THE BSCC HARDWARE.
10	ADAPTER TEST FAILURE	A TEST ON A LINE ADAPTER IN ROUTINE 08 OR 09 FAILED.
11	FD1 SUBSECTION __ NOT FOUND	A GIVEN SUBSECTION HEADER COULD NOT BE FOUND AFTER SEARCHING THROUGH MICRO DIAGNOSTIC FD1.
12	INSTRUCTION WAS REJECTED	A 'SIO' OR A 'LIO' INSTRUCTION WAS REJECTED BY THE BSCC HARDWARE, AND A TIMEOUT OCCURRED.
13	S/3 - MICRO BUFFER	A 'SNS' OF THE 'S/3-TO-MICRO BUFFER' WAS PERFORMED. CONTENTS OF THE BUFFER DID NOT COMPARE TO THE EXPECTED VALUE.
14	MICRO - S/3 BUFFER	A 'SNS' OF THE 'MICRO-TO-S/3 BUFFER' WAS PERFORMED. CONTENTS OF THE BUFFER DID NOT COMPARE TO THE EXPECTED VALUE.
15	ATTACHMENT STATUS	A 'SNS' OF THE 'ATTACHMENT STATUS' WAS PERFORMED. CONTENTS OF THE REGISTER DID NOT COMPARE TO THE EXPECTED VALUE.
16	CURRENT ADDRESS REGISTER	A 'SNS' OF THE 'CURRENT ADDRESS REGISTER' WAS PERFORMED. CONTENTS OF THE REGISTER DID NOT COMPARE TO THE EXPECTED VALUE.
17	COMMUNICATION LINES STATUS	A 'SNS' OF THE 'COMMUNICATION LINES STATUS' WAS PERFORMED. CONTENTS OF THE REGISTER DID NOT COMPARE TO THE EXPECTED VALUE.
18	OP END INTERRUPT	A 'TIO' FOR 'OP END INTERRUPT' CONDITION WAS PERFORMED. EXPECTED CONDITION - TRUE, ACTUAL CONDITION - FALSE.
19	OP END INTERRUPT	A 'TIO' FOR 'OP END INTERRUPT' CONDITION WAS PERFORMED. EXPECTED CONDITION - FALSE, ACTUAL CONDITION - TRUE.

3.3.3 ERROR CODES (CONTINUED)

ERROR CODE	DESCRIPTION FIELD	EXPLANATION OF ERROR
1A	S/3 - MICRO BUFFER FULL	A 'TIO' FOR 'S/3-TO-MICRO BUFFER FULL' CONDITION WAS PERFORMED. EXPECTED CONDITION - TRUE, ACTUAL CONDITION - FALSE.
1B	'S/3 - MICRO BUFFER FULL	A 'TIO' FOR S/3-TO-MICRO BUFFER FULL' CONDITION WAS PERFORMED. EXPECTED CONDITION - FALSE, ACTUAL CONDITION - TRUE.
1C	INTERRUPT PENDING	A 'TIO' FOR 'INTERRUPT PENDING' CONDITION WAS PERFORMED. EXPECTED CONDITION - TRUE, ACTUAL CONDITION - FALSE.
1D	INTERRUPT PENDING	A 'TIO' FOR 'INTERRUPT PENDING' CONDITION WAS PERFORMED. EXPECTED CONDITION - FALSE, ACTUAL CONDITION - TRUE.
1E	MICRO - S/3 BUFFER FULL	A 'TIO' FOR 'MICRO-TO-S/3 BUFFER FULL' CONDITION WAS PERFORMED. EXPECTED CONDITION - TRUE, ACTUAL CONDITION - FALSE.
1F	MICRO - S/3 BUFFER FULL	A 'TIO' FOR 'MICRO-TO-S/3 BUFFER FULL' CONDITION WAS PERFORMED. EXPECTED CONDITION - FALSE, ACTUAL CONDITION - TRUE.
20	CONTROL STORE MODULE _ ADDRESS - ____	CONTENTS OF GIVEN CONTROL STORE MODULE ADDRESS DID NOT COMPARE TO THE EXPECTED VALUE IN ROUTINE 05, TEST 02 ('AAAA' TEST).
21	CONTROL STORE MODULE _ ADDRESS - ____	CONTENTS OF GIVEN CONTROL STORE MODULE ADDRESS DID NOT COMPARE TO THE EXPECTED VALUE IN ROUTINE 05, TEST 03 (ADDRESS TEST).
22	INCORRECT DATA TRANSFER	AN ATTEMPT TO TRANSFER A BYTE OF DATA ('AA') THROUGH THE MICRO-TO-S/3 BUFFER BY WAY OF A 'SNS' INSTRUCTION FAILED.
23	INCORRECT DATA TRANSFER	AN ATTEMPT TO TRANSFER A BYTE OF DATA ('FE') THROUGH THE MICRO-TO-S/3 BUFFER BY WAY OF A 'SNS' INSTRUCTION FAILED.
24	STORE CYCLE STEAL DATA	AN ATTEMPT TO CYCLE STEAL A BYTE OF DATA ('AA') INTO S/3 MAIN STORE FAILED.
25	PROGRAM CONDITION REG FAILURE	A PROGRAM CONDITION INDICATOR FAILURE WAS DETECTED IN ROUTINE 07.
26	CABLE DTA WRAP FAILURE	AN ATTEMPT TO WRAP DATA THROUGH THE COMMUNICATIONS CABLE FAILED IN ROUTINE 0B.

3.3.4 ACTION CODES

AS SECTION 281 EXECUTES, IT BUILDS A TABLE OF THREE BYTE ENTRIES CONTAINING THE ROUTINE NUMBER, TEST NUMBER AND ERROR CODE FOR EACH ERROR MESSAGE THAT MAY BE PRINTED. WHEN THE LAST TEST IS COMPLETED, THIS TABLE IS EXAMINED FOR CERTAIN ERROR COMBINATIONS. IF SUCH A COMBINATION IS FOUND, A FOUR CHARACTER ACTION CODE IS PRINTED OUT. THIS ACTION CODE CAN BE USED AS AN ENTRY POINT IN THE BSCC MAP CHARTS WHERE CARD CALLOUTS OR FURTHER INSTRUCTIONS ARE GIVEN.

EXAMPLE: BSCC MAP CHART ACTION CODE - 5060

IF A PROCESSOR CHECK OR OTHER ABNORMAL CONDITION OCCURS TO PREVENT SECTION 281 FROM EXECUTING TO COMPLETION, PRESS 'SYSTEM RESET', TURN ON SENSE SWITCH 20, AND PRESS 'START'. THIS FORCES THE ERROR CHECKING DESCRIBED ABOVE ON ~~ANY ERRORS~~ THAT MAY HAVE BEEN ACCUMULATED TO THAT POINT.

3.4 OPERATION OF SECTION 281

3.4.1 CALL IN SECTION 281 AND RESET THE 'HA' HALT. A MESSAGE WILL BE PRINTED INSTRUCTING THE OPERATOR TO PRESS 'SYSTEM RESET'. THIS RESETS PART OF THE BSCC HARDWARE TO INITIAL CONDITIONS THAT ARE EXPECTED IN THE TESTS THAT FOLLOW. WHEN RUNNING, SECTION 281 PRINTS OUT THE ROUTINE THAT IS ABOUT TO BE EXECUTED. IF NO ERROR CONDITONS OCCUR DURING THAT ROUTINE, NO ADDITONAL MESSAGES ARE PRINTED FOR THAT ROUTINE. IF ERROR CONDITIONS DO EXIST, ERROR MESSAGES ARE PRINTED AS PER THE FORMAT DESCRIBED ABOVE.

BECAUSE THE BSCC HARDWARE MUST BE RESET PRIOR TO EXECUTING SECTION 281, DCP SENSE SWITCH '30' (LOOP ON SECTION) CANNOT BE USED. ALSO, DCP SENSE SWITCH '01' (LOOP ON ROUTINE) CANNOT BE USED FOR ROUTINES 01 AND 02.

3.5 DESCRIPTION OF ROUTINES

3.5.1 ROUTINE 01 - INACTIVE MICRO-PROCESSOR (CHECKS OUT PART OF THE CHANNEL INTERFACE HARDWARE).

TEST 01 - SET MICRO RESET

TEST 02 - ENABLE ATTACHMENT

TEST 03 - DISABLE ATTACHMENT

TEST 04 - ENABLE ATTACHMENT

TEST 05 - CHECK TIO'S FOR PROPER CONDITIONS MET

* TEST 06 - SELECT LINE 2

* TEST 07 - SET CURRENT ADDRESS REGISTER (LINE 2)

A VALUE OF HEX '5555' IS LOADED INTO THE CURRENT ADDRESS REGISTER FOR LINE 2.

* TEST 08 - SET CURRENT ADDRESS REGISTER (LINE 2)

A VALUE OF HEX 'AAAA' IS LOADED INTO THE CURRENT ADDRESS REGISTER FOR LINE 2.

* TEST 09 - SET CURRENT ADDRESS REGISTER (LINE 2)

A VALUE OF HEX 'FEFE' IS LOADED INTO THE CURRENT ADDRESS REGISTER FOR LINE 2.

TEST 10 - SELECT LINE 1

TEST 11 - SET CURRENT ADDRESS REGISTER (LINE 1)

A VALUE OF HEX '5555' IS LOADED INTO THE CURRENT ADDRESS REGISTER FOR LINE 1.

TEST 12 - SET CURRENT ADDRESS REGISTER (LINE 1)

VALUE OF HEX 'AAAA' IS LOADED INTO THE CURRENT ADDRESS REGISTER FOR LINE 1.

TEST 13 - SET CURRENT ADDRESS REGISTER (LINE 1)

A VALUE OF HEX 'FEFE' IS LOADED INTO THE CURRENT ADDRESS REGISTER FOR LINE 1.

TEST 14 - DIAGNOSTIC LIO (LINE 1)

A DIAGNOSTIC LIO WITH AN I-R BYTE OF HEX 'AAAA' IS ISSUED TO THE ATTACHMENT.

TEST 15 - SET IMPL STOP ADDRESS (LINE 1)

A VALUE OF HEX 'A5A5' IS LOADED AS THE IMPL (INITIAL MICRO PROGRAM LOAD) STOP ADDRESS.

TEST 16 - RECEIVE SIO (LINE 1)

A RECEIVE SIO IS ISSUED TO THE ATTACHMENT. SINCE THE MICRO-PROCESSOR IS DISABLED, THE INSTRUCTION SHOULD CAUSE A 'NO-OP' AND AN INTERRUPT TO THE S/3 CPU. ALSO, A SENSE OF THE ATTACHMENT STATUS SHOULD RESET THE 'NO-OP' BIT.

TEST 17 - CHECK RESET OF NO-OP (LINE 1)

INSURE THAT NO-OP BIT WAS RESET DURING A SENSE OF THE ATTACHMENT STATUS IN THE PREVIOUS TEST.

TEST 18 - ENABLE INTERRUPTS

TEST 19 - CHECK TIO'S FOR PROPER CONDITIONS MET.

* TEST IS SKIPPED IF LINE 2 IS NOT PROPERLY DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

3.5.2 ROUTINE 02 - ACTIVE MICRO-PROCESSOR (CHECKS OUT PART OF THE CHANNEL INTERFACE HARDWARE)

TEST 01 - PERFORM IMPL (LINE 1)

AN INITIAL MICRO PROGRAM LOAD IS PERFORMED. THE MICROCODE THAT IS LOADED IS A TWO INSTRUCTION PROGRAM THAT SELECTS PAGE 0 AND LOOPS ON ITSELF. THIS TEST CHECKS THE IMPL SEQUENCE UP TO AND INCLUDING THE INTERRUPT THAT OCCURS AFTER THE STOP ADDRESS IS REACHED.

TEST 02 - COMPLETE IMPL (LINE 1)

THIS TEST CHECKS THE IMPL SEQUENCE AFTER THE INTERRUPT IS RECEIVED AND THE MICROCODE IS ALLOWED TO EXECUTE. AT THIS POINT, THE MICRO-PROCESSOR HAS BECOME 'READY' FOR THE FIRST TIME.

TEST 03 - CHECK TIO'S (LINE 1)

THIS TEST CHECKS THE PROPER CONDITIONS OF THE ATTACHMENT BY USE OF TIO'S - SHOULD INDICATE A 'READY' CONDITION.

TEST 04 - DIAGNOSTIC SIO (LINE 1)

THIS TEST CHECKS THE PROPER HARDWARE ACCEPTANCE OF A DIAGNOSTIC SIO.

TEST 05 - RECEIVE SIO (LINE 1)

THIS TEST CHECKS THE PROPER HARDWARE ACCEPTANCE OF A RECEIVE SIO.

TEST 06 - TRANSMIT/RECEIVE SIO (LINE 1)

THIS TEST CHECKS THE PROPER HARDWARE ACCEPTANCE OF A TRANSMIT/RECEIVE SIO.

TEST 07 - RECEIVE INITIAL SIO (LINE 1)

THIS TEST CHECKS THE PROPER HARDWARE ACCEPTANCE OF A RECEIVE INITIAL SIO.

TEST 08 - MICRO CONTROL SIO (LINE 1)

THIS TEST CHECKS THE PROPER HARDWARE ACCEPTANCE OF A MICRO CONTROL SIO.

TEST 09 - SIO REJECT (LINE 1)

TWO SIO'S ARE ISSUED BACK-TO-BACK. SINCE THE FIRST SIO IS NOT PROPERLY SERVICED BY THE MICRO-CODE, THE SECOND SIO MUST BE REJECTED. THE S/3 CPU WILL HANG UNTIL THE PRE-SET TIME OUT OCCURS.

TEST 10 - MICRO RESET (LINE 1)

THE REJECT CONDITION SET UP IN THE PREVIOUS TEST MUST BE RESET BEFORE PROCEEDING.

TEST 11 - LIO REJECT (LINE 1)

AN SIO AND AN LIO ARE ISSUED BACK-TO-BACK. SINCE THE SIO IS NOT PROPERLY SERVICED BY THE MICRO-CODE, THE LIO MUST BE REJECTED. THE S/3 CPU WILL HANG UNTIL THE PRE-SET TIME OUT OCCURS.

TEST 12 - MICRO RESET (LINE 1)

THE REJECT CONDITION SET UP IN THE PREVIOUS TEST MUST BE RESET BEFORE PPOCEEDING.

3.5.3 ROUTINE 03 - ESTABLISH DATA TRANSFER (CHECKSOUT THE MICRO-TO-S/3 DATA PATH)

THIS TEST USES INTELLIGENT MICROCODE FOR THE FIRST TIME. SUBSECTION 00 FROM DIAGNOSTIC MICROCODE FD1 IS CALLED IN AND LOADED INTO CONTROL STORE AND EXECUTED. THE TESTS IN ROUTINE 04 REQUIRE THAT THE MICRO-PROCESSOR BE CAPABLE OF TRANSFERRING ONE BYTE OF DATA TO THE S/3 CPU, AND CAPABLE OF CAUSING A 'MICRO WAIT' STATE. ROUTINE 03 TESTS THAT CAPABILITY.

TEST 01 - CHECK MICRO-TO-S/3 BUFFER FOR '55'

THIS TEST TRANSFERS A HEX '55' FROM THE MICRO-PROCESSOR TO THE S/3 CPU.

TEST 02 - CHECK MICRO-TO-S/3 BUFFER FOR 'AA'

THIS TEST TRANSFERS A HEX 'AA' FROM THE MICRO-PROCESSOR TO THE S/3 CPU.

TEST 03 - CHECK MICRO-TO-S/3 BUFFER FOR 'FE'

THIS TEST TRANSFERS A HEX 'FE' FROM THE MICRO-PROCESSOR TO THE S/3 CPU.

TEST 04 - CHECK FOR 'MICRO WAIT' STATE

THIS TEST PERFORMS A 'BRANCH AND WAIT' INSTRUCTION.

3.5.4 ROUTINE 04 - MICRO INSTRUCTIONS TEST (CHECKSOUT THE MICRO-PROCESSOR)

THIS ROUTINE EXECUTES A SERIES OF MICRO-DIAGNOSTIC SUBSECTIONS FROM FD1 TO TEST VARIOUS MICRO-PROCESSOR FUNCTIONS.

TEST 01 - FD1TC041 (ALU ZERO TEST)
TEST 02 - FDITC042 (ALU NON-ZERO TEST)
TEST 03 - FDITC043 (ALU ZERO AND CARRY TEST)
TEST 04 - FDITC044 (ALU NON-ZERO AND CARRY TEST)
TEST 05 - FDITC045 (ALU ZERO AND NON-ZERO TEST)
TEST 06 - FDITC046 (ALU ZERO, NON-ZERO, AND CARRY TEST)
TEST 07 - FDITC051 ('BAL' AND 'PTN' TEST)
TEST 08 - FDITC052 (NESTED 'BAL' AND 'RTN' TEST)
TEST 09 - FDITC058 ('BVD' TEST)
TEST 10 - FDITC059 ('A' AND 'AC' TEST)
TEST 11 - FDITC05A ('S' AND 'SB' TEST)
TEST 12 - FDITC05B ('SS' AND 'A' TEST)
TEST 13 - FDITC05C ('C' TEST)
TEST 14 - FDITC05D ('N' TEST)
TEST 15 - FDITC05E ('N' TEST)
TEST 16 - FDITC05F ('T' TEST)
TEST 17 - FDITC060 ('T' TEST)
TEST 18 - FDITC061 ('C' AND 'NS' TEST)
TEST 19 - FDITC062 ('C' AND 'NS' TEST)
TEST 20 - FDITC063 ('C' AND 'TS' TEST)
TEST 21 - FDITC064 ('C' AND 'TS' TEST)
TEST 22 - FDITC065 ('O' TEST)
TEST 23 - FDITC066 ('O' TEST)
TEST 24 - FDITC067 ('ON' TEST)
TEST 25 - FDITC068 ('ON' TEST)
TEST 26 - FDITC069 ('X' TEST)
TEST 27 - FDITC06A ('X' TEST)
TEST 28 - FDITC06B ('XN' TEST)
TEST 29 - FDITC06C ('XN' TEST)
TEST 30 - FD1RG001 (PRIME REG TEST)

THE PRIME REGISTERS ARE TESTED TWICE. FIRST, A HEX '55' IS LOADED INTO R0. THEN THE CONTENTS OF R0 ARE MOVED INTO R1, THEN FROM R1 TO R2, AND SO ON THROUGH R15. THEN THE CONTENTS OF R15 ARE CHECKED TO SEE THAT IT CONTAINS A HEX '55'. THE ENTIRE PROCESS IS REPEATED USING A HEX 'AA'.

TEST 31 - FD1RG002 (AUX REG TEST)

THE AUX REGISTERS ARE TESTED TWICE. FIRST, A HEX '55' IS LOADED INTO R0. THEN THE CONTENTS OF R0 ARE MOVED INTO R1, THEN FROM R1 TO R2, AND SO ON THROUGH R15. THEN THE CONTENTS OF R15 ARE CHECKED TO SEE THAT IT CONTAINS A HEX '55'. THE ENTIRE PROCESS IS REPEATED USING A HEX 'AA'.

TEST 32 - FD1RG003 (DAR TEST)

THE DATA ADDRESS REGISTERS ARE TESTED TWICE. FIRST, A HEX '55' IS LOADED INTO D0. THEN THE CONTENTS OF D0 ARE MOVED INTO D1, THEN FROM D1 TO D2, AND SO ON THROUGH D15. THEN THE CONTENTS OF D15 ARE CHECKED TO SEE THAT IT CONTAINS A HEX '55'. THE ENTIRE PROCESS IS REPEATED USING A HEX 'AA'.

TEST 33 - FD1RG004 (PRIME/AUX SELECT TEST)

THE ABILITY TO SELECT PRIME AND AUX REGISTERS IS TESTED BY LOADING A HEX '5' INTO PRIME REG R0, AND A HEX 'A' INTO AUX REG R0.

3.5.5 ROUTINE 05 - CONTROL STORE TESTS (CHECKS OUT THE ENTIRE CONTROL STORE)

TEST 01 - '5555' TEST

CONTROL STORE IS LOADED WITH A '55' PATTERN OVERLAYED WITH ENOUGH MICROCODE TO DUMP THE CONTENTS OF ONE CONTROL STORE MODULE (2K BYTES) BACK INTO S/3 CPU FOR COMPARISON. ALL SIX CONTROL STORE MODULES ARE CHECKED ONE AT A TIME. THIS TEST REQUIRES THAT CONTROL STORE BE LOADED SIX TIMES.

TEST 02 - 'AAAA' TEST

CONTROL STORE IS LOADED WITH A 'AA' PATTERN OVERLAYED WITH ENOUGH MICROCODE TO DUMP THE CONTENTS OF ONE CONTROL STORE MODULE (2K BYTES) BACK INTO S/3 CPU FOR COMPARISON. ALL SIX CONTROL STORE MODULES ARE CHECKED ONE AT A TIME. THIS TEST REQUIRES THAT CONTROL STORE BE LOADED SIX TIMES.

TEST 03 - ADDRESS TEST

CONTROL STORE IS LOADED WITH A PATTERN OF ASCENDING ADDRESSES SUCH THAT EACH CONTROL STORE LOCATION WILL BE LOADED WITH ITS OWN ADDRESS. THIS PATTERN IS OVERLAYED WITH ENOUGH MICROCODE TO DUMP THE CONTENTS OF ONE CONTROL STORE MODULE (2K BYTES) BACK INTO S/3 CPU FOR COMPARISON. ALL SIX CONTROL STORE MODULES ARE CHECKED ONE AT A TIME. THIS TEST REQUIRES THAT CONTROL STORE BE LOADED SIX TIMES.

3.5.6 ROUTINE 06 - RESPOND TO DIAGNOSTIC SIO (CHECKS OUT THE INTER-ACTION BETWEEN MICRO-PROCESSOR AND S/3)

THIS ROUTINE USES MORE INTELLIGENT MICROCODE (SUBSECTION FROM FD1) THAN WAS USED PREVIOUSLY. THE INTENT IS TO ISSUE DIAGNOSTIC SIO'S FROM THE S/3 CPU, CAUSE AN INTERRUPT TO THE MICRO-PROCESSOR, DECODE THE I-R BYTE BY MICROCODE, AND PERFORM VARIOUS TASKS ACCORDING TO THE I-R DECODE.

* TEST 01 - SELECT LINE 2 AND RESET OP END INTERRUPT

TEST 02 - SELECT LINE 1 AND RESET OP END INTERRUPT

TEST 03 - CHECK OP END INTERRUPT TIO (LINE 1)

AT THIS TIME THE TIO FOR OP END INTERRUPT SHOULD RESULT IN A NOT-MET CONDITION.

TEST 04 - SET OP END INTERRUPT (LINE 1)

THIS TEST CAUSES THE MICROCODE TO SET THE OP END INTERRUPT FOR LINE 1. A TIO TO CHECK THAT OP END CONDITION SHOULD RESULT IN RESETTING THE CONDITION.

TEST 05 - CHECK RESET OF OP END INTERRUPT (LINE 1)

THIS TEST INSURES THAT THE OP END CONDITION WAS RESET BY THE TIO IN THE PREVIOUS TEST.

TEST 06 - SET BUSY (LINE 1)

THIS TEST CAUSES THE HARDWARE TO SET THE LINE BUSY FOR LINE 1.

TEST 07 - RESET BUSY (LINE 1)

THIS TEST CAUSES THE MICROCODE TO RESET BUSY FOR LINE 1.

* TEST 08 - SET OP END INTERRUPT (LINE 2)

THIS TEST CAUSES THE MICROCODE TO SET THE OP END INTERRUPT FOR LINE 2. A TIO TO CHECK THAT OP END CONDITION SHOULD RESULT IN RESETTING THE CONDITION.

* TEST 09 - CHECK RESET OF OP END INTERRUPT (LINE 2)

THIS TEST INSURES THAT THE OP END CONDITION WAS RESET BY THE TIO IN THE ?REVIOUS TEST.

* TEST 10 - SET BUSY (LINE 2)

THIS TEST CAUSES THE HARDWARE TO SET THE LINE BUSY FOR LINE 2.

* TEST 11 - RESET BUSY (LINE 2)

THIS TEST CAUSES THE MICROCODE TO RESET BUSY FOR LINE 2.

TEST 12 - LOAD MICRO-S/3 BUFFER WITH '55' (LINE 1)

THIS TEST CAUSES THE MICROCODE TO LOAD HEX '55' INTO THE MICRO-S/3 BUFFER.

TEST 13 - LOAD MICRO-S/3 BUFFER WITH 'AA' (LINE 1)

THIS TEST CAUSES THE MICROCODE TO LOAD HEX 'AA' INTO THE MICRO-S/3 BUFFER.

TEST 14 - FETCH CYCLE STEAL 'FF' (LINE 1)

THIS TEST CAUSES THE MICROCODE TO FETCH A BYTE OF HEX 'FF' FROM S/3 MAIN STORE AND LOAD IT INTO THE AUTOPOLL BUFFER FOR LINE 1

TEST 15 - FETCH CYCLE STEAL '00' (LINE 1)

THIS TEST CAUSES THE MICROCODE TO FETCH A BYTE OF HEX '00' FROM S/3 MAIN STORE AND LOAD IT INTO THE AUTOPOLL BUFFER FOR LINE 1

TEST 16 - STORE CYCLE STEAL 'AA' (LINE 1)

THIS TEST CAUSES THE MICROCODE TO STORE A BYTE OF HEX 'AA' INTO S/3 MAIN STORE.

TEST 17 - STORE CYCLE STEAL '55' (LINE 1)

THIS TEST CAUSES THE MICROCODE TO STORE A BYTE OF HEX '55' INTO MAIN STORE.

* TEST 18 - FETCH CYCLE STEAL (LINES 1 AND 2)

THIS TEST CAUSES THE MICROCODE TO FETCH A BYTE OF HEX '55' FROM S/3 MAIN STORE USING LINE 1 AND LOAD IT INTO THE AUTOPOLL BUFFER FOR LINE 1. IT ALSO CAUSES THE MICROCODE TO FETCH A BYTE OF HEX 'AA' FROM S/3 MAIN STORE USING LINE 2 AND LOAD IT INTO THE AUTOPOLL BUFFER FOR LINE 2.

* TEST 19 - STORE CYCLE STEAL (LINES 1 AND 2)

THIS TEST CAUSES THE MICROCODE TO STORE A BYTE OF HEX '55' INTO S/3 MAIN STORE USING LINE 1. IT ALSO CAUSES THE MICROCODE TO STORE A BYTE OF HEX 'AA' INTO S/3 MAIN STORE USING LINE 2.

TEST 20 - START MICRO CLOCK (LINE 1)

THIS TEST CAUSES THE MICRO-PROCESSOR CLOCK TO START RUNNING. UP TO THIS POINT IN THIS ROUTINE, THE MICROCODE HAS RESPONDED TO VARIOUS SIO'S, BUT AFTER IT PERFORMED EACH TASK, IT WAS NECESSARY FOR THE MICROCODE TO CAUSE A 'MICRO WAIT'. CONSEQUENTLY, IT WAS IN A 'NOT READY' STATE BEFORE THE SNS AND TIO INSTRUCTIONS COULD BE PERFORMED. THIS IS THE FIRST TIME IN THIS ROUTINE THAT THE 'MICRO WAIT' STATE BIT IS NOT ON IN THE SENSE BYTES.

* TEST IS SKIPPED IF LINE 2 IS NOT PROPERLY DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

3.5.7 ROUTINE 07 - PROGRAM CONDITION REGISTER TEST (CHECKS OUT THE PROGRAM CONDITION INDICATORS)

THIS ROUTINE EXECUTES A SUBSECTION OF FD1 TO TEST THE PROGRAM CONDITION REGISTER BY FORCING ON ONE OR MORE OF THE CONDITION INDICATORS, CAUSING A MICRO INTERRUPT, AND EXAMINING THE SAVED VALUES OF THESE INDICATORS. THERE ARE THREE INDICATORS THAT CAN BE ON IN VARIOUS COMBINATIONS.

TEST 01 - NON ZERO INDICATOR

TEST 02 - ZERO INDICATOR

TEST 03 - ZERO AND NON ZERO INDICATORS

TEST 04 - CARRY AND NON ZERO INDICATORS

TEST 05 - CARRY AND ZERO INDICATORS

TEST 06 - CARRY, ZERO, AND NON ZERO INDICATORS

3.5.8 ROUTINE 08 - ADAPTER TESTS (CHECKS OUT PART OF THE ADAPTER FUNCTIONS)

THIS ROUTINE EXECUTES A SERIES OF MICRO-DIAGNOSTIC SUBSECTIONS FROM FD1 TO TEST VARIOUS ADAPTER CARD FUNCTIONS.

TEST 01 - FD1AC001 (LINE 1 BUFFER SELECT TEST)

THIS TEST LOADS AND SENSES DATA TO AND FROM THE ADAPTER BUFFER TO INSURE THAT ACCESS TO THAT BUFFER IS POSSIBLE.

TEST 02 - FD1AC003 (LINE 1 LOAD, SENSE BUFFER TEST)

THIS TEST LOADS, SENSES AND THEN ANALYZES DATA FROM THE ADAPTER BUFFER TO INSURE THAT NO BITS ARE PERMANENTLY ON OR OFF.

TEST 03 - FD10A001 (LINE 1 DTR, RTS, XMIT MODE, AND TEST CLOCK TEST)

THIS TEST CAUSES ABO CODES TO SET AND RESET THE DTR, RTS, XMIT MODE, AND TEST CLOCK LATCHES.

TEST 04 - FD10A005 (LINE 1 ADAPTER RESET, XMIT, AND CLEAR TESTS)

THIS TEST CHECKS THE ABILITY OF ADAPTER RESET TO RESET THE TRANSMIT TRIGGER, TRANSMIT MODE, RTS, AND THE TEST CLOCK LATCHES. ALSO, THE PRESET AND CLEAR FUNCTIONS OF THE TRANSMIT TRIGGER ARE TESTED.

TEST 05 - FD1AC005 (LINE 1 IBSR, XBSR, AND OVERRUN TESTS)

THIS TEST CHECKS THAT BOTH THE INTERNAL AND EXTERNAL BUFFER SERVICE REQUEST LATCHES AND THE OVERRUN LATCH ARE CAPABLE OF BEING SET AND RESET.

TEST 06 - FD10C001 (LSCD TEST)

THIS TEST CHECKS THAT 106 MS CLOCKS ARE BEING GENERATED BY THE BSCC ADAPTER CONTROLLER HARDWARE.

TEST 07 - FD1AC009 (LINE 1 BSR INTERRUPT TEST)

THIS TEST DETERMINES IF THE BUFFER SERVICE REQUEST LATCH CAN INITIATE A MICRO INTERRUPT.

TEST 08 - FD1AC00B (LINE 1 SYNC LATCH TEST)

THIS TEST CHECKS FOR PROPER SETTING AND RESETTING OF THE SYNC LATCH.

TEST 09 - FD10A003 (LINE 1 PSEUDO TRANSMIT TEST)

THIS IS AN ELEMENTARY TEST WHICH LOADS ONE BYTE INTO THE BUFFER, TRANSFERS THE BUFFER TO THE SERDES, AND THEN SHIFTS THE SERDES THROUGH THE TRANSMIT TRIGGER WHERE THE DATA IS THEN SENSED ON DBI AND ANALYZED.

* TEST 10 - FD1AC002 (LINE 2 BUFFER SELECT TEST)

THIS TEST LOADS AND SENSES DATA TO AND FROM THE ADAPTER BUFFER TO INSURE THAT ACCESS TO THAT BUFFER IS POSSIBLE.

* TEST 11 - FD1AC004 (LINE 2 LOAD, SENSE BUFFER TEST)

THIS TEST LOADS, SENSES AND THEN ANALYZES DATA FROM THE ADAPTER BUFFER TO INSURE THAT NO BITS ARE PERMANENTLY ON OR OFF.

* TEST 12 - FD10A002 (LINE 2 DTR, RTS, XMIT MODE, AND TEST CLOCK TEST)

THIS TEST CAUSES ABO CODES TO SET AND RESET THE DTR, RTS, XMIT MODE, AND TEST CLOCK LATCHES.

* TEST 13 - FD10A006 (LINE 2 ADAPTER RESET, XMIT, AND CLEAR TESTS)

THIS TEST CHECKS THE ABILITY OF ADAPTER RESET TO RESET THE TRANSMIT TRIGGER, TRANSMIT MODE, RTS, AND THE TEST CLOCK LATCHES. ALSO, THE PRESET AND CLEAR FUNCTIONS OF THE TRANSMIT TRIGGER ARE TESTED.

* TEST 14 - FD1AC006 (LINE 2 IBSR, XBSR, AND OVERRUN TESTS)

THIS TEST CHECKS THAT BOTH THE INTERNAL AND EXTERNAL BUFFER SERVICE REQUEST LATCHES AND THE OVERRUN LATCH ARE CAPABLE OF BEING SET AND RESET.

* TEST 15 - FD1AC00A (LINE 2 BSR INTERRUPT TEST)

THIS TEST DETERMINES IF THE BUFFER SERVICE REQUEST LATCH CAN INITIATE A MICRO INTERRUPT.

* TEST 16 - FD1AC00C (LINE 2 SYNC LATCH TEST)

THIS TEST CHECKS FOR PROPER SETTING AND RESETTING OF THE SYNC LATCH.

* TEST 17 - FD10A004 (LINE 2 PSEUDO TRANSMIT TEST)

THIS IS AN ELEMENTARY TEST WHICH LOADS ONE BYTE INTO THE BUFFER, TRANSFERS THE BUFFER TO THE SERDES, AND THEN SHIFTS THE SERDES THROUGH THE TRANSMIT TRIGGER WHERE THE DATA IS THEN SENSED ON DBI AND ANALYZED.

* TEST IS SKIPPED IF LINE 2 IS NOT PROPERLY DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

3.5.9 ROUTINE 09 - ADAPTER TESTS (CHECKS OUT PART OF THE ADAPTER FUNCTIONS)

THIS ROUTINE EXECUTES A SERIES OF MICRO-DIAGNOSTIC SUBSECTIONS FROM FD1 TO TEST VARIOUS ADAPTER CARD FUNCTIONS.

TEST 01 - FD10C002 (LINE 1 TIME OUT TEST)

THIS TEST CHECKS OUT THE CIRCUITRY WHICH SETS AND RESETS THE TIME OUT COUNTER.

TEST 02 - FD1AC007 (LINE 1 TIME OUT INTERRUPT TEST)

THIS TEST DETERMINES IF THE TIME OUT COUNTER CAN INITIATE A MICRO INTERRUPT. UNEXPECTED INTERRUPTS ARE ALSO CHECKED FOR.

TEST 03 - FD1AC00D (LINE 1 PSEUDO TRANSMIT/RECEIVE TEST)

THIS IS A WRAP TEST THAT LOADS A BYTE OF DATA ('55') INTO THE BUFFER, TRANSFERS THE BUFFER TO THE SERDES, AND THEN WRAPS THE DATA 256 TIMES. THE WRAP IS SUCCESSFUL IF THERE ARE NO CONSECUTIVE 8 BYTE STRINGS OF '00' OR 'FF'.

faults if no BSCA Cable

NOTE: THE 38LS (WORLD TRADE) MUST HAVE SOME 'TRANSMIT LEVEL' ATTENUATION SWITCHED IN. REFER TO LOGIC PAGE ZB300, ALD VOL 12.

* TEST 04 - FD10C003 (LINE 2 TIME OUT TEST)

THIS TEST CHECKS OUT THE CIRCUITRY WHICH SETS AND RESETS THE TIME OUT COUNTER.

* TEST 05 - FD1AC008 (LINE 2 TIME OUT INTERRUPT TEST)

THIS TEST DETERMINES IF THE TIME OUT COUNTER CAN INITIATE A MICRO INTERRUPT. UNEXPECTED INTERRUPTS ARE ALSO CHECKED FOR.

* TEST 06 - FD1AC00E (LINE 2 PSEUDO TRANSMIT/RECEIVE TEST)

THIS IS A WRAP TEST THAT LOADS A BYTE OF DATA ('55') INTO THE BUFFER, TRANSFERS THE BUFFER TO THE SERDES, AND THEN WRAPS THE DATA 256 TIMES. THE WRAP IS SUCCESSFUL IF THERE ARE NO CONSECUTIVE 8 BYTE STRINGS OF '00' OR 'FF'.

NOTE: THE 38LS (WORLD TRADE) MUST HAVE SOME 'TRANSMIT LEVEL' ATTENUATION SWITCHED IN. REFER TO LOGIC PAGE ZB300, ALD VOL 12.

* TEST IS SKIPPED IF LINE 2 IS NOT PROPERLY DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

3.5.10 ROUTINE 0A - CONFIGURATION TEST (DETERMINES LINE CONFIGURATION)

THIS ROUTINE DETERMINES THE CONFIGURATION OF LINE 1 AND LINE 2, IF INSTALLED AND PROPERLY DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

THE LINE CLOCK RATE IS DETERMINED BY FORCING A TRANSMIT OF THREE BYTES OF A '55' PATTERN. A MICROCODE LOOP COUNTS THE NUMBER OF MICRO INTERVALS (APPROXIMATELY 6 MICRO-SECONDS) BETWEEN TWO BUFFER SERVICE REQUESTS. THIS COUNT IS PASSED TO THE S/3 CPU BY WAY OF THE INTERFACE BUFFERS. THE COUNT IS THEN CONVERTED INTO BITS PER SECOND BY DIVIDING IT INTO A FIXED CONSTANT. THE RESULTS ARE THEN ROUNDED OFF TO THE NEAREST HUNDREDS AND PRINTED.

TEST 01 - FD1BAUD1 (CLOCK RATE FOR LINE 1)

* TEST 02 - FD1BAUD2 (CLOCK RATE FOR LINE 2)

* TEST IS SKIPPED IF LINE 2 IS NOT PROPERLY DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

3.5.11 ROUTINE 0B - COMMUNICATIONS CABLE DATA WRAP (CHECKS OUT DATA TRANSMISSION THROUGH COMMUNICATIONS CABLE)

THESE TESTS ANALYZE DATA FOR THE EIA, AND DDSA SIGNAL CONVERTER CARDS. THEY ALSO RUN WITH THE 38LS, BUT ONLY IF THE LINE HAS A 4-WIRE COMMUNICATIONS CONNECTION.

THIS ROUTINE IS NOT LINKED BY DCP, BUT MUST BE CALLED IN BY THE DCP ROUTINE 'CALL-IN' FEATURE, AND REQUIRES MANUAL INTERVENTION. THIS ROUTINE IS USED ONLY WHEN A DATA WRAP THROUGH THE COMMUNICATIONS CABLE IS DESIRED.

THE TRANSMIT/RECEIVE TESTS PERFORMED IN ROUTINE 09 ARE REPEATED IN THIS ROUTINE. THE ONLY DIFFERENCE IS THAT IN ROUTINE 09 THE DATA WAS WRAPPED BACK FROM THE SIGNAL CONVERTER CARD, AND IN THIS ROUTINE THE DATA IS WRAPPED BACK FROM THE END OF THE COMMUNICATIONS CABLE.

BEFORE EXECUTING THIS ROUTINE:

1. REMOVE THE DATA WRAP JUMPER (JUMPER 'I') FROM THE ADAPTER CARD LOCATED IN 01B-B4M2 FOR LINE 1, AND/OR 01B-B4N2 FOR LINE 2, IF INSTALLED. REFER TO LOGIC PAGE ZB100, IN ALD VOL 12.
2. CONDITION THE COMMUNICATIONS CABLE FOR WRAP BY PERFORMING ONE OF THE FOLLOWING:

   EIA - TURN THE CABLE SWITCH FROM 'OPERATE' TO 'TEST'.
   38LS - INSTALL THE 38LS CABLE WRAP PLUG INTO THE QUICK DISCONNECT OF THE 38LS INTERNAL CABLE.
   DDSA - INSTALL THE DDSA CABLE WRAP PLUG INTO THE DDSA CABLE.
3. DEFINE WHICH LINE IS TO BE TESTED BY TURNING ON SENSE SWITCH '21' TO TEST LINE 1, AND/OR TURNING ON SENSE SWITCH '22' TO TEST LINE 2.

TEST 01 - FD1AC00D (LINE 1 PSEUDO TRANSMIT/RECEIVE TEST)

THIS IS A WRAP TEST THAT LOADS A BYTE OF DATA ('55') INTO THE BUFFER, TRANSFERS THE BUFFER TO THE SERDES, AND THEN WRAPS THE DATA 256 TIMES. THE WRAP IS SUCCESSFUL IF THERE ARE NO CONSECUTIVE 8 BYTE STRINGS OF '00' OR 'FF'.

NOTE: THE 38LS (WORLD TRADE) MUST HAVE SOME 'TRANSMIT LEVEL' ATTENUATION SWITCHED IN. REFER TO LOGIC PAGE ZB300, ALD VOL 12.

TEST 02 - FD1AC00E (LINE 2 PSEUDO TRANSMIT/RECEIVE TEST)

THIS IS A WRAP TEST THAT LOADS A BYTE OF DATA ('55') INTO THE BUFFER, TRANSFERS THE BUFFER TO THE SERDES, AND THEN WRAPS THE DATA 256 TIMES. THE WRAP IS SUCCESSFUL IF THERE ARE NO CONSECUTIVE 8 BYTE STRINGS OF '00' OR 'FF'.

NOTE: THE 38LS (WORLD TRADE) MUST HAVE SOME 'TRANSMIT LEVEL' ATTENUATION SWITCHED IN. REFER TO LOGIC PAGE ZB300, ALD VOL 12.

3.5.12 ROUTINE 0C - INDICATOR LAMP TEST (CHECKS OUT BSCC INDICATOR LAMPS)

THIS ROUTINE IS NOT LINKED BY DCP, BUT MUST BE CALLED IN BY THE DCP ROUTINE 'CALL-IN' FEATURE. IT IS USED TO DIAGNOSE PROBLEMS RELATED TO THE INDICATOR LAMPS ON THE BSCC OPERATOR PANEL.

WITH SENSE SWITCH 26 ON, AND LINE 2 PROPERLY INSTALLED AND DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10, LINE 2 INDICATOR LAMPS WILL BE TESTED. OTHERWISE, LINE 1 LAMPS WILL BE TESTED. TO ALTERNATE BETWEEN LINE 1 AND LINE 2, SENSE SWITCH 26 CAN BE TURNED ON AND OFF WHILE THE TEST IS LOOPING WITHOUT HAVING TO PRESS 'SYSTEM RESET'.

IF EIA IS INSTALLED, REMOVE THE 'EIA USED' JUMPER ON 01B-B4M2 FOR LINE 1, AND/OR 01B-B4N2 FOR LINE 2. REFER TO LOGIC PAGE ZB100. ALSO, REMOVE THE CABLES FROM 01B-B4V2 AND 01B-B4V3 IF INSTALLED. REPLACE THE JUMPER(S) AND CABLE(S) AFTER EXECUTING THIS ROUTINE.

WITH EIA AND DDSA INSTALLED, THE TEST ALTERNATES INDEFINITELY BETWEEN THE TWO FOLLOWING STEPS AT ONE SECOND INTERVALS.

1. 'BSCC ATTN' LAMP IS ON, ALL OTHER LAMPS ARE OFF.
2. 'BSCC ATTN' LAMP IS OFF, ALL OTHER LAMPS ARE ON.

WITH 38LS INSTALLED, THE TEST ALTERNATES INDEFINITELY BETWEEN THE TWO FOLLOWING STEPS AT ONE SECOND INTERVALS.

1. 'DT SET READY' LAMP IS ON, ALL OTHER LAMPS ARE OFF.
2. 'BSCC ATTN' LAMP IS OFF, ALL OTHER LAMPS ARE ON.

4.0 DIAGNOSTIC SECTION 284 - AUTOPOLL TEST

4.1 SUMMARY

DIAGNOSTIC SECTION 284 PROVIDES TESTING OF THE AUTOPOLL FEATURE OF THE BSCC ATTACHMENT. A PROMPTING MESSAGE IS WRITTEN ON EACH OF THE SELECTED DEVICES, AND AN AUTOPOLL SIO IS ISSUED TO THE ATTACHMENT. THE MICRO-PROCESSOR POLLS EACH DEVICE IN TURN UNTIL A RESPONSE IS RECEIVED FROM ONE DEVICE, OR UNTIL THE NUMBER ENTRY IN THE SIO IS EXHAUSTED.

IF ONE OF THE SELECTED DEVICES RESPONDS, THE DATA IS RECEIVED, AND TRANSMITTED BACK TO THE DEVICE FOR DISPLAY.

4.2 OPERATION OF SECTION 284.

4.2.1 CALL IN SECTION 284.

4.2.2 SENSE SWITCHES (TO BE TURNED ON BEFORE RESETTING 'HA' HALT).

SSW 10 - PREVENT LOADING OF FUNCTIONAL MICROCODE INTO CONTROL STORE BY SECTION 28C. THIS SENSE SWITCH CAN BE USED ALONG WITH SENSE SWITCH 24 TO DUMP THE CE TRACE BUFFER AFTER RUNNING SYSTEM TEST.

SSW 23 - DISABLE CE TRACE WHICH STORES LAST 512 BYTES OF TRANSMITTED AND RECEIVED DATA ON SELECTED LINE. CE TRACE IS NORMALLY ACTIVE.

SSW 24 - DUMP CONTENTS OF CE TRACE BUFFER FOR LINE 1, AND LINE 2, IF LINE 2 IS PROPERLY DEFINED IN UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

4.2.3 RESET THE 'HA' HALT. AT THIS TIME, THE SECTION PREFACE IS EXAMINED TO DETERMINE WHETHER FUNCTIONAL MICROCODE FB0 HAS BEEN LOADED INTO BSCC CONTROL STORE. IF IT HAS NOT, SECTION 28C IS CALLED IN, WHICH CALLS IN FB0 AND LOADS IT INTO CONTROL STORE. WHEN THIS IS ACCOMPLISHED, THE SECTION PREFACE IS ALTERED TO INDICATE THE ACTION, AND FB0 IS NOT LOADED AGAIN PRIOR TO EXECUTING ANY BSCC DIAGNOSTIC.

4.2.4 AT THE 'E1' HALT, SECTION 284 IS READY FOR OPERATOR INPUT. ENTER THE DESIRED VALUES IN THE FOLLOWING DISPLAY WRITTEN ON THE CONSOLE CRT, AND PRESS THE 'ENTER' KEY. IF ALL THE ENTRIES ARE VALID, THE DISPLAY IS RE-WRITTEN TO ALLOW FOR ANY CHANGES. IF THERE ARE NO CHANGES, PRESS THE 'ENTER' KEY AGAIN TO START THE TEST.

```
 --------------------------------------
|      **  BSCC AUTOPOLL TEST  **      |
| LINE _    ## _  enter                |
| CU/DA (1 - 40 ENTRIES, COMMA OPTIONAL)|
|______________________________________|
|______________________________________|
|______________________________________|
|______________________________________|
|                                      |
|'ENTER' TO CONTINUE, 'PF1' TO STOP POLL|
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VALID 'LINE' ENTRIES ARE '1', OR '2' IF LINE 2 IS INSTALLED AND PROPERLY DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

VALID '##' ENTRIES ARE '01 THROUGH 'FF'. THIS REPRESENTS THE HEX VALUE OF THE NUMBER OF TIMES THE POLL SEQUENCE IS TO BE PERFORMED. A VALUE OF 'FF' CAUSES CONTINUOUS POLLING.

INVALID ENTRIES CAUSE THE DISPLAY TO BE RE-WRITTEN WITH A MESSAGE INDICATING AN INVALID ENTRY, AND THE CURSOR IS POSITIONED AT THAT ENTRY.

4.2.5 THE CU/DA SELECT ENTRIES CAN BE ENTERED IN ANY MANNER ON THE FOUR LINES PROVIDED. THE RESTRICTIONS ARE THAT THEY BE VALID ENTRIES, THAT THE FIRST ENTRY BE AT THE INITIAL CURSOR POSITION, AND THAT THERE BE FOUR CHARACTERS PER ENTRY. COMMA BETWEEN ENTRIES IS OPTIONAL. ONLY THE SELECTION ADDRESSES ARE VALID. THE POLLING ADRESSES ARE DERIVED FROM THE SELECTION ADDRESSES WHEN REQUIRED.

IT IS ASSUMED BY SECTION 284 THAT THE SELECTED DEVICES WERE PREVIOUSLY PLACED IN A READY CONDITION. OTHERWISE, ERRORS WILL OCCUR. IF THE 'STATUS' INDICATOR ON THE CONTROL UNIT IS ON, IT MAY BE NECESSARY TO TURN THE POWER SWITCH ON THE CONTROL UNIT 'OFF' AND 'ON' TO CLEAR THE INDICATOR.

EXAMPLE:

```
 --------------------------------------
|      **  BSCC AUTOPOLL TEST  **      |
| LINE 1    ## FF                      |
| CU/DA (1 - 40 ENTRIES, COMMA OPTIONAL)|
|6040,60C160C2_________________________|
|_______60C3___________________________|
|___________,60C460C5,60C6_____________|
|______________________60C7____________|
|                                      |
|'ENTER' TO CONTINUE, 'PF1' TO STOP POLL|
 --------------------------------------
```

4.2.6 AT THIS TIME, EACH OF THE SELECTED DEVICES (INCLUDING PRINTERS) IS WRITTEN WITH THE FOLLOWING MESSAGE:

```
 --------------------------------------
| BSCC AUTOPOLL TEST                   |
|ENTER MESSAGE:                        |
|______________________________________|
|______________________________________|
|                                      |
|                                      |
|                                      |
 --------------------------------------
```

THIS EXAMPLE REPRESENTS THE DISPLAY SEEN ON A DEVICE WITH A REMOTE CRT OF 40 CHARACTERS PER LINE SUCH AS A 3277 MODEL 1. ON A REMOTE CRT OF 80 CHARACTERS PER LINE SUCH AS THE 3277 MODEL 2, THE MESSAGE ENTRY LINE EXTENDS ACROSS THE ENTIRE CRT.

4.2.7 THE OPERATOR CAN TYPE IN ANY MESSAGE 80 CHARACTERS OR LESS ON THE REMOTE KEYBOARD IN THE SPACE INDICATED BY THE UNDERSCORES AND PRESS THE 'ENTER' KEY. THE BSCC ATTACHMENT WILL RECEIVE THE ENTIRE MESSAGE INCLUDING ANY REMAINING UNDERSCORES, AND RE-WRITE THE DEVICE WITH THAT 'RECEIVED' MESSAGE BELOW THE 'ENTER' MESSAGE AS IN THE FOLLOWING EXAMPLE:

```
 ----------------------------------------
| BSCC AUTOPOLL TEST                     |
|                                        |
|ENTER MESSAGE:                          |
|THIS IS AN OPERATOR MESSAGE.____________|
|________________________________________|
|                                        |
|RECEIVED MESSAGE:                       |
|THIS IS AN OPERATOR MESSAGE.____________|
|________________________________________|
|                                        |
 ----------------------------------------
```

THIS EXAMPLE REPRESENTS THE DISPLAY SEEN ON A DEVICE WITH A REMOTE CRT OF 40 CHARACTERS PER LINE SUCH AS A 3277 MODEL 1.

PRESSING ANY OF THE 'PF' KEYS ON THE REMOTE KEYBOARD RESULTS IN THE SAME ACTION AS PRESSING THE 'ENTER' KEY.

4.2.8 IF THE 'ENTER' KEY IS PRESSED WITHOUT MODIFYING ANY CHARACTER WITHIN THE MESSAGE FIELD, THE RECEIVED MESSAGE CONTAINS NO DATA, AND THE RESULT WILL BE A DISPLAY SUCH AS THE FOLLOWING:

```
 ----------------------------------------
| BSCC AUTOPOLL TEST                     |
|                                        |
|ENTER MESSAGE:                          |
|THIS IS AN OPERATOR MESSAGE.____________|
|________________________________________|
|                                        |
|RECEIVED MESSAGE:                       |
|                                        |
|                                        |
|                                        |
 ----------------------------------------
```

THIS EXAMPLE REPRESENTS THE DISPLAY SEEN ON A DEVICE WITH A REMOTE CRT OF 40 CHARACTERS PER LINE SUCH AS A 3277 MODEL 1.

PRESSING ANY OF THE 'PA' KEYS ON THE REMOTE KEYBOARD RESULTS IN THE SAME ACTION AS PRESSING THE 'ENTER' KEY WITHOUT TYPING IN ANY CHARACTERS.

PRESSING THE 'CLEAR' KEY ON THE REMOTE KEYBOARD RESULTS IN THE SAME ACTION AS PRESSING THE 'ENTER' KEY WITHOUT TYPING IN ANY CHARACTERS. HOWEVER, THE ENTIRE DISPLAY WILL BE CLEARED, AND ONLY THE 'RECEIVED MESSAGE' PORTION WILL BE RE-WRITTEN. ALSO, SINCE THE CLEARING OF THE DISPLAY TAKES TIME, THE DEVICE MAY RESPOND WITH A STATUS TO THE AUTOPOLL AND CAUSE THAT DEVICE TO BE DELETED FROM THE POLLING LIST.

PRESSING THE 'TEST REQ' OR 'SYS REQ' KEY ON THE REMOTE KEYBOARD CAUSES THE AUTOPOLL TEST TO BE RESTARTED.

4.2.9 AS LONG AS THE POLLING NUMBER HAS NOT BEEN EXHAUSTED, ANY MESSAGE CAN BE ENTERED ON ANY DEVICE. AFTER EACH RECEIVED MESSAGE IS TRANSMITTED BACK TO THE DEVICE, THE ATTACHMENT IS PLACED BACK INTO THE AUTOPOLL MODE.

4.2.10 PRESSING THE 'PF1' KEY ON THE CONSOLE KEYBOARD CAUSES A 'STOP POLLING' SIO TO BE ISSUED TO THE BSCC ATTACHMENT. AT THIS TIME, THE INITIAL CONSOLE CRT DISPLAY IS R-WRITTEN, AND AN 'E1' HALT OCCURS. SEE 4.2.4.

4.2.11 IF A PRINTER IS ONE OF THE REMOTE DEVICES, THE 'BSCC AUTOPOLL TEST' MESSAGE WILL BE PRINTED. SEE EXAMPLE IN 4.2.6. THE PRINTER MAY RESPOND WITH A STATUS TO THE AUTOPOLL AND CAUSE IT TO BE DELETED FROM THE POLLING LIST.

THE PRINTER CAN BE MADE TO PRINT THE 'BSCC AUTOPOLL TEST' MESSAGE REPEATEDLY BY PRESSING THE 'TEST REQ' OR 'SYS REQ' KEY ON ANY OF THE REMOTE KEYBOARDS.

*NOTE: THE 3275 IS A STANDALONE DISPLAY TERMINAL, THAT CAN HAVE A PRINTER ATTACHED AS A FEATJRE. IF THIS FEATURE IS ATTACHED, WHENEVER A SCREEN IS SENT TO THE 3275, IT IS ALSO PRINTED ON THE PRINTER. WITH SECTION 284, AN ERROR IS DETECTED AS SOON AS THE MESSAGE IS SENT (BUSY IS ON AND A WACK IS SENT TO THE SYSTEM/3.) SECTION 284 CANNOT RECOVER FROM THIS PARTICULAR ERROR AND THE PROGRAM TERMINATES TESTING AND PRINTS AN ERROR SAYING THAT THERE ARE NO MORE TERMINALS IN THE POLLING LIST. THERE IS ONLY ONE CUDV ENTERED WHEN A 3275 IS ATTACHED, UNLESS A MULTIPOINT LINE IS INSTALLED IN WHICH CASE THE PROGRAM WILL TAKE THE 3275 OUT OF THE POLLING LIST AND CONTINUE POLLING THE REMAINING TERMINALS.

TO RECOVER, THE C.E. SHOULD TEMPORARILY DISCONNECT THE PRINTER FEATURE BY REMOVING THE PRINTEP FEATURE CARD FROM THE 3275 BOARD (SEE 3275 SERVICE MANUAL).

RETURN THE PRINTER FEATURE CARD TO IT'S ORIGINAL 3275 BOARD LOCATION IMMEDIATELY AFTER RJNNING SECTION 284.

4.2.12 REMOTE CONTROL UNIT AND DEVICE ADDRESSING.

CU OR DEVICE NUMBER	DEVICE ADDRESS OR POLLING ADDRESS		SELECTION ADDRESS	
	EBCDIC	ASCII	EBCDIC	ASCII
0	40	20	60	2D
1	C1	41	61	2F
2	C2	42	E2	53
3	C3	43	E3	54
4	C4	44	E4	55
5	C5	45	E5	56
6	C6	46	E6	57
7	C7	47	E7	58
8	C8	48	E8	59
9	C9	49	E9	5A
10	4A	5B	6A	7C
11	4B	2E	6B	2C
12	4C	3C	6C	25
13	4D	28	6D	5F
14	4E	2B	6E	3E
15	4F	21	6F	3F
16	50	26	F0	30
17	D1	4A	F1	31
18	D2	4B	F2	32
19	D3	4C	F3	33
20	D4	4D	F4	34
21	D5	4E	F5	35
22	D6	4F	F6	36
23	D7	50	F7	37
24	D8	51	F8	38
25	D9	52	F9	39
26	5A	5D	7A	3A
27	5B	24	7B	23
28	5C	2A	7C	40
29	5D	29	7D	27
30	5E	3B	7E	3D
31	5F	5E	7F	22

4.3 ERROR MESSAGES AND ERROR CODES

4.3.1 ERROR MESSAGE FORMAT

```
ERROR  284-XX   XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                    CAR - XXXX, STATUS - XXXX
          |      |_______________________________|                      |__|          |__|
          |                      |                                        |             |
          |                      DESCRIPTION OF THE ERROR                 |             |
          |                                                               |             |
          ERROR CODE ASSIGNED TO                              WHEN PRINTED THIS FIELD   |
          THE TYPE OF ERROR.                                  CONTAINS THE VALUE OF THE |
                                                              CURRENT ADDRESS REGISTER  |
                                                              WHEN THE ERROR OCCURRED.  |
                                                                                        |
                                                                    WHEN PRINTED, THIS FIELD USUALLY
                                                                    CONTAINS THE BSCC STATUS SUPPLIED BY
                                                                    THE FUNCTIONAL MICROCODE. IF THE ERROR
                                                                    IS AN UNEXPECTED INTERRUPT, THIS FIELD
                                                                    CONTAINS THE ATTACHMENT STATUS.
```

4.3.2 ERROR CODES

ERROR CODES	DESCRIPTION FIELD	EXPLANATION OF ERROR
01	SELECT SENT, ACK0 NOT RECEIVED	A SELECT WAS TRANSMITTED TO A DEVICE, BUT THE PESPONSE WAS NOT 'ACK0' OR 'RVI'.
02	RVI RECEIVED 10 TIMES.	A SELECT WAS TRANSMITTED TO A DEVICE, AND 'RVI' WAS RECEIVED. THIS SEQUENCE OCURRED 10 TIMES.
03	MESSAGE SENT, NAK RECEIVED	THE 'ENTER' MESSAGE WAS TRANSMITTED, AND 'NAK' WAS RECEIVED.
04	MESSAGE SENT, ACK1 NOT RECEIVED	THE 'ENTER' MESSAGE WAS TRANSMITTED, BUT THE RESPONSE WAS NOT 'ACK1' OR 'NAK'.
05	INCORRECT MESSAGE RECEIVED	RESPONSE TO THE AUTOPOLL WAS NOT A TEXT MESSAGE OR A STATUS.
06	MESSAGE SENT, ACK1 NOT RECEIVED.	THE 'RECEIVED' MESSAGE WAS TRANSMITTED, BUT THE RESPONSE WAS NOT 'ACK1' OR 'NAK'.
07	MESSAGE SENT, NAK RECEIVED	THE 'RECEIVED' MESSAGE WAS TRANSMITTED, AND 'NAK' WAS RECEIVED. THIS SEQUENCE OCCURRED 10 TIMES.
08	3277 CRT NOT READY	WRITING TO THE CONSOLE CRT RESULTED IN A 'NOT READY' OR ERROR.
09	BSCC ATTACH NOT READY/UNIT CHK	A 'NOT READY/UNIT CHECK' CONDITION WAS DETECTED PRIOR TO EXECUTING A BSCC 'SIO'.
10	INCORRECT BSCC STATUS	THE FUNCTIONAL MICROCODE DETECTED AN ERROR AND RETURNED A CODE OTHER THAN '0002'. REFER TO 13.0 FOR BSCC STATUS.
11	UNEXPECTED INTERRUPT.	AN UNEXPECTED INTERRUPT WAS DETECTED. THE ATTACHMENT STATUS IS PLACED IN THE 'STATUS' FIELD OF THE ERROR MESSAGE. REFER TO 12.0 FOR ATTACHMENT STATUS.
12	NO VALID CU/DV ENTRIES	ALL ENTRIES IN THE POLLING LIST WERE DELETED BECAUSE ALL DEVICES RES| RESPONDED TO THE AUTOPOLL WITH STATUS.
13	XXXX DELETED FROM POLLING LIST.	THE DEVICE, WHOSE ADDRESS IS PRINTED IN THE MESSAGE, WAS DELETED FROM THE POLLING LIST BECAUSE IT RESPONDED TO THE AUTOPOLL WITH A STATUS. THIS IS NORMAL IF THE DEVICE IS A PRINTER.

5.0 DIAGNOSTIC SECTION 289 AND 28A - ON-LINE TESTS

5.1 SUMMARY

DIAGNOSTIC SECTIONS 289 AND 28A PROVIDE ON-LINE TESTING CAPABILITY AS DEFINED IN SPECIFICATION CP-AR-000668-02-RAL. SECTION 289 IS THE ON-LINE REQUESTOR, AND 28A IS THE ON-LINE RESPONDER.

SECTION 289 SUPPORTS REQUEST FOR TEST (RFT) MESSAGES 00, 01, 02, 04, 05, 06, 14, 15, 16, AND 19.

SECTION 28A SUPPORTS REQUEST FOR TEST (RFT) MESSAGES 00, 01, 02, 04, 05, 06, 07, 08, 12, 13, 14, 15, 16, 19, 20, 21, 22, AND 99.

REFER TO SECTION 5.5 FOR TEST SEQUENCE AND SECTION 5.8 FOR DEFINITIONS OF RFT MESSAGES.

5.2 OPERATION OF SECTION 289 (REQUESTOR)

5.2.1 CALL IN SECTION 289.

5.2.2 SENSE SWITCHES (TO BE TURNED ON BEFORE RESETTING 'HA' HALT).

SSW 10 - PREVENT LOADING OF FUNCTIONAL MICROCODE INTO CONTROL STORE BY SECTION 28C. THIS SENSE SWITCH CAN BE USED ALONG WITH THE SENSE SWITCH 24 TO DUMP THE CE TRACE BUFFER AFTER RUNNING SYSTEM TEST.

SSW 15 - CAUSE TEST TO LOOP INDEFINITELY.

SSW 23 - DISABLE CE TRACE WHICH STORES THE LAST 512 BYTES OF TRANSMITTED AND RECEIVED DATA ON THE SELECTED LINE. THE CE TRACE IS NORMALLY ACTIVE.

SSW 24 - DUMP CONTENTS OF CE TRACE BUFFER FOR LINE 1, AND LINE 2, IF LINE 2 IS PROPERLY DEFINED IN UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

5.2.3 RESET THE 'HA' HALT. AT THIS TIME, THE SECTION PREFACE IS EXAMINED TO DETERMINE WHETHER FUNCTIONAL MICROCODE FBO HAS BEEN LOADED INTO BSCC CONTROL STORE. IF IT HAS NOT, SECTION 28C IS CALLED IN, WHICH CALLS IN FBO AND LOADS IT INTO CONTROL STORE. WHEN THIS IS ACCOMPLISHED, THE SECTION PREFACE IS ALTERED TO INDICATE THE ACTION, AND FBO IS NOT LOADED AGAIN PRIOR TO EXECUTING ANY BSCC DIAGNOSTIC.

5.2.4 AT THE 'E1' HALT, SECTION 289 IS READY FOR OPERATOR INPUT. ENTER THE DESIRED VALUES IN THE FOLLOWING DISPLAY WRITTEN ON THE CONSOLE CRT, AND PRESS THE 'ENTER' KEY. IF ALL THE ENTRIES ARE VALID, THE DISPLAY IS RE-WRITTEN TO ALLOW FOR ANY CHANGES. IF THERE ARE NO CHANGES, PRESS THE 'ENTER' KEY AGAIN TO START THE TEST. VALID ENTRIES APPEAR ON THE DISPLAY. INVALID ENTRIES CAUSE THE DISPLAY TO BE RE-WRITTEN WITH A MESSAGE INDICATING AN INVALID ENTRY, AND THE CURSOR IS POSITIONED AT THAT ENTRY.

```
 ----------------------------------------
|     **  BSCC ON-LINE REQUESTOR  **      |
|  LINE    XX    YY                      |
|    -     --    --                      |
| LINE = 1,2                             |
|   XX = 00,01,04,14,15,16     (EBCDIC)  |
|   XX = 00,01,02,19    (EBCDIC TRANSP)  |
|   XX = 00,01,05,06           (ASCII)   |
|   YY = 00-99                           |
|'ENTER' TO CONTINUE, 'PF1' TO TERMINATE |
 ----------------------------------------
```

5.2.5 IF MESSAGE 00 OR 01 IS ENTERED, A SECOND DISPLAY IS WRITTEN ON THE 3277 CRT, AND A HALT 'E2' OCCURS.

```
 ----------------------------------------
|     **  BSCC ON-LINE REQUESTOR  **      |
|TEXT (IN HEX):                          |
|02F0F1F2F3F4F5F6F7F8F9C1C2C303__________|
|                                        |
|POLL/SELECT ________     (OPTIONAL)     |
|UNDERSCORE IS REQUIRED AT THE END       |
|OF EACH ENTRY.                          |
|'ENTER' TO CONTINUE, 'PF1' TO TERMINATE |
 ----------------------------------------
```

THE MESSAGE DISPLAYED IN LINE 4 IS THE EBCDIC REPRESENTATION OF:

```
S                             E
T 0 1 2 3 4 5 6 7 8 9 0 A B C T
X                             X
```

IF ASCII IS INSTALLED ON THE LINE SELECTED, LINE 4 ON THE CRT WOULD BE:

```
|02303131323334353637383941424303________|
```

THIS MESSAGE IS INSERTED FOR OPERATOR CONVENIENCE ONLY, AND CAN BE ALTERED, IF DESIRED, TO ANY SET OF CHARACTERS. THE RESTRICTIONS ARE THAT THERE MUST BE AN EVEN NUMBER OF CHARACTERS ENTERED, THE FIRST CHARACTER MUST BE ENTERED AT THE ORIGINAL CURSOR POSITION, THE LIMIT IS 40 CHARACTERS, AND THE LAST CHARACTER MUST BE FOLLOWED BY AN UNDERSCORE (_) IF THE NUMBER OF CHARACTERS IS LESS THAN 40.

IF A SELECTION OR POLLING ADDRESS IS REQUIRED BY THE RESPONDING DEVICE, THAT ADDRESS CAN BE ENTERED ON LINE 7. THE RESTRICTIONS ARE THAT THERE MUST BE AN EVEN NUMBER OF CHARACTERS ENTERED, THE FIRST CHARACTER MUST BE ENTERED AT THE ORIGINAL CURSOR POSITION, THE LIMIT IS 8 CHARACTERS, AND THE LAST CHARACTER MUST BE FOLLOWED BY AN UNDERSCORE (_) IF THE NUMBER OF CHARACTERS IS LESS THAN 8.

IF THIS TEST IS RUN TO THE 3600 SYSTEM:

1. THE 'STARTER DISKETTE' SHOULD BE USED ON THE 3601.
2. THE SELECTION ADDRESS (CUA) SHOULD BE ENTERED.
3. THE POLL/SELECT ENTRY FORMAT SHOULD BE 'CUCUF1' (F1 MUST BE PRESENT).

   EXAMPLE: POLL/SELECT 8181F1__

5.2.6 AT THIS TIME, IT IS ASSUMED BY SECTION 289 THAT THE RESPONDING DEVICE IS CONDITIONED TO RECEIVE AN INQUIRY FROM THE REQUESTOR, AND A MESSAGE IS PRINTED INDICATING THAT THE TEST HAS BEGUN. THE XX AND YY VALUES ARE PRINTED IN THIS MESSAGE.

5.2.7 WHEN THE REQUESTED MESSAGE IS RECEIVED YY TIMES, A MESSAGE IS PRINTED INDICATING NORMAL TERMINATION. AT THIS TIME, IF SENSE SWITCH 15 IS NOT ON, THE INITIAL CONSOLE CRT DISPLAY IS RE-WRITTEN, A HALT 'E1' OCCURS, AND A NEW MESSAGE CAN BE REQUESTED. SEE 5.2.4.

IF SENSE SWITCH 15 IS ON, THE INITIAL CRT DISPLAY IS BYPASSED, AND THE TEST WILL LOOP INDEFINITELY. PRESSING THE 'PF1' KEY ON THE CONSOLE KEYBOARD WILL CAUSE TERMINATION AT THE COMPLETION OF THE CURRENT SERIES OF YY TRANSMISSIONS.

5.2.8 CONTINUOUS 'SYN' CHARACTERS

TO TRANSMIT CONTINUOUS 'SYN' CHARACTERS, ENTER THE DESIRED LINE NUMBER, AND ENTER 'SS' AS THE 'XX' VALUE AT THE 'E1' HALT. THE 'YY' VALUE IS IGNORED. PRESS THE 'ENTER' KEY ON THE CONSOLE KEYBOARD. IF ALL VALUES ARE VALID, THE DISPLAY IS RE-WRITTEN TO ALLOW FOR CHANGES. IF THERE ARE NO CHANGES, PRESS THE 'ENTER' KEY AGAIN TO START THE TEST.

AT THIS TIME, THE ATTACHMENT BEGINS CONTINUOUS TRANSMISSION OF 128 BYTES OF 'SYN' CHARACTERS FOLLOWED BY AN 'EOT'. THIS TEST NEITHER REQUIRES NOR EXPECTS A RESPONSE FROM THE DEVICE ATTACHED TO THE SELECTED LINE. TO TERMINATE THE TEST, PRESS 'SYSTEM RESET'.

THIS TEST IS USED TO ISOLATE LINE PROBLEMS. FOR ADDITIONAL INFORMATION REFER TO BSCC MAPS, LINE TEST FAILURE CHART.

5.3 OPERATION OF SECTION 28A (RESPONDER)

5.3.1 CALL IN SECTION 28A.

5.3.2 SENSE SWITCHES (TO BE TURNED ON BEFORE RESETTING 'HA' HALT).

SSW 10 - PREVENT LOADING OF FUNCTIONAL MICROCODE INTO CONTROL STORE BY SECTION 28C. THIS SENSE SWITCH CAN BE USED ALONG WITH SENSE SWITCH 24 TO DUMP THE CE TRACE BUFFER AFTER RUNNING SYSTEM TEST.

SSW 17 - IF 2780 TERMINAL IS THE REQUESTOR, THIS CAUSES A 10 SECOND DELAY FOR OPERATOR RESPONSE.

SSW 23 - DISABLE CE TRACE WHICH STORES THE LAST 512 BYTES OF TRANSMITTED AND RECEIVED DATA ON THE SELECTED LINE. THE CE TRACE IS NORMALLY ACTIVE.

SSW 24 - DUMP CONTENTS OF CE TRACE BUFFER FOR LINE 1, AND LINE 2 IF LINE 2 IS PROPERLY DEFINED IN UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

5.3.3 RESET THE 'HA' HALT. AT THIS TIME, THE SECTION PREFACE IS EXAMINED TO DETERMINE WHETHER FUNCTIONAL MICROCODE FB0 HAS BEEN LOADED INTO BSCC CONTROL STORE. IF IT HAS NOT, SECTION 28C IS CALLED IN, WHICH CALLS IN FB0 AND LOADS IT INTO CONTROL STORE. WHEN THIS IS ACCOMPLISHED, THE SECTION PREFACE IS ALTERED TO INDICATE THE ACTION, AND FB0 IS NOT LOADED AGAIN PRIOR TO EXECUTING BSCC DIAGNOSTIC.

5.3.4 AT THE 'E1' HALT, SECTION 28A IS READY FOR OPERATOR INPUT. ENTER THE DESIRED VALUES IN THE FOLLOWING DISPLAY WRITTEN ON THE CONSOLE CRT AND PRESS THE 'ENTER' KEY. IF ALL THE ENTRIES ARE VALID, THE DISPLAY IS RE-WRITTEN TO ALLOW FOR ANY CHANGES. IF THERE ARE NO CHANGES, PRESS THE 'ENTER' KEY AGAIN TO START THE TEST. VALID ENTRIES APPEAR ON THE DISPLAY. INVALID ENTRIES CAUSE THE DISPLAY TO BE RE-WRITTEN WITH A MESSAGE INDICATING AN INVALID ENTRY, AND THE CURSOR IS POSITIONED AT THAT ENTRY.

```
 -----------------------------------------
|     **  BSCC ON-LINE RESPONDER  **      |
| LINE _                                  |
| POLL/SELECT ________ (OPTIONAL-MSG01)   |
|                                         |
|LINE = 1,2                               |
|                                         |
|'ENTER' TO CONTINUE, 'PF1' TO TERMINATE  |
 -----------------------------------------
```

IF A SELECTION OR POLLING ADDRESS IS REQUIRED BY THE REQUESTING DEVICE, THAT ADDRESS CAN BE ENTERED ON LINE 5. THE RESTRICTIONS ARE THAT THERE MUST BE AN EVEN NUMBER OF CHARACTERS ENTERED, THE FIRST CHARACTER MUST BE AT THE ORIGINAL CURSOR POSITION, THE LIMIT IS 8 CHARACTERS, AND THE LAST CHARACTER MUST BE FOLLOWED BY AN UNDERSCORE (_) IF THE NUMBER OF CHARACTERS IS LESS THAN 8.

5.3.5 AT THIS TIME, A MESSAGE IS PRINTED INDICATING THAT THE TEST HAS BEGUN, AND THE SELECTED LINE IS PLACED IN A 'RECEIVE INITIAL' CONDITION. NO FURTHER PROCESSING IS DONE UNTIL THE REQUESTING DEVICE INITIATES THE TEST SEQUENCE.

5.3.6 WHEN THE REQUEST FOR TEST (RFT) MESSAGE IS RECEIVED AND ACCEPTED, A MESSAGE IS PRINTED INDICATING THE RECEIVED XX ANY YY VALUES. THE APPROPRIATE TEST MESSAGE IS THEN TRANSMITTED YY NUMBER OF TIMES. AT THAT TIME, A MESSAGE IS PRINTED INDICATING NORMAL TERMINATION, AND THE SELECTED LINE IS AGAIN PLACED IN A 'RECEIVE INITIAL' CONDITION, WAITING FOR THE REQUESTING DEVICE TO RE-INITIATE THE TEST SEQUENCE.

PRESSING THE 'PF1' KEY ON THE CONSOLE KEYBOARD WILL CAUSE TERMINATION AT THE COMPLETION OF THE CURRENT SERIES OF YY TRANSMISSIONS.

5.4 ERROR MESSAGES AND ERROR CODES

5.4.1 ERROR MESSAGE FORMAT FOR SECTION 289 AND 28A

```
ERROR  28X-XX  XXXXXXXXXXXXXXXXXXXXXXXXXXXXX                 CAR - XXXX, STATUS - XXXX
          |    |_____________________________|                     |__|           |__|
          |                 |                                       |              |
          |           DESCRIPTION OF THE ERROR.                     |              |
          |                                                         |              |
       ERROR CODE ASSIGNED TO                          WHEN PRINTED, THIS FIELD    |
       THE TYPE OF ERROR.                              CONTAINS THE VALUE OF THE   |
                                                       CURRENT ADDRESS REGISTER    |
                                                       WHEN THE ERROR OCCURRED.    |
                                                                                   |
                                                         WHEN PRINTED, THIS FIELD USUALLY
                                                         CONTAINS THE BSCC STATUS SUPPLIED BY
                                                         THE FUNCTIONAL MICROCODE. IF THE ERROR
                                                         IS AN UNEXPECTED INTERRUPT, THIS FIELD
                                                         CONTAINS THE ATTACHMENT STATUS.
```

5.4.2 ERROR CODES FOR SECTION 289

ERROR CODES	DESCRIPTION FIELD	EXPLANATION OF ERROR
01	ENQ SENT, ACK0 NOT RECEIVED	THE INITIAL 'ENQ' WAS TRANSMITTED 10 TIMES, BUT THE RESPONSE WAS NOT 'ACK0'.
02	RFT SENT, ACK1 NOT RECEIVED.	THE RFT MESSAGE WAS TRANSMITTED, BUT THE RESPONSE WAS NOT 'ACK1' OR 'NAK'.
03	RFT SENT, NAK RECVD 10 TIMES	THE RFT MESSAGE WAS TRANSMITTED, AND 'NAK' WAS RECEIVED. THIS SEQUENCE OCCURRED 10 TIMES.
04	EOT SENT, ENQ NOT RECEIVED	'EOT' WAS TRANSMITTED 1 TIME, AND 'NAK' WAS TRANSMITTED 32 TIMES, BUT 'ENQ' WAS NOT RECEIVED.
05	CURR YY IS 00, BUT EOT NOT RCV	'YY' NUMBER OF TEST MESSAGES HAVE BEEN RECEIVED AND 'ACK0' WAS TRANSMITTED, BUT RESPONSE WAS NOT 'EOT' OR 'DISC'.
06	DATA MISCOMPARE	TEST MESSAGE RECEIVED DOES NOT COMPARE TO EXPECTED MESSAGE.
07	EOT RECEIVED, BUT YY IS NOT 00	AN 'EOT' WAS RECEIVED BEFORE 'YY' NUMBER OF TEST MESSAGES WAS RECEIVED.
08	3277 CRT NOT READY	WRITING TO THE CONSOLE CRT RESULTED IN A 'NOT READY' OR ERROR.
09	BSCC ATTACH NOT READY/UNIT CK	A 'NOT READY/UNIT CHECK' CONDITION WAS DETECTED PRIOR TO EXECUTING A BSCC 'SIO'.
10	INCORRECT BSCC STATUS	THE FUNCTIONAL MICROCODE DETECTED AN ERROR AND RETURNED A CODE OTHER THAN '0002'. REFER TO 13.0 FOR BSCC STATUS.
11	NAK RECEIVED, EXPECTED ACK0/1	WHEN 'XX' = 00, THE CE MESSAGE WAS TRANSMITTED AND A 'NAK' WAS RECEIVED.
12	ACK0/1 NOT RECEIVED	WHEN 'XX' = 00, THE CE MESSAGE WAS TRANSMITTED BUT THE RESPONSE WAS NOT 'ACK0', 'ACK1', OR 'NAK'.
13	UNEXPECTED INTERRUPT.	AN UNEXPECTED INTERRUPT WAS DETECTED. THE ATTACHMENT STATUS IS PLACED IN THE 'STATUS' FIELD OF THE ERROR MESSAGE. REFER TO 12.0 FOR ATTACHMENT STATUS.

5.4.3 ERROR CODES FOR SECTION 28A

ERROR CODES	DESCRIPTION FIELD	EXPLANATION OF ERROR
01	ENQ WAS NOT RECEIVED	THE INITIAL DATA RECEIVED WAS NOT 'ENQ'.
02	INVALID RFT RECEIVED.	INVALID RFT FORMAT WAS RECEIVED, AND 'NAK' WAS TRANSMITTED. THIS SEQUENCE OCCURRED 10 TIMES.
03	ACK1 SENT, EOT NOT RECEIVED.	RFT WAS RECEIVED, 'ACK1' WAS TRANSMITTED, BUT RESPONSE WAS NOT 'EOT'.
04	ENQ SENT, ACK0 NOT RECEIVED	'ENQ' WAS TRANSMITTED BUT RESPONSE WAS NOT 'ACK0' OR 'NAK'.
05	MESSAGE SENT, NAK RECEIVED.	THE TEST MESSAGE WAS TRANSMITTED, AND 'NAK' WAS RECEIVED.
06	MESSAGE SENT, ACK0/1 NOT RECVD	THE TEST MESSAGE WAS TRANSMITTED, BUT RESPONSE WAS NOT 'ACK0', 'ACK1', 'NAK', OR 'WACK'.
07	MSG SENT, WACK RECVD 25 TIMES.	THE TEST MESSAGE WAS TRANSMITTED, AND 'WACK' WAS RECEIVED. THIS SEQUENCE OCCURRED 25 TIMES.
08	3277 CRT NOT READY	WRITING TO THE CONSOLE CRT RESULTED IN A 'NOT READY' OR ERROR.
09	BSCC ATTACH NOT READY/UNIT CK	A 'NOT READY/UNIT CHECK' CONDITION WAS DETECTED PRIOR TO EXECUTING A BSCC 'SIO'.
10	INCORRECT BSCC STATUS	THE FUNCTIONAL MICROCODE DETECTED AN ERROR AND RETURNED A CODE OTHER THAN '0002'. REFER TO 13.0 FOR BSCC STATUS.
11	YY IS 00, BUT EOT NOT RECEIVED	WHEN 'XX' = 00, 'ACK1' WAS TRANSMITTED, BUT 'EOT' WAS NOT RECEIVED AFTER 'YY' TEST MESSAGES WAS RECEIVED.
12	EOT RECEIVED, BUT YY IS NOT 00	WHEN 'XX' = 00, 'EOT' WAS RECEIVED BEFORE 'YY' TEST MESSAGES WAS RECEIVED.
13	ACK1 SENT, EOT NOT RECEIVED	WHEN 'XX' = 99, 'ACK1' WAS TRANSMITTED BUT 'EOT' WAS NOT RECEIVED.
14	ENQ NOT RCV AFTER 30 SEC DELAY	WHEN 'XX' = 99, 'EOT' WAS TRANSMITTED BUT 'ENQ' WAS NOT RECEIVED, WITHIN 30 SECONDS.
15	UNEXPECTED INTERRUPT.	AN UNEXPECTED INTERRUPT WAS DETECTED. THE ATTACHMENT STATUS IS PLACED IN THE 'STATUS' FIELD OF THE ERROR MESSAGE. REFER TO 12.0 FOR ATTACHMENT STATUS.

5.5 ON-LINE TEST SEQUENCE

IN THE FOLLOWING EXAMPLES, THE REQUESTOR IS THE TOP LINE, AND THE RESPONDER IS THE BOTTOM LINE. IF OPERATING IN TRANSPARENCY MODE, EACH 'STX' AND 'ETX' SHOULD BE PRECEDED BY A 'DLE'.

'MSG' REFERS TO THE TEST MESSAGE ASSOCIATED WITH THE 'XX' ENTRY.
THE TEST MESSAGE IS TRANSMITTED A TOTAL NUMBER OF YY TIMES.

5.5.1 WHEN XX = 00: (POINT TO POINT OR MULTIPOINT - BSCC SUPPORTS REQUESTOR ONLY ON MULTIPOINT)

```
E     S         S E     S     E     S     E                 E
N     O %00YY0  T T     T MSG T     T MSG T --------------> O
Q     H         X X     X     X     X     X                 T
  A                 A         A         A
  C                 C         C         C ----------->
  K                 K         K         K
  0                 1
```

1. A POLLING ADDRESS MAY BE RQUIRED PRIOR TOTHE INITIAL 'ENQ' FROM THE REQUESTOR. AN EXAMPLE WHOULD BE THE 3600 SYSTEM. REFER TO 5.2.5.
2. 'ACK' INDICATES THAT EITHER 'ACK0' OR 'ACK1' IS ACCEPTABLE.

5.5.2 WHEN XX = 01: (POINT TO POINT)

```
E     S         S     E     E     A              A            A
N     O %01YY0  T MSG T     O     C              C            C -->
Q     H         X     X     T     K              K            K
                                  0

  A                   A     E     S     E      S     E ------> E
  C                   C     N     T MSG T      T MSG T         O
  K                   K     Q     X     X      X     X         T
  0                   1
```

1. 'ACK' INDICATES THAT EITHER 'ACK0' OR 'ACK1' IS ACCEPTABLE.

5.5.3 WHEN XX = 01: (MULTIPOINT - BSCC SUPPORTS RESPONDER ONLY)

```
         S        A S     E     E           A           A           A
         O %01YYN D T MSG T     O           C           C           C-->
         H        D X     X     T           K           K           K
                  R                         0

E P E                     A     E A E   S       E     S     E -----> E
O O N                     C     O D N   T  MSG  T     T MSG T        O
T L Q                     K     T D Q   X       X     X     X        T
  L                       1       R
```

1. EACH 'EOT' FROM THE RESPONDER IS FOLLOWED BY 'PAD SYN SYN'.
2. 'ACK' INDICATES THAT EITHER 'ACK0' OR 'ACK1' IS ACCEPTABLE.

5.5.4 WHEN XX = 02 THROUGH 22: (POINT TO POINT)

```
E     S         A S E     E     A              A            A
N     O %XXYYN  D T T     O     C              C            C ----->
Q     H         D X X     T     K              K            K
                R               0

                                                                  E
  A                   A     E     S     E      S     E --------> O
  C                   C     N     T MSG T      T MSG T            T
  K                   K     Q     X     X      X     X
  0                   1
```

1. 'ACK' INDICATES THAT EITHER 'ACK0' OR 'ACK1' IS ACCEPTABLE.

5.5.5 WHEN XX = 02 THROUGH 22: (MULTIPOINT - BSCC SUPPORTS RESPONDER ONLY)

```
         S        A S E     E          A            A            A
         O %XXYYN D T T     O          C            C            C ----->
         H        D X X     T          K            K            K
                  R                    0

                                                                         E
E P E                     A     E A E     S     E     S     E --------> O
O O N                     C     O D N     T     T MSG T     T MSG T      T
T L Q                     K     T D Q     X     X     X
  L                       1       R
```

1. EACH 'EOT' FROM THE RESPONDER IS FOLLOWED BY 'PAD SYN SYN'.
2. 'ACK' INDICATES THAT EITHER 'ACK0' OR 'ACK1' IS ACCEPTABLE.

5.5.6 WHEN XX = 99:

```
E     S         S     E     E       E     S     E     S     E ------> E
N     O %99YY0  T MSG T     O ***** N     T MSG T     T MSG T         O
Q     H         X     X     T       Q     X     X     X     X         T
  A                   A           A           A           A
  C                   C           C           C           C --->
  K                   K           K           K           K
  0                   1           0           1           0
                                                          /
                                                          1
```

1. 'ACK0/1' INDICATES THAT ACK0 AND ACK1 ARE ALTERNATED WITH THE RECEPTION OF SUCCESSIVE MESSAGES.
2. '*****' INDICATES A TIME DELAY DUE TO OPERATOR INTERVENTION.

5.6 COMMUNICATION CONTROL CHARACTERS

FUNCTION	MNEMONIC	EBCDIC	ASCII
START OF HEADING	SOH	01	01
START OF TEXT	STX	02	02
END OF TRANSMISSION BLOCK	ETB	26	17
END OF TEXT	ETX	03	03
END OF TRANSMISSION	EOT	370F	040F
ENQUIRY	ENQ	2D	05
NEGATIVE ACKNOWLEDGE	NAK	3D0F	150F
SYNCHRONOUS IDLE	SYN	32	16
DATA LINK ESCAPE	DLE	10	10
INTERMEDIATE BLOCK	ITB	1F	1F
EVEN ACKNOWLEDGE	ACK0	1070	1030
ODD ACKNOWLEDGE	ACK1	1061	1031
WAIT BEFORE TRANSMIT POSITIVE ACK	WACK	106B	103B
MANDATORY DISCONNECT	DISC	1037	1004
REVERSE INTERRUPT	RVI	107C	103C
TEMPORARY TEXT DELAY	TTD	022D	0205
TRANSPARENT START OF TEXT	XSTX	1002	
TRANSPARENT INTERMEDIATE BLOCK	XITB	101F	
TRANSPARENT END OF TEXT	XETX	1003	
TRANSPARENT END OF TRANSMISSION BLOCK	XETB	1026	
TRANSPARENT SYNCHRONOUS IDLE	XSYN	1032	
TRANSPARENT BLOCK CANCEL	XENQ	102D	
TRANSPARENT TTD	XTTD	1002	
TRANSPARENT TTD	XTTD	102D	
DATA IDLE IN TRANSPARENT MODE	XDLE	1010	
ESCAPE	ESC	27	1B

5.7 EBCDIC AND ASCII TABLE

CHARACTER	EBCDIC	ASCII	CHARACTER	EBCDIC	ASCII
A	C1	41	U	E4	55
B	C2	42	V	E5	56
C	C3	43	W	E6	57
D	C4	44	X	E7	58
E	C5	45	Y	E8	59
F	C6	46	Z	E9	5A
G	C7	47			
H	C8	48			
I	C9	49			
J	D1	4A			
K	D2	4B	0	F0	30
L	D3	4C	1	F1	31
M	D4	4D	2	F2	32
N	D5	4E	3	F3	33
O	D6	4F	4	F4	34
P	D7	50	5	F5	35
Q	D8	51	6	F6	36
R	D9	52	7	F7	37
S	E2	53	8	F8	38
T	E3	54	9	F9	39

5.8 RFT (REQUEST FOR TEST) MESSAGES

MSG (XX)	DESCRIPTION
00	RECEIVE AND ACKNOWLEDGE FOLLOWING MESSAGE. (OPERATOR ENTERS MESSAGE ON CRT)
01	TRANSMIT FOLLOWING MESSAGE. (OPERATOR ENTERS MESSAGE ON CRT)
02	TRANSMIT 256 TRANSPARENT EBCDIC CHARACTERS - HEX '00' THROUGH 'FF'.
04	TRANSMIT 245 EBCDIC CHARACTERS - HEX '00' THROUGH 'FF', EXCLUDING DLC CONTROL CHARACTERS.
05	TRANSMIT 117 ASCII CHARACTERS - HEX '00' THROUGH '7F', EXCLUDING DLC CONTROL CHARACTERS.
06	TRANSMIT 36 ASCII CHARACTERS - 'A' THROUGH 'Z', AND '0' THROUGH '9'.
07	TRANSMIT 'ESC Q' FOLLOWED BY 36 ASCII CHARACTERS - 'A' THROUGH 'Z', AND '0' THROUGH '9'. THIS IS A 2780 PRINTER MESSAGE.
08	TRANSMIT 'ESC 4' FOLLOWED BY 36 ASCII CHARACTERS - 'A' THROUGH 'Z', AND '0' THROUGH '9'. THIS IS A 2780 PUNCH MESSAGE.
12	TRANSMIT 'ESC /' FOLLOWED BY 36 EBCDIC CHARACTERS - 'A' THROUGH 'Z', AND '0' THROUGH '9'. THIS IS A 2780 PRINTER MESSAGE.
13	TRANSMIT 'ESC 4' FOLLOWED BY 36 EBCDIC CHARACTERS - 'A' THROUGH 'Z', AND '0' THROUGH '9'. THIS IS A 2780 PUNCH MESSAGE.
14	TRANSMIT 36 EBCDIC CHARACTERS - 'A' THROUGH 'Z', AND '0' THROUGH '9'.
15	TRANSMIT 84 EBCDIC CHARACTERS - 74 '00', AND 10 'SYN'.
16	TRANSMIT 80 EBCDIC CHARACTERS - 40 'AA', AND 40 '55'.
19	TRANSMIT 290 TRANSPARENT EBCDIC CHARACTERS - 280 '00', AND 10 'SYN'.
20	TRANSMIT 80 TRANSPARENT EBCDIC CHARACTERS - 'U' THROUGH 'Z', '0' THROUGH '9', AND HEX '00' THROUGH '3F'.
21	TRANSMIT 120 TRANSPARENT EBCDIC CHARACTERS - 'A' THROUGH 'Z', '0' THROUGH '9', AND HEX '00' THROUGH '53'.
22	TRANSMIT 144 TRANSPARENT EBCDIC CHARACTERS - 'A' THROUGH 'Z', '0' THROUGH '9', AND HEX '00' THROUGH '6B'.
99	RECEIVE AND ACKNOWLEDGE FOLLOWING MESSAGE (2780 AND 2770 USE ONLY).

6.0 DIAGNOSTIC SECTION 28C - FUNCTIONAL MICROCODE LOADER

6.1 SUMMARY

DIAGNOSTIC SECTION 28C IS USED TO LOAD BSCC FUNCTIONAL MICROCODE FB0 INTO THE BSCC ATTACHMENT CONTROL STORE. IT CAN BE CALLED INTO MAIN STORE BY USE OF THE DCP LOAD FUNCTION AND THE CPU CONSOLE SWITCHES, OR IT CAN BE CALLED IN BY ANY OTHER BSCC DIAGNOSTIC WHEN REQUIRED. IF 28C WAS CALLED IN BY ANOTHER BSCC DIAGNOSTIC, IT PASSES CERTAIN DATA TO THE RESIDENT SECTION BY WAY OF THE SECTION HEADER. THIS DATA CONTAINS THE FOLLOWING INFORMATION:

ADDRESS 'LDTERM' TO WHICH A BRANCH CAN BE MADE IF TERMINATION IS REQUIRED AFTER LOADING FB0.

ADDRESS 'LDRETN' TO WHICH A BRANCH CAN BE MADE IF RETURN TO THE CALLING DIAGNOSTIC IS REQUIRED AFTER LOADING FB0.

INDICATOR 'LDRIN' WHICH CONTAINS A VALUE OF 'D28C' WHEN SECTION 28C HAS BEEN LOADED BY DCP.

INDICATOR 'CDEIN' WHICH CONTAINS A VALUE OF 'DFB0' WHEN FB0 HAS BEEN LOADED INTO CONTROL STORE BY 28C.

SINCE MICROCODE PROGRAMS RESIDING ON THE 3340 DISK CANNOT BE PATCHED, SECTION 28C HAS THE CAPABILITY OF PATCHING THE MICROCODE AFTER LOADING IT IN MAIN STORE, AND BEFORE WRITING IT TO CONTROL STORE.

SECTION 28C EXISTS IN UPPER MAIN STORE, AND CAN RESIDE IN MAIN STORE ALONG WITH ANY OTHER BSCC DIAGNOSTIC SECTION.

6.2 OPERATION OF SECTION 28C

6.2.1 CALL IN SECTION 28C.

6.2.2 SENSE SWITCHES (TO BE TURNED ON BEFORE RESETTING 'HA' HALT).

SSW 10 - PREVENT LOADING OF BSCC FUNCTIONAL MICROCODE FB0 INTO CONTROL STORE.

6.2.3 RESET THE 'HA' HALT. THE FOLLOWING MESSAGE IS PRINTED:

START LOADING MICROCODE INTO MAIN STORAGE

6.2.4 AT THIS TIME, A 12K WRITE BUFFER IS FILLED WITH HEX '00', AND THEN OVERLAYED WITH BSCC FUNCTIONAL MICROCODE FB0.

6.2.5 AFTER FB0 IS LOADED, THE LEVEL NUMBER AND THE EC NUMBER ARE INSERTED IN THE MICROCODE BUFFER AT THE PROPER LOCATIONS. REFER TO THE DESCRIPTION OF THE ID/EC/PATCH FIELD BELOW

6.2.6 NEXT, A SEARCH THROUGH THE LOADER PATCH AREA IS STARTED. INITIALLY, THE PATCH AREA (256 BYTES) IS FILLED WITH A DELIMITER HEX 'FF'. IF ANY PATCHES EXIST, THEY ARE RECOGNIZED, AND A PATCH INDICATOR ('P') IS INSERTED IN THE MICROCODE BUFFER AT THE PROPER LOCATION. REFER TO THE DESCRIPTION OF THE ID/EC/PATCH FIELD BELOW. ALSO, A MESSAGE SIMILAR TO THE FOLLOWING IS PRINTED FOR EACH PATCH:

PATCH 700F-701D 0700 4518,F706,D0DD,5211C,D001,D0DD

6.2.7 AFTER ALL THE PATCHES ARE IMPLEMENTED, THE UDT ENTRY IS EXAMINED AND THE INDICATORS FOR LINE 2, ASCII, AND INTERNAL CLOCK OPTIONS ARE INSERTED IN THE MICROCODE BUFFER AT THE PROPER LOCATIONS.

6.2.8 FINALLY, A CHECKSUM OPERATION IS PERFORMED ON EACH OF THE THREE CONTROL STORE PAGES (4K BYTES PER PAGE), AND THE THREE RESULTS ARE INSERTED IN THE PROPER LOCATIONS IN THE MICROCODE BUFFER.

6.2.9 IF SENSE SWITCH 10 IS ON, THE LOADING OF MICROCODE TO BSCC CONTROL STORE IS BYPASSED. THIS SENSE SWITCH IS TURNED ON BY DIAGNOSTIC SECTION FD5 WHEN UPDATING THE CUSTOMER SYSTEM PACK.

IF SENSE SWITCH 10 IS NOT ON, THE FOLLOWING MESSAGE IS PRINTED, AND THE ALTERED MICROCODE IS WRITTEN TO BSCC CONTROL STORE.

START LOADING MICROCODE INTO CONTROL STORE

6.2.10 IF THERE ARE NO ERRORS ENCOUNTERED WHILE ATTEMPTING TO WRITE CONTROL STORE, THE FOLLOWING MESSAGE IS PRINTED:

MICROCODE FB0 PN _______ EC ______ LEVEL _ LOADED SUCCESSFULLY

6.2.11 CPU 'HE' HALT OCCURS.

6.3 PATCH MESSAGES

6.3.1 FIELDS WITHIN THE PATCH MESSAGE HAVE THE FOLLOWING MEANING:

```
PATCH 700F-701D 0124 4518,F706,D0DD,521C,D001,D0DD
      |__| |__| |__| |______________________________|
      |    |    |                 |
      |    |    |           MICRO INSTRUCTIONS
      |    |    |
      |    |    CONTROL STORE ADDRESS OF THE FIRST INSTRUCTION
      |    |    IN THE INSTRUCTION STRING
      |    |
      |    END LOADER PATCH ADDRESS (LAST BYTE OF PATCH)
      |
      START LOADER PATCH ADDRESS  (FIRST BYTE OF PATCH)
```

6.4 ENTERING PATCHES

PATCHING IS ACCOMPLISHED BY USING DISK EDITOR SECTION DD6.

6.4.1 CALL IN DISK EDITOR DD6, AND FOLLOW PROCEDURE OUTLINED IN USER GUIDE BLOCK 94 FOR '$REP' CONTROL RECORDS.

6.4.2 ENTER '$REP28C'

6.4.3 ENTER PATCH ACCORDING TO THE FOLLOWING FORMAT:

```
R PPPP CCCC,NN,IIII,IIII,IIII,IIII,...........,IIII
  |__| |__| |  |___________________________________|
  |    |    |                  |
  |    |    |        MICRO INSTRUCTIONS (NO MORE THAN 29
  |    |    |        INSTRUCTIONS, COMMAS OPTIONAL)
  |    |    |
  |    |    NUMBER, IN DECIMAL, OF MICRO INSTRUCTIONS TO BE ENTERED
  |    |    (FROM 00 THROUGH 29)
  |    |
  |    CONTROL STORE ADDRESS WHERE FIRST MICRO INSTRUCTION
  |    IS TO BE PATCHED
  |
  ADDRESS WHERE PATCH IS TO EXIST IN SEC 28C PATCH AREA. VALID ADDRESSES ARE 7000 THROUGH 70FF. IF
  THERE ARE NO CURRENT PATCHES, ENTER 7000. OTHERWISE, USE PATCH MESSAGE TO DETERMINE THE NEXT PATCH
  ADDRESS. IN EXAMPLE GIVEN IN 6.3.1 ABOVE, CURRENT PATCH ENDS AT ADDRESS 701D, AND THE NEXT PATCH
  SHOULD BEGIN AT 701E. EACH BYTE (TWO CHARACTERS) ENTERED, EXCLUDING COMMAS, OCCUPIES ONE BYTE IN THE
  PATCH AREA. TO DETERMINE THE START PATCH ADDRESS OF SUBSEQUENT 'R' RECRDS, COUNT EACH BYTE ENTERED,
  INCLUDING ONE BYTE FOR THE 'NN' ENTRY.
```

6.4.4 PATCHES CAN BE CONCATENATED IN THE FOLLOWING MANNER:

```
R 7000 CCCC,04,1111,2222,3333,4444,CCCC,02,1111,2222,CCCC,01,1111
  |__| |__|  |_________________|  |__|  |_______|  |__|  |__|
  |     CS ADDRESS     |        CS ADDRESS  |     CS ADDRESS  |
  |           4 INSTRUCTIONS      2 INSTRUCTIONS              |
  START OF PATCH                             1 INSTRUCTION
```

IN THIS EXAMPLE, THE PATCH WILL BE ENTERED STARTING AT ADDRESS 7000 AND END AT ADDRESS 7016. NEXT 'R' RECORD START PATCH ADDRESS SHOULD BE 7017.

6.5 ID/EC/PATCH FIELD

6.5.1 THE FOLLOWING ID/EC/PATCH FIELD IS INSERTED INTO THE BSCC FUNCTIONAL MICROCODE FB0 AT CONTROL STORE ADDRESSES '0F36' THROUGH '0F3B' BY SECTION 28C AFTER LOADING FB0 INTO MAIN STORE:

```
FB0LEEEEEEEP
|_|||_____||
 | | |     P = '0' IF MICROCODE WAS NOT PATCHED
 | | |     P = 'F' IF MICROCODE WAS PATCHED.
 | | SEVEN CHARACTER EC NUMBER (LEFT JUSTIFIED).
 | LEVEL OF FB0.
 MICROCODE IDENTIFICATION 'FB0'.
```

6.6 ERROR MESSAGES

ERROR MESSAGE	EXPLANATION
FB0 END RECORD NOT FOUND	WHEN FB0 IS FOUND ON THE CE DATA MODULE, THE SEQUENCE NUMBER FOR THE LAST RECORD IN FB0 IS SAVED FROM THE HEADER RECORD. IF THE NUMBER OF RECORDS READ IN BY 28C EXCEEDS THE SAVED VALUE, THIS MESSAGE IS PRINTED.
WRITE CONTROL STORE OPERATION FAILED FOUR TIMES	AFTER FB0 IS LOADED INTO MAIN STORE AND THE UDT DATA AND CHECKSUM DATA IS INSERTED, FOUR ATTEMPTS TO PERFORM THE IMPL (INITIAL MICRO PROGRAM LOAD) SEQUENCE ARE MADE IF ALL FOUR ATTEMPTS FAIL, THIS MESSAGE IS PRINTED.

7.0 DIAGNOSTIC SECTION 28E - TERMINAL STATISTICS

7.1 SUMMARY

DIAGNOSTIC SECTION 28E DUMPS THE TERMINAL STATISTICS ACCUMULATED ON A CUSTOMER SYSTEM PACK. THE TERMINAL STATISTICS ARE WRITTEN IN A FILE NAMED 'MLTERFIL', AND THE LOCATION OF THIS FILE IS ENTERED IN THE VOLUME TABLE OF CONTENTS (VTOC). SINCE IT IS POSSIBLE TO IPL FROM EITHER DRIVE 1 OR DRIVE 3 ON A 5415 MODEL D WITH 3344'S ATTACHED, THERE ARE FOUR POSSIBLE SIMULATION AREAS WHERE VTOC CAN BE LOCATED.

7.2 OPERATION OF SECTION 28E

7.2.1 CALL IN SECTION 28E.

7.2.2 SENSE SWITCHES (TO BE TURNED ON BEFORE RESETTING 'HA' HALT).

SSW 25 - PREVENT CLEARING OF TERMINAL STATISTICS AFTER PRINTOUT.

7.2.3 AT THE 'E1' HALT, SECTION 28E IS READY FOR OPERATOR INPUT. ENTER THE DESIRED VALUES IN THE FOLLOWING DISPLAY WRITTEN ON THE CONSOLE CRT, AND PRESS THE 'ENTER' KEY. IF ALL THE ENTRIES ARE VALID, THE DISPLAY IS RE-WRITTEN TO ALLOW FOR ANY CHANGES. IF THERE ARE NO CHANGES, PRESS THE 'ENTER' KEY AGAIN TO START THE TEST.

```
 ----------------------------------------
|     ** BSCC TERMINAL STATISTICS **     |
|                                        |
|        DRIVE: _         AREA: _        |
|                                        |
|1. ENTER DRIVE WHERE TERMINAL STATISTICS|
|   LOCATED. DRIVE = 1, OR 3 (IF 3344).  |
|2. IF DRIVE ENTERED = 1, PLACE SYSTEM   |
|   PACK ON DRIVE 2 AND MAKE IT READY.   |
|3. IF DRIVE ENTERED = 3, MAKE DRIVE 3   |
|   READY.                               |
|4. ENTER SIMULATED AREA 'F' OR 'R'.     |
|5. PRESS 'ENTER' ON KEYBOARD.           |
 ----------------------------------------
```

VALID 'DRIVE' ENTRIES ARE '1', OR '3' IF 3344'S ARE ATTACHED. DRIVE '3' IS CONSIDERED AN INVALID ENTRY IF OPTION '2' IS NOT PROPERLY DEFINED IN THE 'CPU' RECORD, IF DRIVE '4' IS NOT PROPERLY DEFINED IN THE 'UDT' RECORD, OR IF A DIAGNOSTIC SENSE TO DRIVE 3 INDICATES THAT 3344'S ARE NOT INSTALLED. REFER TO USER GUIDE BLOCK 010 FOR 'CPU' AND 'UDT' RECORD FORMATS.

VALID 'AREA' ENTRIES ARE 'F', OR 'R'.

INVALID ENTRIES CAUSE THE DISPLAY TO BE RE-WRITTEN WITH A MESSAGE INDICATING AN INVALID ENTRY, AND THE CURSOR IS POSITIONED AT THAT ENTRY.

7.2.4 AT THIS TIME, SECTION 28E READS THE VOLUME LABEL TO FIND THE ADDRESS OF VTOC, ACCESSES VTOC AND SEARCHES THROUGH IT FOR THE LOCATION OF THE 'MLTERFIL' FILE. WHEN THE FILE IS FOUND, THE DATA CONTAINED IN THE FILE IS PRINTED, AND THE FILE IS CLEARED IF SENSE SWITCH 25 IS NOT ON.

DATA FOR LINE 1, IF ANY, IS ALWAYS PRINTED. DATA FOR LINE 2, IF ANY, IS PRINTED ONLY IF LINE 2 IS PROPERLY DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10.

7.2.5 SAMPLE PRINTOUT:

```
*------ BSCC LINE 1 TERMINAL STATISTICS ------*

TERMINAL          UNSUCCESSFUL     SUCCESSFUL
ADDRESS          I/O OPERATIONS  I/O OPERATIONS

4040C1C1                 1               9
4040C2C2               256            4096
4040C3C3              4096           65536
4040C4C4             65535      4294967295

TERMINAL STATISTICS DUMP COMPLETE


*------ BSCC LINE 2 TERMINAL STATISTICS ------*

TERMINAL          UNSUCCESSFUL     SUCCESSFUL
ADDRESS          I/O OPERATIONS  I/O OPERATIONS

TERMINAL STATISTICS DUMP COMPLETE
```

7.2.6 TERMINAL UNSUCCESSFUL I/O OPERATIONS ARE DECIMAL NUMBERS FROM 0 THROUGH 65,535 (HEX 'FFFF').

TERMINAL SUCCESSFUL I/O OPERATIONS ARE DECIMAL NUMBERS FROM 0 THROUGH 4,294,967,295 (HEX 'FFFFFFFF').

7.2.7 IF NO ERRORS ARE ENCOUNTERED, SECTION 28E TERMINATES WITH A HALT 'HE'.

7.3 ERROR MESSAGES AND ERROR CODES

7.3.1 ERROR MESSAGE FORMAT

```
ERROR  28E-XX   XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
           |    |___________________________|
           |                 |
           |                 DESCRIPTION OF THE ERROR.
           |
           ERROR CODE ASSIGNED TO
           THE TYPE OF ERROR.
```

7.3.2 ERROR CODES

ERROR CODE	DESCRIPTION FIELD	EXPLANATION OF ERROR
01	INVALID CYLINDER ADDRESS	CYLINDER ADDRESS (5444 FORMAT) READ FROM CUSTOMER DATA MODULE IS INVALID AND CANNOT BE CONVERTED TO 3340 FORMAT. THE ACTUAL CYL/SEC ADDRESS IS PRINTED IN THE MESSAGE.
02	INVALID SECTOR ADDRESS	SECTORADDRESS (5444 FORMAT) READ FROM CUSTOMER DATA MODULE IS INVALID AND CANNOT BE CONVERTED TO 3340 FORMAT. THE ACTUAL CYL/SEC ADDRESS IS PRINTED IN THE MESSAGE.
03	FILE MLTERFIL NOT IN VTOC	THE FILE NAMED 'MLTERFIL' WHICH CONTAINS THE BSCC TERMINAL STATISTICS, CANNOT BE LOCATED IN THE VTOC (VOLUME TABLE OF CONTENTS) ON THE CUSTOMER DATA MODULE.
04	3277 CRT NOT READY	WRITING TO THE CONSOLE CRT RESULTED IN A 'NOT READY' OR ERROR.
06	3340 DISK ERROR	A 'TIO' DETECTED A 'NOT READY/UNIT CHECK' CONDITION DURING A 3340 READ OR WRITE OPERATION. THE 24 BYTE DIAGNOSTIC SENSE BYTE DATA ITED IN THE MESSAGE.

8.0 DIAGNOSTIC SECTION 28F - SYSTEM TEST MODULE

8.1 SUMMARY

DIAGNOSTIC SECTION 28F PERFORMS A DATA WRAP ON BSCC LINE 1 AND ALSO LINE 2, IF LINE 2 IS INSTALLED AND PROPERLY DEFINED IN THE UDT (UNIT DEFINITION TABLE) ACCORDING TO USER GUIDE BLOCK 10. IN THE FOLLOWING DESCRIPTION, TWO LINES ARE ASSUMED.

A BYTE OF DATA IS PLACED IN A TRANSMIT/RECEIVE BUFFER FOR EACH LINE, AND A DIAGNOSTIC SIO IS ISSUED TO THE BSCC ATTACHMENT FOR EACH LINE. FUNCTIONAL MICROCODE FB0 RESPONDS TO THE SIO'S BY WRAPPING THE DATA THROUGH THE SIGNAL CONVERTER CARD, AND BACK INTO THE BUFFER 256 TIMES. WHEN THE WRAP IS COMPLETE, AN OP-END INTERRUPT IS CAUSED FOR THAT LINE.

SECTION 28F, RUNNING IN INTERRUPT MODE, RECEIVES THE INTERRUPT. THE RECEIVED DATA IS SCANNED FOR EIGHT CONSECUTIVE BYTES OF '00' OR 'FF'. IF NONE ARE FOUND, THE DATA IS CONSIDERED ACCEPTABLE, AND ANOTHER SIO IS ISSUED TO THE LINE THAT JUST INTERRUPTED.

ERROR HALTS:
01 - ERROR DETECTED BY FUNCTIONAL MICROCODE
02 - UNEXPECTED INTERRUPT OCCURRED
03 - RECEIVED DATA UNACCEPTABLE (8 CONSECUTIVE BYTES OF ALL 'ZEROS' OR 'ONES' FOUND)
04 - NOT READY/UNIT CHECK DETECTED AT START OF TEST (POSSIBLY FB0 NOT LOADED)
05 - NOT READY/UNIT CHECK DETECTED AFTER START OF TEST

8.2 OPERATION OF SECTION 28F AS A STAND-ALONE DIAGNOSTIC

8.2.1 CALL IN SECTION 28F AND RESET THE 'HA' HALT.

8.2.2 AT THIS TIME, THE SECTION PREFACE IS EXAMINED TO DETERMINE WHETHER FUNCTIONAL MICROCODE FB0 HAS BEEN LOADED INTO BSCC CONTROL STORE. IF IT HAS NOT, SECTION 28C IS CALLED IN, WHICH CALLS IN FB0 AND LOADS IT INTO CONTROL STORE. WHEN THIS IS ACCOMPLISHED, THE SECTION PREFACE IS ALTERED TO INDICATE THE ACTION, AND FB0 IS NOT LOADED AGAIN.

8.2.3 SECTION 28F BEGINS BY EXAMINING THE UDT ENTRY TO DETERMINE WHETHER LINE 2 IS INSTALLED. IF IT IS NOT, THE I/O INSTRUCTIONS TO LINE 2 ARE DISABLED, AND THE TEST PROCEEDS USING ONLY LINE 1.

8.2.4 AFTER ISSUEING THE SIO'S, 28F WAITS IN AN IDLE LOOP FOR AN INTERRUPT. IF AN INTERRUPT IS RECEIVED, THE INTERRUPTING LINE IS DETERMINED. IF ANY ERRORS ARE DETECTED, AN APPROPRIATE HALT WILL OCCUR. IF NO ERRORS ARE DETECTED, ANOTHER SIO IS ISSUED TO THAT LINE, AND 28F GOES BACK INTO THE IDLE LOOP.

8.3 OPERATION OF SECTION 28F UNDER SUPERVISOR

8.3.1 BEFORE CALLING IN THE SYSTEM TEST LOADER FF1, BE SURE THAT THE BSCC FUNCTIONAL MICROCODE FB0 IS LOADED INTO CONTROL STORE. THEN CALL IN SECTION FF1 AND EXECUTE AS DESCRIBED IN USER GUIDE BLOCK 11.

8.3.2 SECTION 28F BEGINS BY EXAMINING THE UDT ENTRY TO DETERMINE WHETHER LINE 2 IS INSTALLED. IF IT IS NOT, THE I/O INSTRUCTIONS TO LINE 2 ARE DISABLED, AND THE TEST PROCEEDS USING ONLY LINE 1.

8.3.3 AFTER ISSUEING THE SIO'S, 28F RETURNS TO THE SUPERVISOR. IF AN INTERRUPT IS RECEIVED, THE INTERRUPTING LINE IS DETERMINED. IF ANY ERRORS ARE DETECTED, AN APPROPRIATE HALT WILL OCCUR. IF NO ERRORS ARE DETECTED, ANOTHER SIO IS ISSUED TO THAT LINE, ANY 28F RETURNS TO THE SUPERVISOR.

8.3.4 A HALT '04' INDICATES THAT A NOT READY/UNIT CHECK CONDITION EXISTS. THIS HALT OCCURS ONLY AT THE START OF THE TEST, AND IS PROBABLY BECAUSE THE FUNCTIONAL MICROCODE HAS NOT BEEN LOADED PROPERLY. RESETTING THE HALT CAUSES THE SUPERVISOR TO BYPASS THIS MODULE, AND CONTINUE EXECUTING THE REMAINING MODULES THAT HAVE BEEN LOADED.

8.3.5 REFER TO USER GUIDE BLOCK 11 FOR ADDITIONAL INFORMATION.

8.4 CE TRACE DUMP

8.4.1 TO DUMP THE CONTENTS OF THE CE TRACE BUFFER, CALL IN ANY DIAGNOSTIC SECTION 284, 289, OR 28A AND TURN ON SENSE SWITCH 10 AND 24 BEFORE RESETTING THE 'HA' HALT. REFER TO 4.0 OR 5.0 FOR ADDITIONAL INFORMATION ON THE CE TRACE DUMP.

9.0 DIAGNOSTIC MICROCODE FD1

9.1 SUMMARY

DIAGNOSTIC MICROCODE FD1 IS A CONCATENATION OF A SERIES OF MICROCODE SUBSECTIONS. FD1 IS NOT DIRECTLY EXECUTABLE, BUT MUST BE RUN UNDER THE SUPERVISION OF SECTION 281.

EACH SUBSECTION CONSISTS OF A HEADER RECORD, TEXT RECORDS, AND AN END RECORD. AS SECTION 281 IS EXECUTING, IT CALLS IN FD1 AND SEARCHES FOR A REQUIRED SUBSECTION HEADER. WHEN FOUND, THE TEXT RECORDS THAT FOLLOW ARE MOVED INTO A BUFFER IN CPU MAIN STORE. WHEN THE END RECORD IS READ, THE MICROCODE IS LOADED INTO THE BSCC CONTROL STORE BY THE IMPL (INITIAL MICRO-PROGRAM LOAD) SEQUENCE.

WHEN THE SUBSECTION HAS EXECUTED, IT INDICATES TO THE S/3 CPU WHETHER OR NOT THE TEST WAS SUCCESSFUL. IF NO ERROR OCCURRED, THE NEXT SUBSECTION IS LOADED. IF AN ERROR OCCURRED, A MESSAGE IS PRINTED, AND THEN THE NEXT SUBSECTION IS LOADED.

9.2 SUBSECTIONS

SUBSECTION	NAME	ROUTINE	TEST
000	FD1CHAN1	03	01 - 04
001	FD1TC041	04	01
002	FD1TC042	04	02
003	FD1TC043	04	03
004	FD1TC044	04	04
005	FD1TC045	04	05
006	FD1TC046	04	06
007	FD1TC051	04	07
008	FD1TC052	04	08
009	FD1TC058	04	09
010	FD1TC059	04	10
011	FD1TC05A	04	11
012	FD1TC05B	04	12
013	FD1TC05C	04	13
014	FD1TC05D	04	14
015	FD1TC05E	04	15
016	FD1TC05F	04	16
017	FD1TC060	04	17
018	FD1TC061	04	18
019	FD1TC062	04	19
020	FD1TC063	04	20
021	FD1TC064	04	21
022	FD1TC065	04	22
023	FD1TC066	04	23
024	FD1TC067	04	24
025	FD1TC068	04	25
026	FD1TC069	04	26
027	FD1TC06A	04	27
028	FD1TC06B	04	28
029	FD1TC06C	04	29
030	FD1RG001	04	30
031	FD1RG002	04	31
032	FD1RG003	04	32
033	FD1RG004	04	33

SUBSECTION	NAME	ROUTINE	TEST
040	FD1DMP0	05	01 - 03
041	FD1DMP1	05	01 - 03
042	FD1DMP2	05	01 - 03
043	FD1DMP3	05	01 - 03
044	FD1DMP4	05	01 - 03
045	FD1DMP5	05	01 - 03
047	FD1CHAN2	06	01 - 20
048	FD1PCI	07	01 - 06
050	FD1AC001	08	01
051	FD1AC003	08	02
052	FD10A001	08	03
053	FD10A005	08	04
054	FD1AC005	08	05
055	FD10C001	08	06
056	FD1AC009	08	07
057	FD1AC00B	08	08
058	FD10A003	08	09
059	FD1AC002	08	10
060	FD1AC004	08	11
061	FD10A002	08	12
062	FD10A006	08	13
063	FD1AC006	08	14
064	FD1AC00A	08	15
065	FD1AC00C	08	16
066	FD10A004	08	17
080	FD10C002	09	01
081	FD1AC007	09	02
082	FD1AC00D	09	03
083	FD10C003	09	04
084	FD1AC008	09	05
085	FD1AC00E	09	06
086	FD1BAUD1	0A	01
087	FD1BAUD2	0A	02
090	FD1AC00D	0B	01
091	FD1AC00E	0B	02
092	FD1LIGHT	0C	

10.0 DIAGNOSTIC SECTION FD5 - SYSTEM PACK UPDATE

10.1 SUMMARY

DIAGNOSTIC SECTION FD5 IS USED TO LOAD FUNCTIONAL MICROCODE FBO FROM THE CE DISK PACK TO THE CUSTOMER SYSTEM PACK. THE CE DISK PACK IS PLACED ON 3340 DRIVE 1. IF THE CUSTOMER'S SYSTEM IS ON A REMOVABLE DISK PACK, AND IPL (INITIAL PROGRAM LOAD) IS NORMALLY PERFORMED FROM DRIVE 1, THE DISK PACK IS PLACED ON DRIVE 2 AND MADE READY. IF THE CUSTOMER'S SYSTEM IS ON A 3344 HEAD/DISK ASSEMBLY, AND IPL IS NORMALLY PEPFORMED FROM DRIVE 3, DRIVE 3 IS MADE READY.

10.2 OPERATION OF SECTION FD5.

10.2.1 CALL IN SECTION FD5 AND RESET THE 'HA' HALT.

10.2.2 AT THIS TIME, THE SECTION PREFACE IS EXAMINED TO DETERMINE WHETHER FUNCTIONAL MICROCODE FBO HAS BEEN LOADED INTO CPU MAIN STORE. IF IT HAS NOT, SECTION 28C IS CALLED IN, WHICH CALLS IN FBO AND LOADS IT INTO MAIN STORE. SENSE SWITCH 10 IS TURNED ON BY SECTION FD5 TO PREVENT LOADING OF FBO INTO CONTROL STORE.

10.2.3 AT THE 'E1' HALT, SECTION FD5 IS READY FOR OPERATOR INPUT. ENTER THE DESIRED VALUES IN THE FOLLOWING DISPLAY WRITTEN ON THE CONSOLE CRT, AND PRESS THE 'ENTER' KEY. IF THE ENTRIES ARE VALID, THE DISPLAY IS RE-WRITTEN TO ALLOW FOR ANY CHANGES. IF THERE ARE NO CHANGES, PRESS THE 'ENTER' KEY AGAIN TO START THE UPDATE.

```
 ---------------------------------------
|      ** BSCC SYSTEM PACK UPDATE **    |
|                                       |
|  DRIVE: _    AREA: _    FILE: $$BSYD  |
|                                       |
|1. ENTER DRIVE WHERE CUSTOMER IPL IS   |
|   PERFORMED. DRIVE = 1, OR 3 (IF 3344).|
|2. IF DRIVE ENTERED = 1, PLACE SYSTEM  |
|   PACK ON DRIVE 2 AND MAKE IT READY   |
|3. IF DRIVE ENTERED = 3, MAKE DRIVE 3  |
|   READY.                              |
|4. ENTER SIMULATED AREA 'F' OR 'R'.    |
|5. PRESS 'ENTER' ON KEYBOARD.          |
 ---------------------------------------
```

VALID 'DRIVE' ENTRIES ARE '1', OR '3' IF 3344'S ARE ATTACHED. DRIVE '3' IS CONSIDERED AN INVALID ENTRY IF OPTION '2' IS NOT PROPERLY DEFINED IN THE 'CPU' RECORD, IF DRIVE '4' IS NOT PROPERLY DEFINED IN THE 'UDT' RECORD, OR IF A DIAGNOSTIC SENSE TO DRIVE 3 INDICATES THAT 3344'S ARE NOT INSTALLED. REFER TO USER GUIDE BLOCK 010 FOR 'CPU' AND 'UDT' RECORD FORMATS.

VALID 'AREA' ENTRIES ARE 'F' OR 'R'.

ANY SIX CHARACTER FILE NAME CAN BE ENTERED. DEFAULT IS '$$BSYD' IF NOT ALTERED ON THE CRT. WHEN UPDATING THE 'PID' PACK, ENTER THE FILE NAME '$@BYYD'.

INVALID ENTRIES CAUSE THE DISPLAY TO BE RE-WRITTEN WITH A MESSAGE INDICATING AN INVALID ENTRY, AND THE CURSOR IS PLACED AT THAT ENTRY.

10.2.4 THE ADDRESS OF THE OBJECT FILE LIBRARY IS READ. WHEN FOUND, A SEARCH THROUGH THE LIBRARY IS PERFORMED FOR THE OBJECT FILE NAME. WHEN THE FILE NAME IS FOUND, THE ADDRESS OF THE FILE IS ACCESSED, AND THE ENTIRE MAIN STORE BUFFER CONTAINING FBO (MODIFIED BY 28C TO INCLUDE UDT AND CHECKSUM INFORMATION) IS WRITTEN INTO THE FILE.

ADDRESSES READ FROM THE SYSTEM PACK ARE IN 5444 CYLINDER/SECTOR FORMAT, AND ARE CONVERTED TO 3340/3344 CYLINDER/HEAD/RECORD FORMAT BY FD5.

10.2.5 IF THERE WERE NO ERRORS ENCOUNTERED IN THE ABOVE PROCESS, ONE OF THE TWO FOLLOWING MESSAGES WILL BE PRINTED:

BSCC MICROCODE FBO PN 4835417 EC ______ LEVEL _ COPIED TO SYSTEM PACK WITH NO PATCHES

BSCC MICROCODE FBO PN 4835417 EC ______ LEVEL _ COPIED TO SYSTEM PACK WITH PATCHES

10.2.6 SECTION FD5 TERMINATES, AND A HALT 'HE' OCCURS.

10.3 ERROR MESSAGES AND ERROR CODES

10.3.1 ERROR MESSAGE FORMAT

```
ERROR  FD5-XX   XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
            |   |____________________________|
            |                 |
            |                 DESCRIPTION OF THE ERROR.
            |
            ERROR CODE ASSIGNED TO
            THE TYPE OF ERROR.
```

10.3.2 ERROR CODES

ERROR CODE	DESCRIPTION FIELD	EXPLANATION OF ERROR
01	INVALID CYLINDER ADDRESS	CYLINDER ADDRESS (5444 FORMAT) READ FROM CUSTOMER DATA MODULE IS INVALID AND CANNOT BE CONVERTED TO 3340/3344 FORMAT. THE ACTUAL CYC/SEC ADDRESS IS PRINTED IN THE MESSAGE.
02	INVALID SECTOR ADDRESS	SECTOR ADDRESS (5444 FORMAT) READ FROM CUSTOMER DATA MODULE IS INVALID AND CANNOT BE CONVERTED TO 3340/3344 FORMAT. THE ACTUAL CYC/SEC ADDRESS IS PRINTED IN THE MESSAGE.
04	3277 CRT NOT READY	WRITING TO THE CONSOLE CRT RESULTED IN A 'NOT READY' OR ERROR
05	NO OBJECT LIBRARY FOUND	THE VOLUME LABEL IS READ ON THE CUSTOMER DATA MODULE AND THE ENTRY WHERE THE LIBRARY ADDRESS IS TO BE FOUND CONTAINS A HEX 'FF'.
06	3340/3344 DISK ERROR	A 'TIO' DETECT A 'NOT READY/UNIT CHECK' CONDITION DURING A 3340/3344 READ OR WRITE OPERATION. THE 24 BYTE DIAGNOSTIC SENSE BYTE DATA IS PRINTED IN THE MESSAGE.
07	FILE ________ NOT IN LIBRARY	THE ENTERED FILE NAME (DEFAULT '$$BSYD') CANNOT BE FOUND IN THE OBJECT FILE LIBRARY ON THE CUSTOMER DATA MODULE.
08	INSUFFICIENT SPACE FOR FILE	THE SPACE ALLOTTED FOR THE ENTERED FILE NAME IS NOT SUFFICIENT TO CONTAIN THE BSCC FUNCTIONAL MICROCODE.

11.0 I/O INSTRUCTIONS

S/3 INSTRUCTIONS	CODES	DESCRIPTION
SNS	30 2N AAAA	see below
LIO	31 2N AAAA	see below
TIO	C1 2N AAAA	see below
SIO	F3 2N RR	see below

SNS — 30 2N AAAA

THE BSCC 'SNS' INSTRUCTION TRANSFERS THE CONTENTS OF A REGISTER INTO TWO BYTES OF MAIN STORE WHOSE RIGHTMOST (HIGHER NUMBERED) ADDRESS IS 'AAAA'. THE REGISTER TRANSFERRED IS SPECIFIED BY THE FOLLOWING VALUE OF 'N':

VALUE	REGISTER
N=0	FLAG REG/CYCLE STEAL DATA
N=1	S/3-TO-MICRO BUFFER
N=2	MICRO TO SYS/3 BUFFER AND LINE ONE AUTOPOLL BUFFER
N=3	ATTACHMENT STATUS
N=4	CURRENT ADDRESS OR IMPL START ADDRESS
N=5	INVALID
N=6	COMMUNICATIONS LINE STATUS AND LINE 2 AUTOPOLL BUFFER
N=7	INVALID

LIO — 31 2N AAAA

THE BSCC 'LIO' INSTRUCTION PERFORMS A FUNCTION OR LOADS A REGISTER WITH TWO BYTES OF MAIN STORE WHOSE RIGHTMOST (HIGHER NUMBERED) ADDRESS IS' AAAA'. THE FUNCTION PERFORMED OF THE REGISTER LOADED IS SPECIFIED BY THE FOLLOWING VALUE OF 'N':

VALUE	FUNCTION/REGISTER
N=0	INVALID
N=1	IMPL STOP ADDRESS REGISTER
N=2	SELECT LINE 1
N=3	SELECT LINE 2
N=4	CURRENT ADDRESS OR IMPL START ADDRESS REGISTER
N=5	DIAGNOSTIC
N=6	INVALID
N=7	INVALID

TIO — C1 2N AAAA

THE BSCC 'TIO' INSTRUCTION IS ABRANCH ON CONDITION. IF THE CONDITION TESTED BY THE 'Q' CODE IS MET, A BRANCH IS TAKEN TO ADDRESS 'AAAA'. IF THE CONDITION IS NOT MET, THE NEXT SEQUENTIAL INSTRUCTION IS EXCUTED. THE CONDITIONS TESTED ARE SPECIFIED BY THE FOLLOWING VALUES OF 'N':

VALUES	CONDITION
N=0	NOT READY/UNIT CHECK
N=1	OP END INTERRUPT
N=2	S/3-TO-MICRO BUFFER FULL
N=3	INVALID
N=4	INTERRUPT PENDING
N=5	MICRO-TO S/3 BUFFER FULL
N=6	INVALID
N=7	INVALID

SIO — F3 2N RR

THE BSCC 'SIO' INSTRUCTION CONTROLS WHICH TYPE OF OPERATION THE ATTACHMENT IS TO PERFORM. THE TYPE OF OPERATION IS SPECIFIED BY THE FOLLOWING VALUES OF 'N':

VALUE	OPERATION
N=0	CONTROL → 'RR' BYTE (CONTROL)
N=1	RECIEVE
N=2	TRANSMIT/RECIEVE
N=3	RECIEVE INITIAL
N=4	INVALID
N=5	MICRO-CONTROLLER CONTROL → 'RR' BYTE (MICRO-CONTROLLER CONTROL)
N=6	DIAGNOSTIC
N=7	INVALID

'RR' BYTE (CONTROL)

	WHEN BIT 0 = 0	WHEN BIT 0 = 1
BIT 1	ENABLE ATTACHMENT	DISABLE ATTACHMENT
BIT 2	SET MICRO RESET	DISABLE SINGLE CYCLE
BIT 4	IMPL	
BIT 5	NOT USED	
BIT 6	LOAD MICRO-TO-S/3 BUF	RESET INTERRUPT PEND
BIT 7	ENABLE INTERRUPTS	DISABLE INTERRUPTS

'RR' BYTE (MICRO-CONTROLLER CONTROL)

	WHEN BIT 0 = 0	WHEN BIT 0 = 1
BIT 1	SET TEST MODE	RESET TEST MODE
BIT 2	NOT USED	STOP POLLING
BIT 3	NOT USED	NOT USED
BIT 4	NOT USED	NOT USED
BIT 5	START CE TRACE	DISABLE CE TRACE
BIT 6	NOT USED	CANCEL LINE SELECTED
BIT 7	START 2 SEC TIMER	CANCEL 2 SEC TIMER

12.0 SENSE BYTE DATA

SENSE REGISTER	BIT		EB1
FLAG REG/CYCLE STEAL DATA (DIAGNOSTIC USE ONLY)	0	MICRO BUFFER FULL	CYCLE
	1	CHANNEL BUFFER FULL	STEAL
	2	MICRO CYCLE STEAL BUFF ER FULL	DATA
	3	'SIO' TAG	BYTE
	4	'LIO' TAG	LOADED
	5	'N' REG BIT 5	DURING
	6	'N' REG BIT 6	FETCH
	7	'N' REG BIT 7	CYCLE
	0	HIGH	LOW
	1	ORDER	ORDER
	2	S/3-TO-MICRO	S/3
	3	BUFFER	-TO-
	4	DATA	MICRO
	5	BYTE	BUFFER
	6	OR I-R	DATA
	7	BYTE	BYTE
MICRO-TO-S/3 BUFFER	0	MICRO	LINE 1
	1	-TO-	AUTO
	2	S/3	POLL
	3	BUFFER	BUFFER
	4	DATA	(VALID ONLY WHEN MICRO
	5	BYT	IS STOPPED AS RESULT
	6		OF MICRO DETECTED
	7		ERROR)
ATTACHMENT STATUS	0	NO OP	IMPL BLOCK COMPLETE
	1	ATTACHMENT NOT ENABLED	MICRO ERROR
	2	INTERRUPTS NOT ENABLED	MICRO START CLOCK
	3	I/O CYCLE REQUEST	MICRO RESET
	4	I/O ATTENTION FOR LINE 1	MICRO WAIT
	5	I/O ATTENTION FOR LINE 2	MICRO SINGLE CYCLE
	6	I/O CYCLE	IMPL LATCH SET
	7	I/O WORKING	NOT USED
CURRENT ADDRESS REGISTER	0	HIGH	LOW
	1	ORDER	ORDER
	2	OF	OF
	3	CPU	CPU
	4	I/O	I/O
	5	LSR	LSR
	6	BYTE	BYTE
	7		
COMMUNICATION LINES STATUS	0	LINE 2	LINE 1 BUSY
	1	AUTO	LINE 2 BUSY
	2	POLL	LINE 1 OP END INTERRUPT
	3	BUFFER	LINE 2 OP END INTERRUPT
	4	(VALID ONLY WHEN MICRO	LINE 1 SELECTED BY S/3
	5	IS STOPPED AS RESULT	LINE 2 SELECTED BY S/3
	6	OF MICRO DETECTED	NOT USED
	7	ERROR)	NOT USED

13.0 BSCC STATUS

STATUS BYTES	EXPLANATION
0002	NORMAL, NO MICROCODE DETECTED ERRORS.
0003	MAIN STORE DATA OVERRUN DURING AUTOPOLL. CAUSED BY CAR = SAR DURING TRANSFER OF AUTOPOLL BUFFER TO S/3. IF ANOTHER ERROR OCCURS ALONG WITH MAIN STORE DATA OVERRUN, THE TWO ERRORS WILL BE OR'ED TOGETHER.
000A	'DTR' NOT ON AS EXPECTED AFTER 'SIO' IS DECODED.
0010	'DSR' NOT ON AS EXPECTED AFTER 'SIO' IS DECODED.
001A	INVALID 'N' CODE FOR BSCC 'SIO'. HARDWARE DID NOT POST INVALID 'Q' PROCESSOR CHECK.
002A	INVALID 'BSR CONDITION. BOTH 'XMIT AND RECIEVE FLAGS ARE ON.
0032	INVALID 'BSR' CONDITION. 'DLE 2' IS ON AND 'CSBY1'IS OFF.
003A	INVALID 'BSR' CONDITION. BOTH 'XMIT' AND 'REC' FLAGS ARE OFF.
0042	INVALID XMIT STATE. CAR = TAR , BUT NO 'COD' FROM SYS/3.
004A	INVALID STATE OF 'CS BYTE1' AND 'CS BYTE2' BUFFERS DURING TRANSMIT.
0052	INVALID STATE OF 'CS BYTE1' AND 'CS BYTE2' BUFFERS DURING RECIEVE.
005A	INVALID RECIEVE CONDITION. CAR = SAR, BUT NO 'COD' OR 'ITB' RECIEVED FROM THE LINE.
0072	INVALID AUTOPOLL MESSAGE FORMAT. MISSING SECOND '8F'.
007A	256 BYTE AUTOPOLL BUFFER FULL. NO 'ETB' OR 'ETX' RECIEVED
0082	256 BYTE AUTOPOLL LIST BUFFER FULL. NO 'ENQ' FROM S/3.
008A	NOT ASSIGNED.
0092	NOT ASSIGNED.
009A	BSCC LINE ERROR. 'DTR' NOT ON AS EXPECTED DURING TRANSMIT SETUP.
00A8	BSCC LINE ERROR. 'DSR' NOT ON AS EXPECTED DURIND TRANSMIT SETUP.
00B2	BSCC LINE ERROR. 'RTS' NOT ON AS EXPECTED DURING TRANSMIT SETUP.
00BA	BSCCATTACHMENT ERROR. TRANSMIT MODE NOT ON AS EXPECTED.
00C2	INVALID ENTRY FLAG BIT ON. 'LIO' AND 'SIO' TAGS ARE OFF.
00CA	INVALID I/O INSTRUCTION ISSUED. 1. 'LIO' CAR (N=4) ISSUED AND LINE IS ALREADY BUSY. 2. 'SIO' ISSUED BUT 'SIO' IS ALREADY IN PROGRESS ('PEND' ON). 3. 'SIO' (N=1,2,3,6) ISSUED WITHOUT PREREQUISITE OF 'LIO' CAR. 4. 'SIO' (N=1,2,3,6) ISSUED AND LINE IS ALREADYBUSY.
00D2	INVALID 'I-R' BYTE FOR MICRO- CONTROLLER 'SIO' (N=5).
00DA	RECIEVE DATA CHECK. 'ETB' OR 'ETX' RECIVED FROM LINE WITHOUT 'STX' OR 'SOH'. INHIBIT BCC/LRC CHECK.
00E2	INVALID 'I-R' BYTE FOR DIAGNOSTIC 'SIO' (N=6).
00EA	INVALID CONTROL WORD IN AUTOPOLL ROUTINE. 1. 'APCD' - CONTROL WORD INVALID 2. 'DAR1' INCORRECT WHEN ENTRY INTO AUTOPOLL ROUTINE. 3. INITIAL AUTOPOLL ENTRY CONTROL CYCLE LOOP NUMBER (##) WAS '00'. ONLY '01' THROUGH 'FF' ARE VALID. 4. 'SIO' (N=1,2,3,6) ISSUED AND LINE IS ALREADY BUSY>
00FA	RECIEVED ASCII VRC WITHOUT LRC ERROR (EVEN PARITY). BAD PARITY FROM THE LINE.
0802	INVALID ASCII CHARACTER RECIEVED FROM SYS/3 FOR TRANSMIT.
1002	ADAPTER CHECK IN RECIEVE. HARDWARE CAUSED OVERRUN.
1062	ADAPTER CHECK IN RECIEVE. TIME OUT ON STORE CYCLE STEAL REQUEST TO S/3.
10A2	ADAPTER CHECK IN RECIEVE. MICROCDE CAUSED BY NOT FETCHING DATA FROM CS BYTE 1 AND 2 BUFFERS.
2022	ADAPTER CHECK IN TRANSMIT. TIME OUT ON FETCH CYCLESTEAL REQUEST TO S/3.
20F2	ADAPTER CHECK IN TRANSMIT. (3) 1 SEC. TIMEOUT FOR: 1. NO DATA CLOCKED OUT OF SERDES. 2. NO DATA IN CS BYTE 1 AND 2 BUFFERS TO TRANSMIT.
2122	LINE WRAP FAILURE. SEE STATUS '2022'.
4002	RECIEVED B/CCLRC DATA CHECK. DATA FROM THE LINE IS BAD.
40FA	RECIEVED ASCII LRC AND VRC ERROR (EVEN PARITY).
806A	TIME OUT DURING 'SIO' TRANSMIT SETUP WAITING FOR 'CTS'.
80A2	TIME OUT DURING AUTOPOLL RECIEVE.
80F2	TIME OUT DURING RECIEVE BUT NOT AUTOPOLL.
816A	LINE WRAP TEST FAILURE. SEE STATUS '806A'.
81F2	LINE WRAP TEST FAILURE. SEE STATUS '80F2'.
X1YY	LINE WRAP TEST FAILURE. IF ANOTHER ERROR OCURRS ALONG WITH LINE WRAP FAILURE, THE TWO ERRORS WILL BE OR'ED TOGETHER. FOR FURTHER DEFINITION OF THE 'X' AND 'YY', REFER TO THE BSCC FREE LANCE MAP CHART.

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1. SUMMARY OF DIAGNOSTIC SECTIONS FOR 3741.

SECTION	ROUTINES	SPECIAL SWITCH OPTIONS
401 - BASIC FUNCTION TEST. NO DIAGNOSTIC CONNECTOR.	01 - THE 3741 IS TESTED FOR BEING NOT READY. -NOTE- 3741 WILL BE READY IF THE DIAGNOSTIC CONNECTOR IS ON.	10
	02 - THE 3741 IS TESTED FOR BEING NOT BUSY.	10
	*03 - THE STATUS BYTE AND LENGTH COUNT REGISTER ARE SENSED AND CHECKED FOR AN -8000- PATTERN.	10
	04 - THE I/O TRANSFER LINES ARE SENSED FOR AN -0000- PATTERN (NO DIAGNOSTIC CONNECTOR ATTACHED).	10
	*05 - THE DIAGNOSTIC BYTE IS SENSED FOR AN -00- PATTERN.	10
	*** - ROUTINES 03 AND 05 ARE BYPASSED IF SWITCH OPTION 0 (LOOP ON SECTION) IS ON. THESE ROUTINES ARE ONLY VALID AFTER AN INITIAL SYSTEM RESET.	
	06 - LOAD AND SENSE ALL REGISTERS TO INSURE TRANSMISSION OF SOME DATA DURING EB1 AND EB2 CYCLES.	10
	07 - LOAD THE FUNCTION REGISTER WITH AN -AA55- TEST PATTERN AND SENSE FOR THE SAME DATA.	10
	08 - LOAD THE FUNCTION REGISTER WITH AN -55AA- TEST PATTERN AND SENSE FOR THE SAME DATA.	10
	09 - LOAD THE LENGTH COUNT REGISTER WITH AN -55- TEST PATTERN AND SENSE THE STATUS BYTE/LENGTH COUNT FOR AN -8055- PATTERN.	10
	0A - LOAD THE LENGTH COUNT REGISTER WITH AN -AA- TEST PATTERN AND SENSE THE STATUS BYTE/LENGTH COUNT FOR AN -80AA- PATTERN.	10
	0B - LOAD THE DATA ADDRESS REGISTER WITH EVEN TEST PATTERNS, -55AA- AND -AA55-.	10
	0C - LOAD THE DATA ADDRESS REGISTER WITH ODD TEST PATTERNS -1000- AND -0001-.	10
	0D - LOAD THE DATA TRANSFER REGISTER WITH AN -55- TEST PATTERN AND SENSE THE DIAGNOSTIC BYTE/DATA TRANSFER REGISTER FOR AN -0055-.	10
	0E - LOAD THE DATA TRANSFER REGISTER WITH AN -AA- TEST PATTERN AND SENSE THE DIAGNOSTIC BYTE/DATA TRANSFER REGISTER FOR AN -00AA-.	10
	0F - DO A START I/O COMMAND TO ENABLE 3741 INTERUPTS AND SENSE THE DIAGNOSTIC BYTE FOR BIT 3 - INTERUPT ENABLED.	10
	10 - DO A START I/O COMMAND TO ENABLE 3741 INTERUPTS FOLLOWED BY A START I/O COMMAND TO RESET THE INTERUPT ABILITY. THE DIAGNOSTIC BYTE IS SENSED TO BE SURE THAT BIT 3 - INTERUPT ENABLED IS OFF.	10
	11 - WHILE IN A DIAGNOSTIC MODE A START I/O READ CALL COMMAND IS ISSUED AND THE DIAGNOSTIC BYTE IS SENSED FOR BITS 6,7 - READ CALL AND I/O SELECTED TO BE ON.	10
	12 - WHILE IN A DIAGNOSTIC MODE A START I/O WRITE CALL COMMAND IS ISSUED AND THE DIAGNOSTIC BYTE IS SENSED FOR BITS 5,7 - WRITE CALL AND I/O SELECTED TO BE ON.	10
	13 - A START I/O CONTROL 1 COMMAND IS ISSUED JUST TO BE SURE THAT IT WILL BE ACCEPTED.	10
	14 - A START I/O CONTROL 2 COMMAND IS ISSUED JUST TO BE SURE THAT IT WILL BE ACCEPTED.	10
	15 - A START I/O READ CALL IS ISSUED WHILE THE 3741 IS -NOT- IN A DIAGNOSTIC MODE AND THE STATUS BYTE IS SENSED FOR BIT 5 - COMMAND NO-OP'ED TO BE SET AND THEN RESET.	10
	*16 - ALL INVALID N CODES OF ALL COMMANDS (15) ARE ISSUED TO THE 3741 TO INSURE THAT PROCESS CHECK COMES ON.	
	*** - THIS ROUTINE MUST BE DIALED IN THROUGH DCP SSW -F216-.	
402 - ATTACHMENT FUNCTION TEST. WITH DIAGNOSTIC CONNECTOR.	01 - THE I/O TRANSFER LINES ARE SENSED FOR AN -F900-. THE -F9- IS THE DIAGNOSTIC CONNECTOR ID AND SAYS THAT THE CONNECTOR IS IN PLACE.	10
	02 - THE DATA TRANSFER REGISTER IS LOADED WITH AN -AA- TEST PATTERN WHICH WRAPS AROUND TO THE I/O TRANSFER LINES. THE I/O TRANSFER LINES ARE THEN SENSED FOR AN -F9AA- PATTERN.	10
	03 - THE DATA TRANSFER REGISTER IS LOADED WITH AN -55- TEST PATTERN WHICH WRAPS AROUND TO THE I/O TRANSFER LINES. THE I/O TRANSFER LINES ARE THEN SENSED FOR AN -FD55- PATTERN. THE I/O TRANSFER LINES ARE THEN RESET AND SENSED FOR AN -F900- PATTERN.	10
	04 - THE READ CALL, WRITE CALL AND I/O SELECT DRIVERS ARE ACTIVATED AND THE I/O TRANSFER LINES ARE SENSED TO CHECK THE DRIVERS WHICH ARE WRAPPED INTO THE I/O TRANSFER LINES.	10
	05 - I/O DISCONNECT IS CHECKED BY ISSUING A CONTROL 1 START I/O. I/O 2 SELECT WRAPS AROUND TO GENERATE AN EOT SIGNAL CAUSING AN I/O DISCONNECT.	10
	06 - START I/O CONTROL 1 COMMAND WITH I/O SELECT 3 ON IS ISSUED AND THE SIGNAL WRAPS AROUND TO ACTIVATE I/O DISCONNECT. THE RESULT IS CHECKED BY SENSING BIT 3 -I/O DISCONNECT OF THE DIAGNOSTC BYTE.	10
	07 - I/O TRANSFER LINES 1 & 3 ARE TESTED FOR RESETTING. THE I/O TRANSFER LINES ARE SET BY A PATTERN LOADED THROUGH THE DATA TRANSFER REGISTER AND RESET BY I/O SELECT 5 OF A START I/O CONTROL 1 COMMAND.	10
	08 - I/O TRANSFER LINES 4, 6, 7 ARE TESTED FOR RESETTING BY ISSUING AN I/O SELECT 5 VIA A CONTROL 1 START I/O.	10
	09 - TEST ABILITY OF READ AND WRITE CALL COMMANDS TO RESET TRANSFER LINES 3, 4.	10
	0A - TEST ABILITY OF I/O TRANSFER LINES 3, 5 TO RESET THE I/O DISCONNECT LATCH.	10
	0B - CHECK TO BE SURE THAT THE I/O TRANSFER LINES 1, 2 WILL GENERATE AN END OF TRANSMISSION SIGNAL (EOT).	10
	0C - VARIOUS TEST PATTERNS ARE LOADED IN THE DATA TRANSFER REGISTER AND THE I/O TRANSFER LINES ARE SENSED FOR THE PROPER 'WRAP-AROUNDS' (INCLUDING PROPER PARITY TRANSMISSION).	10

1.1 SECTION DESCRIPTIONS. (CONTINUED)

SECTION	ROUTINES	SPECIAL SWITCH OPTIONS
403 - TEST 3741 FUNCTIONS OF A DATA BYTE TRANSFER. WITH DIAGNOSTIC CONNECTOR.	01 - TEST TRANSFER OF DATA BYTE -10-.	10
	02 - TEST TRANSFER OF DATA BYTE -40-.	10
	03 - TEST TRANSFER OF DATA BYTE -A0-.	10
	04 - TEST TRANSFER OF DATA BYTE -05-.	10
	05 - TEST TRANSFER OF DATA BYTE -0A-.	10
	06 - TEST FOR BUSY ON AND OFF AFTER A START I/O CONTROL 1 COMMAND.	10
	07 - TEST DATA BYTE TRANSFER USING A WRITE CALL COMMAND.	10
	08 - CHECK THAT SERVICE RESPONSE RESETS AFTER 6 USEC.	10
	09 - CHECK THAT THE SERVICE RESPONSE DRIVER IS ACTIVE AFTER A BYTE OF DATA IS TRANSFERRED.	10
	0A - TRANSFER THREE DATA BYTES TO INSURE PROPER INCREMENTING/DECREMENTING OF DATA ADDRESS AND LENGTH COUNT REGISTERS.	10
	0B - TEST ABILITY OF LENGTH COUNT OVERFLOW TO CAUSE END OF TRANSMISSION. VIA A READ COMMAND.	10
	0C - CAUSE END OF TRANSMISSION BY LENGTH COUNT OVERFLOW USING A WRITE CALL COMMAND.	10
	0D - TEST FOR PROPER DECREMENTATION OF DATA ADDRESS REGISTER BY TRANSFER TWO DATA BYTES AND TERMINATE BY AN END OF TRANSMISSION.	10
	0E - TEST THE 3741 INTERUPT ABILITY AND CPU INTERRUPT LEVEL 5 REGISTER. THE CPU ARR REGISTER IS ALSO CHECKED.	10
	*0F - BAD PARITY IS GENERATED AND THE PARITY CHECK LATCH IS CHECKED FOR BEING ACTIVE.	10
	*** - THESE ROUTINES MUST BE DIALED IN THROUGH DCP SSW -F20F-.	
404 - 3741 FUNTION TEST.	01 - WRITES 52 RECORDS OF DATA, READS THEM BACK, AND COMPARES.	10
	*02 - READS OR WRITES ONE RECORD AT A TIME.	10

1.2 SENSE SWITCH OPTIONS.

SSW	OPTION
10	WHEN SENSE SWITCH 10 (SSW 10) IS SET, THE PROGRAM WILL HALT PRIOR TO EXECUTION OF THE ACTUAL 3741 COMMANDS. NOTE - THIS HALT IS AN IN-LINE HALT. THAT IS, THIS HALT IS NOT CONTROLLED BY DCP. THE HALT WILL APPEAR AS AN -FF-. THE PURPOSE OF THIS HALT IS TO GIVE THE OPERATOR THE ABILITY TO SINGLE STEP/CYCLE THROUGH THE 3741 TEST INSTRUCTIONS. NOTE - BEFORE AN OPERATOR CAN SINGLE STEP/CYCLE THROUGH A SINGLE DATA BYTE TRANSFER IN SECTION 403 THESE POINTS MUST BE 'TIED TOGETHER'. B-A4S4J09 TO B-A4S4G08 (TIE UP)
15	BYPASS OPERATOR HALT IN ROUTINE 02 OF PROGRAM 404.

3. HALT INDEX TABLE OF 3741 DIAGNOSTIC SECTIONS.

3.1 PROGRAM OPERATOR HALTS. -A0- TO -FF-

HALT ID	HALT DEFINITION	MAP CHART PAGE-ENTRY	LOCATION SECTION	LOCATION ROUTINE
E0 E1	THE OPERATOR IS INSTRUCTED TO DO SYSTEM RESET AND THEN START. THIS RESETS ALL THE 3741 LOGIC BEFORE THE TEST SECTION IS RUN.		401,402 403	SECTION START
EE	WHEN THIS HALT IS RESET, PROCESS CHECK SHOULD OCCUR BECAUSE OF AN INVALID N CODE COMMAND. THE OPERATOR SHOULD THEN DO SYSTEM RESET, START -15- TIMES (ONCE FOR EVERY INVALID N CODE COMMAND).		401	16
F1	CE PREPARES 3741 FOR S/3 WRITE (3741 READ). INSTRUCTIONS ARE PRINTED. THIS HALT WILL BE GIVEN AGAIN WITH A NEW MESSAGE IF THE C.E.LEAVES THE WRAP CONNECTOR PLUGGED IN.		404	ALL
F2	CE PREPARES 3741 FOR S/3 READ (3741 WRITE)		404	ALL
F6	ROUTINE 2. FIRST HALT. (3741 SPECIAL ROUTINE)		404	2
FF	CE MODE HALT. THIS IS AN IN-LINE PROGRAM HALT THAT OCCURS WHEN SENSE SWITCH 10 IS TURNED ON. THIS HALT IS LOCATED IN EVERY ROUTINE JUST BEFORE A 3741 COMMAND IS EXECUTED. THIS WILL ALLOW THE OPERATOR TO SINGLE STEP/CYCLE THE 3741 COMMAND FOR DIAGNOSTIC PURPOSES.		401,402 403	ALL

3.2 PROGRAM ERROR HALTS. -01- TO -8F-

HALT ID	HALT DEFINITION	MAP CHART PAGE-ENTRY	LOCATION SECTION	LOCATION ROUTINE
01	PROGRAM DETECTED THE 3741 TO BE READY WHEN IT SHOULD BE NOT READY.	870-2	401	01
02	THE 3741 IS DETECTED TO BE BUSY WHEN IT SHOULD NOT BE BUSY.	872-1	401	ALL
03	THE DATA SENSED FROM STATUS BYTE AND LENGTH COUNT REGISTER IS NOT AS EXPECTED. THE DATA EXPECTED AFTER DOING A SYSTEM RESET, START IS -8000-.	874-1	401	03
04	THE DATA SENSED FROM THE I/O TRANSFER LINES IS NOT -0000- AS EXPECTED. ALL 0'S INDICATE NO CONNECTOR IS ATTACHED.	878-1	401	04
05	THE DATA SENSED FROM THE DIAGNOSTIC BYTE IS NOT -00- AS IS EXPECTED AFTER DOING SYSTEM RESET, START.	881-1	401	05
06	DURING CERTAIN EB CYCLE(S) -SEE PRINTOUT- DATA WAS NOT TRANSMITTED.	885-1	401	06
07	THE DATA SENSED FROM THE FUNCTION REGISTER DOES NOT CORRESPOND TO THE TEST PATTERN -AA55- THAT WAS LOADED.	889-1	401	07
08	THE DATA SENSED FROM THE FUNCTION REGISTER DOES NOT CORRESPOND TO THE TEST PATTERN -55AA- THAT WAS LOADED.	889-1	401	08
09	THE DATA SENSED FROM THE LENGTH COUNT REGISTER DOES NOT CORRESPOND TO THE TEST PATTERN -55- THAT WAS LOADED.	891-1	401	09
0A	THE DATA SENSED FROM THE LENGTH COUNT REGISTER DOES NOT CORRESPOND TO THE TEST PATTERN -AA- THAT WAS LOADED.	891-1	401	0A
0C	THE OLD TEST PATTERN -55- WAS NOT RESET IN THE LENGTH COUNT REGISTER WHEN THE TEST PATTERN -AA- WAS LOADED. HENCE, THE RESULT IS AN -FF- PATTERN.	891-2	401	0A
10	THE DATA SENSED FROM THE DATA TRANSFER REGISTER DOES NOT CORRESPOND TO THE TEST PATTERN -55- THAT WAS LOADED.	893-1	401	0D

3.2 PROGRAM ERROR HALTS. -01- TO -8F- (CONTINUED)

11	THE DATA SENSED FROM THE DATA TRANSFER REGISTER DOES NOT CORRESPOND TO THE TEST PATTERN -AA- THAT WAS LOADED.	893-1	401	0E
12	DIAGNOSTIC BYTE IS NOT AS EXPECTED AFTER DOING A START I/O TO ENABLE INTERUPTS WHILE IN DIAGNOSTIC MODE. BIT 3 -INTERUPT ENABLED- OF THE STATUS SHOULD BE ON.	895-1	401	0F
13	DIAGNOSTIC BYTE IS IN ERROR AFTER DOING A START I/O TO RESET INTERUPTS ENABLED. EXPECTED NO BITS ON.	897-1	401	10
14	AFTER DOING A START I/O READ CALL IN DIAGNOSTIC MODE, DIAGNOSTIC BYTE WAS NOT AS EXPECTED. EXPECTED BITS 6,7 - READ CALL AND I/O SELECTED TO BE ON.	899-1	401	11
15	AFTER DOING A START I/O WRITE CALL IN DIAGNOSTIC MODE,DIAGNOSTIC BYTE WAS NOT AS EXPECTED. EXPECTED BITS 5,7 - WRITE CALL AND I/O SELECTED TO BE ON.	903-1	401	12
16	AFTER DOING A START I/O READ OR WRITE CALL, A START I/O RESET THAT SHOULD CLEAR THE STATUS BYTE DIDN'T.	899-2	401	11,12,15
17	BIT 5 -NO-OP OF THE STATUS BYTE DID NOT GET SET AFTER DOING A START I/O READ CALL WHILE NOT IN DIAGNOSTIC MODE OF OPERATION.	905-1	401	15
18	BIT 5 -NO-OP OF THE STATUS BYTE DID NOT GET RESET AFTER BEING SET BY A START I/O READ CALL WHILE NOT IN DIAGNOSTIC MODE OF OPERATION.	905-2	401	15
19	A COMMAND WITH AN INVALID N CODE (SEE PRINTOUT) WAS ACCEPTED AS VALID	905-3	401	16
1A	THE 3741 CAUSED AN INTERRUPT PREMATURELY.	895-2	401	0F
20	THE PROGRAM DOES NOT RECOGNIZE THE DIAGNOSTIC CONNECTOR ID BITS. A SENSE OF THE I/O TRANSFER LINES SHOULD GIVE A -F900-.	909-1	402	01
21	DATA -AA- LOADED INTO THE DATA TRANSFER REGISTER DID NOT WRAP -VIA THE DIAGNOSTIC CONNECTOR- TO THE I/O TRANSFER LINES CORRECTLY -F9AA-.	916-1	402	02
22	DATA -55- LOADED INTO THE DATA TRANSFER REGISTER DID NOT WRAP -VIA THE DIAGNOSTIC CONNECTOR- TO THE I/O TRANSFER LINES CORRECTLY -FD55-.	919-1	402	03
23	DATA -00- LOADED INTO THE DATA TRANSFER REGISTER DID NOT WRAP -VIA THE DIAGNOSTIC CONNECTOR- TO RESET THE I/O TRANSFER LINES -F900-.	919-2	402	03
24	A START I/O READ CALL COMMAND FAILED TO ACTIVATE THE READ CALL DRIVER.	923-1	402	04
25	A START I/O WRITE CALL COMMAND FAILED TO ACTIVATE THE WRITE CALL DRIVER.	923-2	402	04
26	A START I/O CONTROL 1 COMMAND FAILED TO ACTIVATE THE I/O SELECTS PROPERLY.	924-1	402	04
27	A START I/O RESET COMMAND FAILED TO CLEAR THE I/O TRANSFER LINES AFTER ACTIVATING READ,WRITE CALL DRIVERS AND I/O SELECTS (CONTROL 1).	924-2	402	04
28	GENERATION OF EOT (END OF TRANSMISSION) SIGNAL FAILED TO CAUSE I/O DISCONNECT. SEE THE PRINTOUT FOR THE SPECIFIC MODE OF FAILURE.	927-1	402	05
29	A CHECK OCCURRED DURING RESET OF I/O DISCONNECT AFTER THE EOT (END OF TRANS-MISSION) SIGNAL GENERATED THE I/O DISCONNECT.	927-2	402	05
2A	DIAGNOSTIC BYTE (EB1 BYTE) IS IN ERROR AFTER TRYING TO ACTIVATE EOT (END OF TRANSMISSION) WITH I/O SELECT 3.	931-1	402	06
2E	I/O TRANSFER LINE X (SEE PRINTOUT FOR ID OF TRANSFER LINE) FAILED TO RESET AFTER BEING LATCHED.	931-2,3,4,5,6	402	07,08
2F	I/O TRANSFER LINES IN ERROR AFTER THE 3741 WAS PLACED IN EVEN PARITY MODE OF OPERATION.	933-1	402	09
30	I/O TRANSFER LINE X WAS NOT RESET BY A READ OR WRITE CALL. SEE PRINTOUT FOR THE SPECIFIC ERROR ID. READ CALL RESETS TRANSFER LINE 4, WRITE CALL RESETS TRANSFER LINE 3.	933-2,3	402	09
31	I/O DISCONNECT LATCH FAILS TO RESET.	935-1	402	0A

3.2 PROGRAM ERROR HALTS. -01- TO -8F- (CONTINUED)

HALT ID	HALT DEFINITION	MAP CHART PAGE-ENTRY	LOCATION SECTION	LOCATION ROUTINE
32	EOT (END OF TRANSMISSION) FAILED TO BE ACTIVATED BY TRANSFER LINE 1 OR 2.	935-2	402	0B
33	THE PARITY BIT OF THE DATA TRANSFER REGISTER DID NOT TURN OFF.	935-3	402	0C
34	A TEST PATTERN WAS NOT TRANSMITTED CORRECTLY FROM THE DATA TRANSFER REGISTER TO THE I/O TRANSFER LINES. SEE ERROR PRINTOUT FOR THE FAILING PATTERN.	935-4	402	0C
35	BUSY FAILED TO BECOME ACTIVE AFTER A READ CALL WHILE NOT IN DIAGNOSTIC MODE OR BUSY FAILED TO BE RESET BY AN N CODE 0 START I/O.	935-4	402	0C
3E	3741 IS NOT READY. WITH THE CONNECTOR ATTACHED, THE 3741 SHOULD BE READY.	907-1	402,403	ALL
3F	3741 IS BUSY AT A TIME WHEN IT SHOULD NOT BE BUSY.	952-2	402,403	ALL
40	DATA TRANSFER CHECK. THE 3741 REGISTER(S) ARE NOT AS EXPECTED AFTER DOING A SINGLE DATA BYTE (10) READ TRANSFER. SEE ERROR PRINTOUT FOR SPECIFIC ERROR ID.	937-1	403	01
41	THE DATA BYTE THAT WAS TRANSFERRED INTO CORE DURING A SINGLE DATA BYTE READ TRANSFER DOES NOT AGREE WITH THE EXPECTED DATA BYTE -10-.	938-1	403	01
42	DATA TRANSFER CHECK. THE 3741 REGISTER(S) ARE NOT AS EXPECTED AFTER DOING A SINGLE DATA BYTE (40) READ TRANSFER. SEE ERROR PRINTOUT FOR MORE INFORMATION.	944-1	403	02
43	THE DATA BYTE THAT WAS TRANSFERRED INTO CORE DURING A SINGLE DATA BYTE READ TRANSFER DOES NOT AGREE WITH THE EXPECTED DATA BYTE -40-.	938-1	403	02
44	DATA TRANSFER CHECK. THE 3741 REGISTER(S) ARE NOT AS EXPECTED AFTER DOING A SINGLE DATA BYTE (A0) READ TRANSFER. SEE ERROR PRINTOUT FOR MORE INFORMATION.	946-1	403	03
45	THE DATA BYTE THAT WAS TRANSFERRED INTO CORE DURING A SINGLE DATA BYTE READ TRANSFER DOES NOT AGREE WITH THE EXPECTED DATA BYTE -A0-.	938-1	403	03
46	DATA TRANSFER CHECK. THE 3741 REGISTER(S) ARE NOT AS EXPECTED AFTER DOING A SINGLE DATA BYTE (05) READ TRANSFER. SEE ERROR PRINTOUT FOR MORE INFORMATION.	948-1	403	04
47	THE DATA BYTE THAT WAS TRANSFERRED INTO CORE DURING A SINGLE DATA BYTE READ TRANSFER DOES NOT AGREE WITH THE EXPECTED DATA BYTE -05-.	938-1	403	04
48	DATA TRANSFER CHECK. THE 3741 REGISTER(S) ARE NOT AS EXPECTED AFTER DOING A SINGLE DATA BYTE (0A) READ TRANSFER. SEE ERROR PRINTOUT FOR MORE INFORMATION.	950-1	403	05
49	THE DATA BYTE THAT WAS TRANSFERRED INTO CORE DURING A SINGLE DATA BYTE READ TRANSFER DOES NOT AGREE WITH THE EXPECTED DATA BYTE -0A-.	938-1	403	05
4A	SERVICE RESPONSE CHECK. THIS CHECK OCCURRED WHILE PREPARING THE 3741 FOR A SINGLE DATA BYTE WRITE TRANSFER TEST. THE DIAGNOSTIC BYTE IS NOT AS EXPECTED AFTER TRYING TO SET SERVICE RESPONSE BY A WRITE CALL COMMAND.	954-1	403	07
4C	A SENSE OF THE STATUS/LENGTH COUNT AND DIAGNOSTIC/DATA TRANSFER REGISTERS SHOWS THAT A SINGLE DATA BYTE WRITE TRANSFER TEST DID NOT PERFORM AS EXPECTED.	954-2	403	07
4E	SERVICE RESPONSE LATCH DID NOT SET. A START I/O WRITE CALL COMMAND IS ISSUED TO SET THE LATCH.	956-1	403	08
4F	SERVICE RESPONSE LATCH DID NOT RESET AFTER 6 MICROSEC. THE FUNCTION REGISTER SPECIFIED THE 6 MICROSEC RESET (EB2 BYTE BIT 1). ALSO A START I/O CONTROL 2 COMMAND WITH I/O 13 SELECT IS ISSUED TO ACTIVATE SERVICE REQUEST WHICH TIMES OUT THE LATCH.	956-2	403	08
50	I/O TRANSFER LINES ARE NOT AS EXPECTED. TRANSFER LINES 10 AND 3 SHOULD BE SET BY START I/O WRITE CALL AND SERVICE RESPONSE (TIED BY DIAGNOSTIC CONNECTOR).	956-3	403	09
51	DATA TRANSFER CHECK, THE 3741 REGISTER(S) ARE NOT AS EXPECTED AFTER DOING THE FIRST OF THREE SINGLE DATA BYTE READ TRANSFERS.	958-1	403	0A
52	DATA TRANSFER CHECK. THE 3741 REGISTER(S) ARE NOT AS EXPECTED AFTER DOING THE SECOND OF THREE SINGLE DATA BYTE READ TRANSFERS.	958-1	403	0A
53	DATA TRANSFER CHECK. THE 3741 REGISTER(S) ARE NOT AS EXPECTED AFTER DOING THE THIRD OF THREE SINGLE DATA BYTE READ TRANSFERS.	958-1	403	0A
55	THE STATUS/LENGTH COUNT REGISTER IS IN ERROR AFTER DOING A SINGLE DATA BYTE READ TRANSFER TO PREPARE THE 3741 FOR THE READ CALL OVERFLOW TEST.	958-2	403	0B
56	THE STATUS/LENGTH COUNT AND DIAGNOSTIC/DATA TRANSFER REGISTERS DO NOT SHOW PROPER EXECUTION OF A LENGTH COUNT OVERFLOW BY A READ CALL COMMAND.	958-3	403	0B
57	THE STATUS/LENGTH COUNT AND DIAGNOSTIC/DATA TRANSFER REGISTERS ARE NOT AS EXPECTED AFTER A SINGLE DATA BYTE WRITE TRANSFER. THIS CHECK IS IN PREPARATION OF DOING AN OVERFLOW BY WRITE CALL COMMAND.	958-4	403	0C
58	THE STATUS/LENGTH COUNT AND DIAGNOSTIC/DATA TRANSFER REGISTERS DO NOT SHOW PROPER EXECUTION OF A LENGTH COUNT OVERFLOW BY A WRITE CALL COMMAND.	958-5	403	0C
59	DATA ADDRESS REGISTER DID NOT DECREMENT (AS SPECIFIED IN FUNCTION REGISTER) AFTER A SINGLE DATA BYTE READ TRANSFER.	960-1	403	0D
5A	THE STATUS/LENGTH COUNT AND DATA ADDRESS REGISTERS ARE NOT AS EXPECTED AFTER DOING A SECOND SINGLE DATA BYTE READ TRANSFER. NOTE - THE FUNCTION REGISTER IS SET SO THAT THE DATA ADDRESS REGISTER DECREMENTS AFTER A READ TRANSFER.	960-2	403	0D
5C	THE STATUS/LENGTH COUNT AND DIAGNOSTIC/DATA TRANSFER REGISTERS ARE NOT AS EXPECTED AFTER DOING THREE SINGLE DATA BYTE READ TRANSFERS AND CAUSING LENGTH COUNT OVERFLOW. NOTE - THE FUNCTION REGISTER SPECIFIES DATA ADDRESS REGISTER DECREMENTATION AFTER A DATA BYTE TRANSFER.	960-3	403	0D
5E	THE 3741 DID NOT CAUSE AN INTERUPT (LEVEL 5) AS EXPECTED.	962-2	403	0E

3.2 PROGRAM ERROR HALTS. -01- TO -8F- (CONTINUED)

60	THE 3741 ISN'T READY AFTER A START I/O RESET WAS ISSUED TO CLEAR THE -NOT READY- CONDITION. THE -NOT READY- WAS CAUSED BY A READ TRANSFER WITH BAD PARITY IN DATA.	964-4	403	0F
61	THE STATUS/LENGTH COUNT REGISTER ARE NOT AS EXPECTED AFTER TRANSFERRING A DATA BYTE WITH BAD PARITY.	964-1	403	0F
62	THE I/O TRANSFER LINES ARE NOT AS EXPECTED AFTER TRANSFERRING A DATA BYTE WITH BAD PARITY.	964-2	403	0F
66	THE 3741 IS NOT BUSY WHEN IT IS EXPECTED TO BE BUSY.	952-1	403	06
67	DATA ADDRESS REGISTER FAILURE.	891-3	401	B,C,D,E
68	A TEST PATTERN LOADED INTO ARR OR THE IAR 5 REGISTER IS NOT THE SAME AS WAS SENSED. SEE ERROR PRINTOUT FOR TEST PATTERN AND REGISTER ID.	962-3,4	403	0E
69	THE ARR REGISTER WAS OR'ED WITH THE IAR 5 REGISTER WHEN THE INTERRUPT LEVEL 5 OCCURRED.	962-1	403	0E
80	INTERRUPT DID NOT OCCUR BECAUSE 3741 IS OFF LINE.		404	ALL
81	3741 BUS OUT PARITY ERROR (DATA TRANSFER REGISTER PARITY ERROR).		404	ALL
82	SIO WAS NO-OPED.		404	ALL
83	3741 DETECTED ERROR (INDICATED BY I/O TRANSFER LINE) -- SEE PRINTOUT.		404	ALL
84	INTERRUPT DID NOT OCCUR (MOD 15) OR NOT PENDING (OTHER MODELS)		404	ALL
85	3741 SET UP FOR DATA TRANSFER IN WRONG DIRECTION. SEE PRINTOUT.	857-1	404	ALL
86	READ MODE AND WRITE MODE ON AT SAME TIME.		404	ALL
87	UNEXPECTED INTERRUPT (LEVEL 5) OCCURRED.		404	ALL
88	LENGTH COUNT REGISTER IN ERROR. SEE PRINTOUT.		404	ALL
89	DATA MISCOMPARE ON READ BACK CHECK.		404	ALL
8A	EOJ NOT UP AFTER ALL DATA READ BACK.		404	ALL
8C	READ MODE AND WRITE MODE BOTH OFF.		404	ALL
8E	BUSY TOO LONG.		404	ALL
8F	'END OF RECORD' NOT ACTIVE AFTER 128 BYTES TRANSFERRED.		404	ALL

4. DETAILED PROGRAM DESCRIPTIONS.

4.1 PROGRAM 401 - 3741 BASIC FUNCTION TEST WITHOUT DIAGNOSTIC CONNECTOR ATTACHED.

RTN#

01 - A TEST I/O FOR NOT READY COMMAND IS ISSUED TO THE SIOC THAT DOES NOT HAVE THE DIAGNOSTIC CONNECTOR ATTACHED. THE 3741 IS EXPECTED TO BE NOT READY. IF THE 3741 IS READY, AN ERROR MESSAGE IS PRINTED.

* NOTE - IF THE DIAGNOSTIC CONNECTOR IS ATTACHED, THE 3741 WILL BE READY.

02 - A TEST I/O FOR NOT BUSY COMMAND IS ISSUED TO THE 3741 THE 3741 SHOULD NOT BE BUSY AT THIS TIME. IF A BUSY CONDITION EXISTS, AN ERROR MESSAGE IS PRINTED.

03 - THE STATUS BYTE AND THE LENGTH COUNT REGISTER ARE SENSED. THE STATUS BYTE IS EXPECTED TO BE AN HEX -80-. THE STATUS BIT 0 (SPARE) IS ALWAYS ON. THE OTHER STATUS BITS SHOULD BE OFF SINCE THE 3741 IS INITIALIZED WHEN THE OPERATOR DOES SYSTEM RESET TO START THIS SECTION. THE LENGTH COUNT REGISTER IS EXPECTED TO BE AN HEX -00-. SYSTEM RESET CLEARS THIS REGISTER ALSO.

* NOTE 1 - THIS ROUTINE IS BYPASSED IF DCP'S SSW 00 (LOOP ON SECTION) IS ON. THE EXPECTED PATTERNS OF THE STATUS BYTE AND LENGTH COUNT REGISTER ARE VALID ONLY AFTER AN INITIAL SYSTEM RESET IS PERFORMED.

* NOTE 2 - BEFORE STATUS BYTE AND LENGTH COUNT REG ARE SENSED, THE 3741 IS 'PROGRAM INITIALIZED'. FUNCTION REG. AND DATA TRANSFER REG. ARE CLEARED BY LOADING IN A PATTERN. THE DATA ADDRESS REGISTER IS ALSO PRELOADED TO INSURE PROPER PARITY. THESE THREE REGISTERS MUST BE PRESET SINCE SYSTEM RESET DOES NOT INITIALIZE THEM. A SENSE COMMAND (N-CODE 3) IS ISSUED TO RESET THE 6 USEC DELAY LOGIC AND TEST VALIDITY OF THE DIAGNOSTIC MODE -- SEE 3741 LOGIC DIAGRAMS.

04 - I/O TRANSFER LINES SENSED. EXPECTED PATTERN- HEX -0000-. THIS PATTERN EXISTS WHILE THE DIAGNOSTIC CONNECTOR IS NOT ATTACHED.

05 - THE DIAGNOSTIC BYTE AND DATA TRANSFER REGISTER ARE SENSED. THE DATA TRANSFER REGISTER, WHICH IS NOT AFFECTED BY SYSTEM RESET, IS NOT CHECKED. THE DIAGNOSTIC BYTE IS CHECKED FOR AN HEX -00- SINCE SYSTEM RESET CLEARS ALL STATUS CONDITIONS.

* NOTE 1 - THIS ROUTINE IS BYPASSED IF DCP'S SSW 00 (LOOP ON SECTION) IS ON. THE EXPECTED PATTERN OF THE DIAGNOSTIC BYTE IS VALID ONLY AFTER AN INITIAL SYSTEM RESET IS PERFORMED.

06 - ALL 3741 REGISTERS ARE FIRST LOADED WITH SOME DATA AND THEN THEY ARE SENSED. ALL SENSED DATA FROM THE REGISTERS ARE CHECKED FOR AN ALL BITS OFF CONDITION. THE PROGRAM THEN IDENTIFIES WHICH BYTE(S) OF WHICH REGISTER(S) FAILED TO TRANSFER NON-ZERO SENSE DATA. RECEIVING ZERO SENSE DATA INDICATES THAT THE EB CYCLE(S) FAILED TO TRANSMIT DATA DURING EITHER THE LOAD I/O OR THE SENSE I/O COMMAND.

07 - THE FUNCTION REGISTER IS LOADED WITH A TEST PATTERN, HEX -AA55- AND THEN THE FUNCTION REGISTER IS SENSED. A COMPARISON IS MADE TO CHECK THAT THE SENSED PATTERN IS THE SAME AS THE TEST PATTERN. IF THE SENSED PATTERN DOES NOT COMPARE WITH THE TEST PATTERN, AN ERROR MESSAGE IS PRINTED THAT SHOWS THE STATE (1 OR 0) OF EACH BIT IN THE FUNCTION REGISTER. AN -*- PLACED UNDER A BIT DESIGNATES THAT THIS BIT IS IN ERROR. THIS TEST ISOLATES TRANSMISSION ERRORS OF INDIVIDUAL BITS DURING THE EB CYCLES OF THE LOAD I/O AND SENSE I/O COMMANDS.

08 - THE FUNCTION REGISTER IS LOADED AND SENSED THE SAME AS IN ROUTINE 07 BUT WITH A TEST PATTERN HEX -55AA-. THIS TEST EXERCISES THE ALTERNATE BITS THAT WERE NOT TESTED IN ROUTINE 07. TESTING THE ALTERNATE BITS IN THIS WAY ALLOWS THE PROGRAM TO IDENTIFY BIT(S) THAT ARE ON OR OFF ALL THE TIME.

09 - THE LENGTH COUNT REGISTER IS LOADED WITH A TEST PATTERN, HEX -55- AND THEN THE LENGTH COUNT REGISTER IS SENSED. A COMPARISON IS MADE TO CHECK THAT THE SENSED PATTERN IS THE SAME AS THE TEST PATTERN. IF THE SENSED PATTERN DOES NOT COMPARE WITH THE TEST PATTERN, AN ERROR MESSAGE IS PRINTED THAT SHOWS THE STATE (1 OR 0) OF EACH BIT IN THE LENGTH COUNT REGISTER. AN -*- PLACED UNDER A BIT DESIGNATES THAT THIS BIT IS IN ERROR. THIS TEST ISOLATES TRANSMISSION ERRORS OF INDIVIDUAL BITS DURING THE EB CYCLES OF THE LOAD I/O AND SENSE I/O COMMANDS.

0A - THE LENGTH COUNT REGISTER IS LOADED AND SENSED THE SAME AS IN ROUTINE 09 BUT WITH A TEST PATTERN HEX -AA-. THIS TEST EXERCISES THE ALTERNATE BITS THAT WERE NOT TESTED IN ROUTINE 09. TESTING THE ALTERNATE BITS IN THIS WAY ALLOWS THE PROGRAM TO IDENTIFY BIT(S) THAT ARE ON OR OFF ALL THE TIME.

0B - THE DATA ADDRESS REGISTER IS LOADED WITH TEST PATTERN -55AA- AND SENSED BACK AND COMPARED. THEN IT IS LOADED WITH -AA55- AND SENSED BACK AND COMPARED. FAILURES ARE INDICATED BY A HALT OR PROCESSOR CHECK.

0C - THE DATA ADDRESS REGISTER IS LOADED AND SENSED WITH ODD TEST PATTERNS -1000- AND -0001-. THIS TEST EXERCISES THE ABILITY OF THE HARDWARE TO NOT SUPPLY PARITY. IF THIS TEST FAILS, A PROCESS CHECK WILL OCCUR.

0D - THE DATA TRANSFER REGISTER IS LOADED WITH A TEST PATTERN, HEX -55- AND THEN THE DATA TRANSFER REGISTER IS SENSED. A COMPARISON IS MADE TO CHECK THAT THE SENSED PATTERN IS THE SAME AS THE TEST PATTERN. IF THE SENSED PATTERN DOES NOT COMPARE WITH THE TEST PATTERN, AN ERROR MESSAGE IS PRINTED THAT SHOWS THE STATE (1 OR 0) OF EACH BIT IN THE DATA TRANSFER REGISTER. AN -*- PLACED UNDER A BIT DESIGNATES THAT THIS BIT IS IN ERROR. THIS TEST ISOLATES TRANSMISSION ERRORS OF INDIVIDUAL BITS DURING THE EB CYCLES OF THE LOAD I/O AND SENSE I/O COMMANDS.

0E - THE DATA TRANSFER REGISTER IS LOADED AND SENSED THE SAME WAY AS IN ROUTINE 0D BUT WITH A TEST PATTERN HEX -AA-. THIS TEST EXERCISES THE ALTERNATE BITS THAT WERE NOT TESTED IN ROUTINE 0D. TESTING THE ALTERNATE BITS IN THIS WAY ALLOWS THE PROGRAM TO IDENTIFY BIT(S) THAT ARE ON OR OFF ALL THE TIME.

0F - TEST ABILITY TO ENABLE INTERRUPTS. BEFORE THIS TEST IS PERFORMED, A TEST I/O FOR BUSY IS ISSUED TO BE SURE THAT THE 3741 IS NOT BUSY. NOTE- IF THE 3741 WAS BUSY AND NOT CHECKED, THE CPU WOULD 'LOOP' ON THE START I/O COMMAND. THE 3741 IS THEN PLACED IN A DIAGNOSTIC MODE OF OPERA ION TO PREVENT THE 3741 FROM GOING BUSY AFTER A START I/O COMMAND. THIS IS PERFORMED BY LOADING AN HEX PATTERN -0080- INTO THE FUNCTION REGISTER. THE START I/O COMMAND (N CODE 0, CONTROL CODE 02) THAT ENABLES INTERUPTS IS THEN ISSUED. TO CHECK ON PROPER EXECUTION OF THE START I/O THE DIAGNOSTIC BYTE IS SENSED AND CHECKED FOR AN HEX PATTERN -10-. THIS INDICATES THAT THE INTERRUPT ENABLE BIT IS SET PROPERLY AND THAT THERE IS NO OTHER CONDITION PREVAILING.

10 - TEST ABILITY TO RESET ENABLE INTERRUPTS. THIS TEST IS PERFORMED IDENTICALLY AS ROUTINE 0F EXCEPT THAT A START I/O COMMAND (N CODE 0, CONTROL CODE 04) IS ISSUED TO RESET THE INTERRUPT ENABLE CONDITION. THE DIAGNOSTIC BYTE IS AGAIN SENSED BUT THIS TIME A CHECK IS MADE TO SEE THAT BIT 3 IS RESET (OTHER DIAGNOSTIC BITS ARE NOT CHECKED).

11 - SET AND RESET READ CALL LATCH. A TEST I/O FOR BUSY IS FIRST ISSUED TO BE SURE THE CPU WILL NOT 'LOOP' ON A START I/O COMMAND IF THE 3741 IS BUSY. THE 3741 IS PUT IN A DIAGNOSTIC MODE BY THE FUNCTION REGISTER TO INHIBIT BUSY BY A START I/O. THE START I/O COMMAND (N CODE 1) IS THEN ISSUED TO SET THE READ CALL LATCH. ANOTHER TEST I/O FOR BUSY IS ISSUED TO INSURE THAT THE DIAGNOSTIC MODE OF OPERATION IS WORKING. THE DIAGNOSTIC BYTE IS SENSED AND CHECKED FOR AN HEX -03- (I/O SELECTED AND READ CALL BITS). IF EVERYTHING IS WORKING, A START I/O COMMAND (N CODE 0, CONTROL CODE 08) IS ISSUED TO RESET THE READ CALL LATCH. THE DIAGNOSTIC BYTE IS AGAIN SENSED AND CHECKED FOR NO BITS ON.

12 - SET AND RESET WRITE CALL LATCH. THIS TEST IS THE SAME AS ROUTINE 11 EXCEPT THAT A START I/O COMMAND (N CODE 2) IS ISSUED TO SET THE WRITE LATCH. THE DIAGNOSTIC BYTE IS SENSED AND CHECKED FOR AN HEX -05- (I/O SELECTED AND WRITE CALL BITS). THE WRITE CALL LATCH IS RESET IN THE SAME AS THE READ CALL LATCH IN ROUTINE 11.

13 - ISSUE A START I/O CONTROL 1 COMMAND. A TEST I/O FOR BUSY COMMAND IS FIRST ISSUED TO BE SURE THAT THE 3741 IS NOT BUSY AND CAUSE THE CPU TO 'LOOP' ON THE START I/O COMMAND. THE 3741 IS PUT IN A DIAGNOSTIC MODE TO PREVENT THE 3741 FROM GOING BUSY ON THE START I/O COMMAND. THE START I/O CONTROL 1 COMMAND (N CODE 3, CONTROL CODE FF) IS THEN ISSUED. THERE IS NO WAY TO CHECK THE PROPER EXECUTION OF THIS START I/O COMMAND WITHOUT THE DIAGNOSTIC CONNECTOR, SO THIS COMMAND IS JUST EXECUTED. HOWEVER, THIS DOES TEST THE ABILITY OF THE 3741 TO DECODE THIS N CODE PROPERLY AND NOT BOMB OUT WITH A PROCESS CHECK.

14 - ISSUE A START I/O CONTROL 2 COMMAND. THIS TEST IS THE SAME AS ROUTINE 13 EXCEPT THAT A START I/O CONTROL 2 COMMAND IS ISSUED. AS IN ROUTINE 13, THERE IS NO CHECK PERFORMED OTHER THAN PROPER DECODE OF THE N CODE (N CODE 4).

15 - SET AND RESET THE NO-OP LATCH. A TEST I/O FOR BUSY IS FIRST ISSUED TO PREVENT THE CPU FROM 'LOOPING' ON A START I/O IF THE 3741 IS BUSY. THE 3741 IS REMOVED FROM DIAGNOSTIC MODE BY LOADING THE FUNCTION REGISTER WITH AN HEX -0000-. A START I/O COMMAND IS ISSUED AND SINCE THE 3741 IS NOT READY (NO DIAGNOSTIC CONNECTOR ATTACHED) THIS COMMAND IS NO-OP'ED. THIS CAUSES THE NO-OP LATCH TO BE SET. THE STATUS BYTE IS SENSED AND BIT 5 (NO-OP) IS CHECKED FOR ON. THEN THE STATUS BYTE IS SENSED AGAIN TO SEE IF THE FIRST SENSE RESET THE NO-OP BIT.

16 - INVALID COMMANDS TEST. ALL INVALID TEST I/O, SENSE I/O, LOAD I/O AND START I/O COMMANDS ARE ISSUED TO THE 3741.

A VALID TEST OCCURS IF A PROCESS CHECK OCCURS AFTER EACH INVALID COMMAND. IF THE 3741 ACCEPTS AN INVALID COMMAND, AN ERROR MESSAGE IS PRINTED THAT IDENTIFIES THE INVALID COMMAND. THIS TEST ASSURES THAT THE 3741 DECODES ITS N CODES PROPERLY.

* NOTE 1 - THIS ROUTINE MUST BE DIALED VIA DCP -F216-. AFTER EACH PROCESS CHECK THE OPERATOR SHOULD DO SYSTEM RESET AND START.

4.2 PROGRAM 402 - 3741 FUNCTION TEST WITH THE DIAGNOSTIC CONNECTOR ATTACHED.

RTN#

01 - SENSE FOR THE DIAGNOSTIC CONNECTOR ID BITS. THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -F900-. BITS 0 - 3 OF THE EB2 BYTE (THE HEX -F-) ARE THE ACTUAL DIAGNOSTIC CONNECTOR ID BITS. BIT 4 OF THE EB2 BYTE IS THE DEVICE ATTACHED BIT WHILE BIT 7 IS THE DATA TRANSFER REGISTER PARITY BIT. NOTE - THE DIAGNOSTIC CONNECTOR TIES THE OUTPUT LINES OF THE DATA TRANSFER REGISTER INTO THE EB1 BYTE OF THE I/O TRANSFER LINES. THE PARITY BIT OF THE DATA TRANSFER REGISTER IS TIED, VIA THE DIAGNOSTIC CONNECTOR, INTO EB2 BYTE BIT 7 OF THE I/O TRANSFER LINES. THIS PARITY BIT IS ACTIVE (ODD PARITY) BECAUSE THE DATA TRANSFER REGISTER IS LOADED WITH ZEROES BEFORE THE I/O TRANSFER LINES ARE SENSED. BEFORE THE DATA TRANSFER REGISTER IS LOADED, THE 3741 IS TESTED FOR NOT BUSY AND READY CONDITIONS TO EXIST. IF THE 3741 IS NOT READY, THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -0000-. A NOT READY ERROR MESSAGE IS PRINTED IF THE I/O TRANSFER LINES ARE NOT ZERO. HOWEVER IF THE I/O TRANSFER LINES ARE ZERO (DIAGNOSTIC CONNECTOR NOT ATTACHED) A MESSAGE IS PRINTED TO INSTRUCT THE OPERATOR TO ATTACH THE DIAGNOSTIC CONNECTOR.

02 - TRANSFER DATA FROM DATA TRANSFER REGISTER TO THE I/O TRANSFER LINES VIA THE DIAGNOSTIC CONNECTOR. THE 3741 IS FIRST PROGRAMMED INITIALIZED BEFORE THIS TEST - SEE SECTION II NOTES. THE DATA TRANSFER REGISTER IS LOADED WITH A TEST PATTERN HEX -AA-. THIS CAUSES THE EB1 BYTE OF THE I/O TRANSFER LINES TO LOOK LIKE THE DATA TRANSFER REGISTER. THE I/O TRANSFER LINES ARE THEN SENSED FOR AN HEX -F9AA-. NOTE THAT EB2 BIT 7 IS ACTIVE WHICH REFLECTS THE DATA TRANS-FER REGISTER'S PARITY BIT THAT IS ACTIVE WHEN THE DATA TRANSFER REGISTER CONTAINS AN EVEN BIT PATTERN.

03 - THIS TEST IS THE SAME AS ROUTINE 02 EXCEPT THAT THE DATA TRANSFER REGISTER IS LOADED WITH AN HEX -55- TEST PATTERN. THIS PATTERN EXERCISES THE ALTERNATE BITS OF THE DATA TRANSFER REGISTER THAT WERE TESTED IN ROUTINE 02. THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -FD55-. EB2 BIT 5 IS ACTIVE BECAUSE RESET TRANSFER ERROR, WHICH IS WRAPPED INTO BIT 5, IS LATCHED UP DURING THIS TEST.

04 - SET AND RESET READ AND WRITE CALL DRIVERS, ACTIVATE THE I/O SELECT LINES. THE 3741 IS PROGRAMMED INITIALIZED BEFORE THIS TEST - SEE PROG. 402 NOTE. A START I/O READ CALL COMMAND IS ISSUED TO SET THE READ CALL DRIVER LATCH. A TEST I/O FOR BUSY IS ISSUED TO BE SURE THAT THE 3741 DID NOT GO BUSY. THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -FD00-. EB2 BIT 5 OF THE I/O TRANSFER LINES REFLECTS THE STATUS OF THE READ CALL DRIVER LATCH. A START I/O COMMAND IS ISSUED TO RESET THE READ CALL DRIVER LATCH AND THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -F900- TO VERIFY THE RESET. A WRITE CALL START I/O COMMAND IS ISSUED TO SET THE WRITE CALL DRIVER LATCH. THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -FF00- (BIT 7 IS ODD PARITY. BIT 5 DOTTED TO I/O SELECTING UNIT). EB2 BIT 6 OF TH I/O TRANSFER LINES REFLECTS THE STATUS OF THE WRITE CALL DRIVER LATCH.
A START I/O COMMAND TO RESET THE WRITE CALL DRIVER LATCH IS ISSUED TO THE 3741 AND THE I/O TRANSFER LINES ARE AGAIN SENSED FOR AN HEX -F900- TO VERIFY THE RESET. A START I/O CONTROL 1 COMMAND WITH CONTROL CODE OF HEX -F8- IS ISSUED TO THE 3741. THE CONTROL CODE I/O SELECT LINES 4,5,6, AND 8 ARE TIED, VIA THE DIAGNOSTIC CONNECTOR, TO I/O TRANSFER LINES 4,5,6,7 AND 8. NOTE - SINCE THE I/O SELECT SIGNALS LAST ONLY 6 MICROSECS THE I/O TRANSFER LINES MUST BE SENSED BY INDIRECT ADDRESSING. THE EXPECTED SENSE DATA IS FOR AN HEX -F9F8-. SINCE THE SIGNALS ARE SHORT, ANOTHER SENSE IS ISSUED TO THE I/O TRANSFER LINES TO BE SURE THAT THE SIGNALS HAVE TERMINATED. THE EXPECTED SENSE DATA IS AN HEX -F900-.

05 - GENERATE AN END OF TRANSFER (EOT) SIGNAL TO BRING UP I/O DISCONNECT. THE 3741 IS FIRST PROGRAMMED INITIALIZED, SEE PROG. 402 NOTES. A START I/O COMMAND IS ISSUED TO RESET THE 3741. A CONTROL 1 START I/O WITH I/O 2 SELECT ACTIVE IN THE CONTROL CODE. THE DIAGNOSTIC CONNECTOR TIES THE I/O 2 SELECT SIGNAL INTO THE END OF TRANSFER (EOT) LINE WHICH, WHEN ACTIVATED, CAUSES I/O DISCONNECT TO OCCUR. A CHECK IS MADE TO VERIFY THAT EVERYTHING IS WORKING BY SENSING THE DIAGNOSTIC BYTE FOR AN HEX -08- (I/O DISCONNECT BIT ON), SENSING THE STATUS BYTE FOR AN HEX -E1- (INTERUPT PENDING, END REQUEST, SPARE, AND I/O READY) AND SENSING THE I/O TRANSFER LINES FOR AN HEX -F902 (I/O DISCONNECT IS TIED TO EB1 BIT 6 BY THE DIAGNOSTIC CONNECTOR). IF AN ERROR OCCURS THE PROGRAM ANALYSES THE SENSED DATA AGAINST EXPECTED FAILING PATTERNS TO AID IN ISOLATING THE ERROR. THE FUNCTION REGISTER IS SET FOR DIAGNOSTIC MODE AND FOR 6 MICROSEC RESET OF I/O DISCONNECT. NEXT A START I/O GENERAL RESET IS ISSUED TO CLEAR ALL STATUS. THE LOAD I/O AND THE START I/O ARE CHECKEC BY SENSING THE STATUS BYTE FOR AN HEX -81- AND SENSING THE DIAGNOSTIC BYTE FOR AN HEX -00-.

06 - USE I/O 3 SELECT TO GENERATE AN END OF TRANSFER (EOT). A START I/O READ CALL WITH A RESET (INTERRUPT REQUEST AND INTERRUPT ABILITY) IS ISSUED AND IS FOLLOWED BY A CONTROL 1 START I/O. THE CONTROL CODE IS SET TO A -04- (I/O 3 SELECT). THE DIAGNOSTIC CONNECTOR TIES I/O 3 SELECT INTO THE END OF TRANSFER LINE (EOT). THE DIAGNOSTIC BYTE IS SENSED FOR AN HEX -08- (I/O DISCONNECT BIT ON) TO VERIFY THE TEST. THE FUNCTION REGISTER IS AGAIN LOADED SUCH THAT I/O DISCONNECT TIMES OUT AFTER 6 MICROSEC.

07 - TEST ABILITY TO RESET I/O TRANSFER LINES 1 AND 3. THE 3741 IS FIRST PROGRAMMED INITIALIZED, SEE PROG. 402 NOTES. THE FUNCTION REGISTER IS LOADED SUCH THAT I/O TRANSFER LINES 1 AND 3 WILL LATCH WHEN ACTIVATED. THE DATA TRANSFER REGISTER IS LOADED WITH AN HEX -01- AND THEN IS LOADEDED WITH ZEROES. THIS ACTIVATES I/O TRANSFER LINE 1 (BY THE DIAGNOSTIC CONNECTOR) WHICH STAYS LATCHED (BY THE FUNCTION REGISTER) EVEN WHEN THE DATA TRANSFER REGISTER IS CLEARED. A CONTROL 1 START I/O WITH I/O 5 SELECT ACTIVE IS ISSUED TO THE 3741. THE DIAGNOSTIC CONNECTOR TIES THIS SIGNAL INTO I/O TRANSFER LINE 5. WITH THE FUNCTION REGISTER'S SLAVE BIT ON, THE I/O TRANSFER LINE 5 SIGNAL RESETS ALL I/O TRANSFER LINE LATCHES (SEE 3741 LOGICS). THE I/O TRANSFER LINES ARE THEN SENSED TWICE. THE FIRST SENSE IS A TIME DELAY TO ALLOW ALL LATCHES TO RESET. THE SECOND SENSE TO THE I/O TRANSFER LINES IS FOR AN HEX -F900- TO VERIFY THE RESET OF TRANSFER LINE 1. I/O TRANSFER LINE 3 IS CHECKED IN THE SAME MANNER AS TRANSFER LINE 1. THE DATA TRANSFER REGISTER IS LOADED WITH AN HEX -04- TO INITIALLY SET I/O TRANSFER LINE 3.

08 - TEST RESET OF I/O TRANSFER LINES 4,6 AND 7. THE 3741 IS FIRST PROGRAMMED INITIALIZED, SEE PROG. 402 NOTES. THE FUNCTION REGISTER IS LOADED WITH AN HEX -01B8- (SLAVE CONTROL, DIAGNOSTIC MODE, LATCH I/O TRANSFER 4,3 AND 1). A START I/O CONTROL 1 COMMAND WITH I/O 5 SELECT ACTIVE IS ISSUED TO RESET THE I/O TRANSFER LINES. NOTE - I/O 5 SELECT IS TIED TO I/O TRANSFER LINE 5 BY THE DIAGNOSTIC CONNECTOR. I/O TRANSFER LINE 5 WITH THE FUNCTION REGISTER'S SLAVE BIT ON CAUSES THE I/O TRANSFER LINES TO BE RESET (SEE 3741 LOGIC). A SENSE TO THE I/O TRANSFER LINES IS ISSUED TO DELAY WHILE THE I/O SELECT SIGNAL GETS TIED AROUND THROUGH THE DIAGNOSTIC CONNECTOR. A CONTROL 1 START I/O COMMAND WITH I/O 4 SELECT ACTIVE. I/O 4 SELECT IS TIED TO I/O TRANSFER LINE 4 BY THE DIAGNOSTIC CONNECTOR. WITH THE FUNCTION REGISTER SET TO LATCH I/O TRANSFER LINE 4, THE I/O 4 SELECT 6 MICROSEC SIGNAL LATCHES THE I/O TRANSFER LINE 4. A SENSE IS AGAIN ISSUED TO DELAY SO THAT THE SIGNALS GET WRAPPED IN TIME. A START I/O CONTROL 1 COMMAND WITH I/O 5 SELECT ON IS ISSUED TO RESET THE I/O TRANSFER LINES. THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -F900- TO VERIFY THE RESET. I/O TRANSFER LINE 6 IS LATCHED AND CHECKED FOR RESET IN THE SAME MANNER AS I/O TRANSFER LINE 4. A START I/O CONTROL 1 WITH I/O 6 SELECT ACTIVE IS USED TO SET I/O TRANSFER LINE 6. THE TEST IS AGAIN REPEATED WITH I/O TRANSFER LINE 7 BEING LATCHED BY I/O 7 SELECT.

09 - TEST ABILITY OF READ AND WRITE CALL TO RESET I/O TRANSFER LINES 3 AND 4. THE 3741 IS FIRST PROGRAMMED INITIALIZED, SEE SECTION II NOTES. THE FUNCTION REGISTER IS FIRST LOADED WITH AN HEX -08B2- (EVEN PARITY, DIAGNOSTIC MODE, LATCH I/O TRANSFER LINES 3 AND 4 AND 6 MICROSEC RESET OF I/O DISCONNECT. THE DATA TRANSFER REGISTER IS FIRST LOADED WITH AN HEX -FF- AND THEN AN HEX -00-. THIS SETS AND CLEARS ALL BITS IN THE I/O TRANSFER LINES (DIAGNOSTIC CONNECTOR TIES DATA TRANSFER LINES TO I/O TRANSFER LINES EB1 BYTE) EXCEPT I/O TRANSFER LINES 3 AND 4. NOTE - THESE ARE LATCHED BECAUSE OF THE FUNCTION REGISTER SETTING. THE I/O TRANSFER LINES ARE THEN SENSED FOR AN HEX -F80C- TO VERIFY THE LATCHING OF I/O TRANSFER LINES 3 AND 4. NOTE - THE PARITY BIT OF THE DATA TRANSFER REGISTER (TIED TO EB2 BIT 7 OF THE TRANSFER LINES BY THE DIAGNOSTIC CONNECTOR) IS ALSO CHECKED FOR OFF. THIS IS SO SINCE THE FUNCTION REGISTER IS SET FOR EVEN PARITY. A START I/O READ CALL COMMAND IS ISSUED TO RESET I/O TRANSFER LINE 4. SEE THE 3741 LOGICS TO SEE HOW THIS IS PERFORMED. THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -FC04-. I/O TRANSFER LINE 3 SHOULD STILL BE ACTIVE (EB1 BIT 5) AND I/O TRANSFER LINE 4 SHOULD BE RESET (EB1 BIT 4). NOTE - I/O TRANSFER LINE 11 (EB2 BIT 5) IS ACTIVE SINCE THE DIAGNOSTIC CONNECTOR TIES READ CALL INTO I/O TRANSFER LINE 11. A START I/O IS ISSUED TO RESET THE READ CALL (AND I/O TRANSFER LINE 11). A START I/O WRITE CALL IS ISSUED TO RESET I/O TRANSFER LINE 3, SEE 3741 LOGIC DIAGRAMS. THE I/O TRANSFER LINES ARE THEN SENSED FOR AN HEX -FE00-. NOTE - WRITE CALL IS TIED TO I/O TRANSFER LINE 10 BY THE DIAGNOSTIC CONNECTOR. A START I/O GENERAL RESET IS THEN ISSUED TO RESET THE WRITE CALL. ALSO I/O TRANSFER LINE 11 IS DOTTED TO I/O SELECTING UNIT.

0A - RESET I/O DISCONNECT BY I/O TRANSFER LINES 3 AND 5. THE 3741 IS FIRST PROGRAMMED INITIALIZED, SEE SECTION II NOTES. THE 3741 IS REMOVED FROM DIAGNOSTIC MODE BY CLEARING THE FUNCTION REGISTER. A START I/O READ CALL IS ISSUED AND THE 3741 IS CHECKED FOR BEING BUSY. A START I/O RESET IS THEN EXECUTED TO CLEAR BUSY AND IS CHECKED BY A TIO FOR BUSY. THE FUNCTION REGISTER IS NEXT LOADED WITH AN HEX-0885- (EVEN PARITY, DIAGNOSTIC MODE, RESET I/O DISCONNECT BY I/O TRANSFER LINE 3 AND 5). THE DATA TRANSFER REGISTER IS LOADED. THIS CAUSES CORRECT PARITY (EVEN) TO BE STORED IN THIS REGISTER. A START I/O READ CALL IS ISSUED AND FOLLOWED BY A CONTROL 1 START I/O WITH I/O 3 SELECT ACTIVE. THE DIAGNOSTIC CONNECTOR TIES I/O 3 SELECT INTO END OF TRANSFER -EOT- LINE. THIS CAUSES I/O DISCONNECT TO BE ACTIVE FOR THE TEST. NEXT THE DATA TRANSFER REGISTER IS LOADED WITH AN HEX -04- WHICH ACTIVATES I/O TRANSFER LINE 3 BY THE DIAGNOSTIC CONNECTOR. I/O TRANSFER LINE 3 THEN STARTS THE 6 MICROSEC RESET OF I/O DISCONNECT (SEE FUNCTION REGISTER SETTING). THE DATA TRANSFER REGISTER IS THEN CLEARED AND ALSO STALLS FOR 6 MICROSECS WHILE THE RESET IS BEING DONE. THE I/O TRANSFER LINES ARE THEN SENSED FOR AN HEX -F800- (RESET OF I/O DISCONNECT -EB1 BIT 6 AND EVEN PARITY -EB2 BIT 7). THE SAME TEST IS PERFORMED AGAIN EXCEPT THAT THE DATA TRANSFER REGISTER IS LOADED WITH AN HEX -10- TO ACTIVATE I/O TRANSFER LINE 5. THIS IN TURN CAUSES A 6 MICROSEC RESET OF I/O DISCONNECT.

0B - CAUSE END OF TRANSFER (EOT) BY I/O TRANSFER LINES 1 AND 2. THE 3741 IS FIRST PROGRAMMED INITIALIZED, SEE SECTION II NOTES. THE FUNCTION REGISTER IS LOADED WITH AN HEX -3082- (I/O TRANSFER LINE 1 AND 2 EOT, DIAGNOSTIC MODE AND 6 MICROSEC RESET OF I/O DISCONNECT LATCH). THE DATA TRANSFER REGISTER IS LOADED WITH ZEROES TO PUT CORRECT PARITY (ODD) IN THE REGISTER. A START I/O WRITE CALL IS ISSUED TO THE 3741. THE DATA TRANSFER REGISTER IS LOADED WITH AN HEX -02- WHICH ACTIVATES (BY DIAGNOSTIC CONNECTOR) I/O TRANSFER LINE 2. I/O TRANSFER LINE 2, BY THE FUNCTION REGISTER, CAUSES END OF TRANSFER WHICH ACTIVATES I/O DISCONNECT. THE FUNCTION REGISTER ALSO SPECIFIES 6 MICROSEC RESET OF I/O DISCONNECT. THE DATA TRANSFER REGISTER IS LOADED WITH ZEROES WHILE THIS IS TAKING PLACE. THIS TEST IS VERIFIED BY SENSING THE DIAGNOSTIC BYTE AND THE DATA TRANSFER REGISTER FOR AN HEX -0000-. THE TEST IS REPEATED BUT A WRITE CALL START I/O IS USED AND I/O TRANSFER LINE 1 IS ACTIVATED BY LOADING THE DATA TRANSFER REGISTER WITH AN HEX -01-.

4.2 PROGRAM 402 (CONTINUED)

RTN#

0C - TEST EVEN PARITY AND VARIOUS PATTERNS IN THE DATA TRANSFER REGISTER TO I/O TRANSFER LINE TIES. THE 3741 IS FIRST PROGRAMMED INITIALIZED, SEE PROG 402 NOTES. WHILE THE 3741 IS SET FOR ODD PARITY (BY FUNCTION REGISTER) AN ODD BIT PATTERN, HEX -2C- IS LOADED INTO THE DATA TRANSFER REGISTER. THE I/O TRANSFER LINES ARE SENSED AND A CHECK IS MADE TO SEE THAT EB2 BIT 7 (DATA TRANSFER REGISTER PARITY BIT AS TIED BY THE DIAGNOSTIC CONNECTOR) IS OFF. THE DATA TRANSFER REGISTER IS LOADED WITH ZEROES. THIS CLEARS THE OLD TEST PATTERN AND ALSO SUPPLIES CORRECT PARITY FOR LATER TESTS. THE FUNCTION REGISTER IS LOADED WITH AN HEX -0190- (SLAVE BIT, DIAGNOSTIC MODE AND LATCH I/O TRANSFER LINE 3). A START I/O CONTROL 1 WITH I/O 5 SELECT ACTIVE IS ISSUED TO THE 3741. I/O 5 SELECT IS TIED TO I/O TRANSFER 5 BY THE DIAGNOSTIC CONNECTOR. I/O TRANSFER LINE 5 ACTIVE ALONG WITH THE SLAVE BIT IN THE FUNCTION REGISTER RESETS THE I/O TRANSFER LINES. THE DATA TRANSFER REGISTER IS LOADED WITH AN HEX -04- TO SET I/O TRANSFER LINE 3 (FROM FUNCTION REGISTER) AND LOADED WITH -00-. THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -F906- TO VERIFY I/O TRANSFER LINE 3 SET AND THAT I/O TRANSFER LINE 2 ON. I/O TRANSFER LINE 2 IS ACTIVATED BY I/O DISCONNECT WHICH WAS ACTIVATED BY I/O TRANSFER LINE 3 AND FUNCTION REGISTER'S SLAVE BIT, SEE 3741 LOGICS. THE FUNCTION REGISTER IS NEXT LOADED WITH AN HEX -0180- (SLAVE AND DIAGNOSTIC MODE). THE I/O TRANSFER LINES ARE THEN SENSED FOR AN HEX -F900-. NOTE - THE FUNCTION REGISTER NO LONGER SPECIFIES LATCHING OF I/O TRANSFER LINE 3. THE FUNCTION REGISTER IS LOADED AGAIN WITH AN HEX -01A0- (SLAVE, DIAGNOSTIC MODE AND LATCH I/O TRANSFER LINE 4). THE DATA TRANSFER REGISTER IS LOADED WITH AN HEX -08- WHICH ACTIVATES I/O TRANSFER LINE 4 BY THE DIAGNOSTIC CONNECTOR. THE DATA TRANSFER REGISTER IS THEN LOADED WITH ZEROES. THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -F90A- (I/O TRANSFER 4 LATCHED AND I/O TRANSFER LINE 2 ON). I/O TRANSFER LINE 2 IS ACTIVATED BY I/O DISCONNECT WHICH WAS ACTIVATED BY I/O TRANSFER LINE 4 AND THE FUNCTION REGISTER'S SLAVE BIT, SEE 3741 LOGICS. THE FUNCTION REGISTER IS THEN LOADED WITH AN HEX -0180- (SLAVE AND DIAGNOSTIC MODE). THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -F900- SINCE THE FUNCTION REGISTER DOES NOT SPECIFY LATCHING OF I/O TRANSFER LINE 4. THE FUNCTION REGISTER IS LOADED WITH AN HEX -0180- (SLAVE AND DIAGNOSTIC MODE). THE DATA TRANSFER REGISTER IS LOADED WITH AN HEX -20- WHICH ACTIVATES I/O TRANSFER LINE 6 BY THE DIAGNOSTIC CONNECTOR. THE DATA TRANSFER IS THEN CLEARED. THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -F922-. I/O TRANSFER LINE 6 IS LATCHED (SEE 3741 LOGIC) AND ALSO CAUSES (WITH FUNCTION REGISTER'S SLAVE BIT) I/O DISCONNECT WHICH ACTIVATES I/O TRANSFER LINE 2 (ALSO SEE 3741 LOGICS). THE I/O TRANSFER LINES ARE RESET BY LOADING THE FUNCTION REGISTER WITH AN HEX -0080- (NO SLAVE BIT). THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -F900- TO VERIFY THIS. THE FUNCTION REGISTER IS LOADED WITH AN HEX -0180- AGAIN WHILE THE DATA TRANSFER REGISTER IS LOADED WITH AN HEX -40-. THIS CAUSES I/O TRANSFER LINE 7 TO BE ACTIVATED BECAUSE OF THE DIAGNOSTIC CONNECTOR. THE DATA TRANSFER REGISTER IS CLEARED AND THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -F942-. I/O TRANSFER LINE 7 ACTS THE SAME AS I/O TRANSFER 6 IN THAT IT LATCHES ITSELF AND CAUSES I/O TRANSFER LINE 2 TO BE ACTIVE. THE FUNCTION REGISTER IS LOADED WITH AN HEX -0080- TO RESET THE I/O TRANSFER LINES. THE I/O TRANSFER LINES ARE SENSED FOR AN HEX -F900- TO VERIFY THIS RESET.

** PROGRAM 402 NOTES

* 'PROGRAM INITIALIZATION' PERFORMS THE FOLLOWING.
LOAD FUNCTION REGISTER WITH HEX -0080- (DIAGNOSTIC MODE). SET LENGTH COUNT REG. TO HEX -0000-.
CLEAR DATA ADDRESS REGISTER. ISSUE SIO (N-CODE 0, CONTROL CODE 0D) TO RESET 3741 LOGIC.
ISSUE TIO FOR NOT READY TO MAKE SURE 3741 IS READY.

4.3 PROGRAM 403 - 3741 DATA TRANSFER FUNCTION TEST.

RTN#

01 - TEST A SINGLE CHARACTER TRANSFER. THE FUNCTION REGISTER IS PRELOADED WITH AN HEX -002- (6 MICROSEC RESET 0 AND AN HEX -F0- IS LOADED INTO THE LENGTH COUNT REGISTER. THE DATA ADDRESS REGISTER IS LOADED WITH THE DATA BYTE ADDRESS. THE 3741 IS THEN PLACED IN THE DIAGNOSTIC MODE (LOADING AN HEX -0080- IN THE FUNCTION REGISTER). A START I/O READ CALL COMMAND IS ISSUED TO PREPARE THE 3741 FOR RECEIVING DATA. TWO START I/O CONTROL 2 COMMANDS ARE ISSUED (CONTROL CODE OF AN HEX -C4-) TO 'PRESENT' A DATA BYTE TO THE 3741 (SEE DIAGNOSTIC CONNECTOR SIGNAL TIE-BACKS, SEC 5.3). ISSUING TWO COMMANDS ALLOWS TIME FOR THE CONTROL CODES TO BE 'WRAPPED AROUNG' AND SENT BACK INTO THE 3741 LOGIC. THE DIAGNOSTIC BYTE/DATA TRANSFER REGISTER IS SENSED FOR AN HEX -0810- (I/O DISCONNECT IS ACTIVE AND THE DATA BYTE 'READ' IS AN HEX -10-). THE STATUS BYTE/LENGTH COUNT REGISTER IS SENSED FOR AN HEX -C1F1- (SPARE BIT, END REQUEST, AND READY). NOTE - THE LENGTH COUNT REGISTER SHOULD INCREMENT BY 1 TO BECOME AN HEX -F1-. THE DATA ADDRESS REGISTER IS ALSO SENSED TO SEE IF IT TOO INCREMENTED BY 1 (CHECKED ONLY FOR ROUTINE 01). THE DATA BYTE THAT IS TRANSFERRED INTO CORE IS CHECKED TO SEE IF IT IS AN HEX -10-.

02 - THIS ROUTINE TESTS A SINGLE CHARACTER TRANSFER IN THE SAME WAY AS ROUTINE 01. ROUTINE 02 USES A CONTRCL CODE OF AN HEX -D0- WHICH CAUSES AN HEX -40- DATA BYTE TO BE TRANSFERRED. THE SAME RESULTS ARE EXPECTED AFTER THE DATA TRANS-FER EXCEPT THAT THE DATA TRANSFER REGISTER SHOULD BE AN HEX -40-.

03 - THIS ROUTINE TFSTS A SINGLE CHARACTER TRANSFER IN THE SAME WAY AS ROUTINE 01. ROUTINE 03 USES A CCNTRCL CODE ON AN HEX -E8- WHICH CAUSES AN HEX -A0- DATA BYTE TO BE TRANSFERRED. THE SAME RESULTS ARE EXPECTED AFTER THE DATA TRANS-FER EXCEPT THAT THE DATA TRANSFER REGISTER SHOULD BE AN HEX -A0-.

04 - THIS ROUTINE TESTS A SINGLE CHARACTER TRANSFER IN THE SAME WAY AS ROUTINE 01. ROUTINE 04 USES A CONTROL CODE OF AN HEX -E1- WHICH CAUSES AN HEX -05- DATA BYTE TO BE TRANSFERRED. THE SAME RESULTS ARE EXPECTED AFTER THE DATA TRANS-FER EXCEPT THAT THE DATA TRANSFER REGISTER SHOULD BE AN HEX -05-.

05 - THIS ROUTINE TESTS A SINGLE CHARACTER TRANSFER IN THE SAME WAY AS ROUTINE 01. ROUTINE 05 USES A CONTROL CODE OF AN HEX -E2- WHICH CAUSES AN HEX -0A- DATA BYTE TO BE TRANSFERRED. THE SAME RESULTS ARE EXPECTED AFTER THE DATA TRANS-FER EXCEPT THAT THE DATA TRANSFER REGISTER SHOULD BE AN HEX -0A-.

06 - BUSY IS CHECKED FOR PROPER ON/OFF TIMINGS. THE 3741 IS FIRST PROGRAMMED INITIALIZED - SEE SECTION III NOTES. THE DATA ADDRESS REGISTER IS LOADED AND THE FUNCTION REGISTER, LENGTH COUNT REGISTER AND DATA TRANSFER REGISTER ARE CLEARED OUT. A START I/O CONTROL 1 COMMAND IS ISSUED. IMMEDIATELY AFTER, A TIO IS ISSUED TO CHECK THAT THE 3741 IS BUSY. THEN ANOTHER TIO IS ISSUED TO MAKE SURE THAT THE SIO IS NOT BUSY. NOTE - THE BUSY SIGNAL SHOULD ONLY LAST FOR 6 MICROSEC.

07 - TEST ABILITY OF 3741 TO DO A SINGLE DATA BYTE TRANSFER BY A WRITE CALL OPERATION. THE 3741 IS PROGRAMED INITIAL-IZED, SEE SECTION III NOTES. THE FUNCTION REGISTER IS LOADED WITH AN HEX -0002- (6 MICROSEC RESET) TO CLEAR THE LOGIC AND THE LENGTH COUNT REGISTER IS LOADED WITH AN HEX -FF-. THE DATA ADDRESS REGISTER IS LOADED AND AN HEX -AA- DATA BYTE IS LOADED INTO THE DATA ADDRESS REGISTER'S CORE ADDRESS. THE FUNCTION REGISTER IS LOADED WITH AN -8082- (WRITE MODE SET SERVICE RESPONSE, DIAGNOSTIC MODE, AND 6 MICROSEC RESET). A START I/O WRITE CALL IS ISSUED TO PREPARE THE 3741 TO RECEIVE A DATA BYTE. THE DIAGNOSTIC BYTE IS SENSED FOR A HEX -25- (SERVICE RESPONSE, WRITE CALL AND I/O SELECT) TO CHECK VALIDITY OF THE COMMAND. A START I/O CONTROL 2 COMMAND (CONTROL CODE OF HEX -40-) IS ISSUED TO FORCE SERVICE REQUEST. THE STATUS/LENGTH COUNT REGISTER IS SENSED FOR A HEX -E100- (SPARE, END REQUEST, INTERRUPT PENDING AND I/O READY). THE DIAGNOSTIC/DATA TRANSFER REGISTER IS SENSED FOR A HEX -00AA-.

08 - TEST FOR 6 MICROSEC RESET OF SERVICE RESPONSE. THE 3741 IS PROGRAMMED INITIALIZED - SEE SECTION III NOTES. THE FUNCTION REGISTER IS LOADED WITH AN HEX -0082- FOR DIAGNOSTIC MODE AND 6 MICROSEC RESET. THE LENGTH COUNT REGISTER IS CLEARED AS WELL AS THE DATA TRANSFER REGISTER. THE DATA ADDRESS REGISTER IS PRELOADED. THE FUNCTION REGISTER IS LOADED WITH AN HEX -4190- (6 MICROSEC RESET OF SERVICE RESPONSE, SLAVE, DIAGNOSTIC MODE AND LATCH TRANSFER LINE 3). A START I/O WRITE CALL IS ISSUED FOLLOWED BY TWO CONTROL 2 START I/O'S WITH A CONTROL CODE OF HEX -40-. THE CONTROL CODE OUTPUT IS TIED INTO THE SERVICE REQUEST LINE BY THE DIAGNOSTIC CONNECTOR. THE I/O TRANSFER REGISTER IS SENSED FOR A HEX -FF06-. THE TRANSFER LINE 3 BIT BEING ACTIVE MEANS THAT IT WAS SET ON BY SERVICE RESPONSE. NOTE - THE ADDRESS LOADED INTO THE DATA ADDRESS REGISTER IS POINTING TO A -00- BYTE. THE DIAGNOSTIC/DATA TRANSFER REGISTER IS SENSED FOR A HEX -0500-. NOTE - THE SERVICE RESPONSE BIT SHOULD BE OFF (RESET).

09 - TEST SERVICE RESPONSE DRIVER. THE 3741 IS PROGRAM INITIALIZED - SEE SECTION III NOTES. THE FUNCTION REGISTER IS LOADED WITH AN HEX -0002- (6 MICROSEC RESET OF DISCONNECT LATCH). AN HEX -F0- IS LOADED INTO THE LENGTH COUNT REGISTER. THE DATA ADDRESS REGISTER IS LOADED WITH A BYTE -00- ADDRESS. THE DATA TRANSFER REGISTER IS CLEARED AND THE FUNCTION REGISTER IS LOADED WITH AN HEX -0080- (DIAGNOSTIC MODE). A START I/O WRITE CALL IS ISSUED AND FOLLOWED BY TWO CONTROL 2 START I/O'S WITH A HEX -40- CONTROL CODE. A SENSE IS ISSUED TO ALLOW TIME FOR THE OUTPUT SIGNAL TO WRAP-AROUND INTO THE INPUT LINE. THE I/O TRANSFER LINES ARE SENSED FOR A HEX -FF04- TO VERIFY THAT THE TEST WORKED PROPERLY.

0A - TRANSFER THREE READ CALL DATA BYTES. THE 3741 IS PROGRAM INITIALIZED - SEE SECTION III NOTES. THIS ROUTINE IS THE SAME AS ROUTINE 01 EXCEPT THAT THREE DATA BYTES ARE TRANSFERRED. THESE BYTES ARE -05-, -0A- AND -A0-. AFTER EACH DATA TRANSFER, THE DATA TRANSFER REGISTER IS SENSED AND CHECKED FOR ERROR. THE LENGTH COUNT REGISTER IS MONITORED TO ENSURE THAT IT IS INCREMENTED AFTER EACH DATA TRANSFER. THE DATA ADDRESS REGISTER IS ALSO CHECKED FOR PROPER INCREMENTATION.

4.3 PROGRAM 403 (CONTINUED)

0B - TEST LENGTH COUNT OVERFLOW. THE 3741 IS PROGRAM INITIALIZED - SEE SECTION III NOTES. THE FUNCTION REGISTER IS LOADED WITH AN HEX -0002- TO RESET THE I/O DISCONNECT LATCH. THE DATA ADDRESS REGISTER IS PRELOADED AND THE DATA TRANSFER REGISTER IS CLEARED. THE LENGTH COUNT REGISTER IS LOADED WITH AN HEX -FE- AND THE FUNCTION REGISTER IS LOADED WITH AN HEX -0080- WHICH PUTS THE 3741 IN A DIAGNOSTIC MODE. A START I/O READ CALL IS ISSUED TO THE 3741 FOLLOWED BY TWO CONTROL 2 START I/O 'S TO TRANSFER A SINGLE DATA BYTE. THE STATUS/LENGTH COUNT IS SENSED FOR AN HEX -81FF- (SPARE AND I/O READY). THE -FF- SHOWS THAT THE LENGTH COUNT REGISTER IS INCREMENTING. THE DATA TRANSFER REGISTER IS CLEARED. TWO MORE CONTROL 2 'S ARE ISSUED TO TRANSFER ANOTHER DATA BYTE (HEX -05-). THIS TRANSFER SHOULD CAUSE THE LENGTH COUNT REGISTER TO 'OVERFLOW' , THAT IS GO TO 0. TO VERIFY THIS TEST, THE DIAGNOSTIC/ DATA TRANSFER REGISTER IS SENSED FOR AN HEX -0805- (I/O DISCONNECT AND DATA BYTE -05-). THE STATUS/LENGTH COUNT REGISTER IS SENSED FOR AN HEX -E200- (SPARE, END REQUEST, INTERRUPT PENDING AND THE LENGTH COUNT -00-).

0C - TEST LENGTH COUNT OVERFLOW BY WRITE CALL DATA TRANSFER. THE 3741 IS PROGRAM INITIALIZED - SEE SECTION III NOTES. THE FUNCTION REGISTER IS LOADED WITH AN HEX -0082- TO RESET THE DISCONNECT LATCH AND PUT THE 3741 IN DIAGNOSTIC MODE. THE DATA TRANSFER REGISTER IS CLEARED AND THE LENGTH COUNT REGISTER IS LOADED WITH AN HEX -FF-. THE DATA ADDRESS REGISTER IS PRELOADED AND THE FUNCTION REGISTER IS LOADED WITH AN HEX -0080- TO PUT THE 3741 IN DIAGNOSTIC MODE. A START I/O WRITE CALL IS ISSUED TO THE 3741. A CONTROL 2 START I/O IS ISSUED NEXT. THIS CAUSES A DATA BYTE TO BE LOADED INTO THE DATA TRANSFER REGISTER FROM CORE. THE DIAGNOSTIC BYTE IS SENSED FOR AN HEX -25- (SERVICE RESPONSE, WRITE CALL AND I/O SELECTED) AND THE STATUS/LENGTH COUNT IS SENSED FOR AN HEX -8300- (SPARE, LENGTH COUNT OVERFLOW AND I/O READY) TO VERIFY THIS TEST. ANOTHER CONTROL 2 START I/O IS ISSUED TO TRANSFER THE DATA BYTE TO THE 'DEVICE'. THIS WILL CAUSE END REQUEST AND INTERRUPT PENDING. THE STATUS BYTE IS SENSED FOR AN HEX -E2- TO VERIFY THIS. THE DIAGNOSTIC BYTE IS ALSO SENSED FOR AN HEX -08- (I/O DISCONNECT).

0D - TEST DATA ADDRESS REGISTER FOR DECREMENTATION. THE 3741 IS FIRST PROGRAM INITIALIZED - SEE SECTION III NOTES. THE FUNCTION REGISTER IS LOADED WITH AN HEX -0482- (DECREMENT DAR, DIAGNOSTIC MODE AND DISCONNECT LATCH RESET. THE DATA TRANSFER REGISTER IS CLEARED AND AN HEX -F0- IS LOADED INTO THE LENGTH COUNT REGISTER. THE DATA ADDRESS REGISTER IS PRELOADED. A START I/O READ CALL IS ISSUED FOLLOWED BY TWO CONTROL 2 START I/O 'S TO TRANSFER A DATA BYTE. THE DATA ADDRESS REGISTER IS SENSED AND CHECKED TO ENSURE THAT IT DECREMENTED. TWO MORE CONTROL 2 COMMANDS ARE ISSUED TO TRANSFER ANOTHER DATA BYTE. THE DATA ADDRESS REGISTER IS AGAIN CHECKED FOR DECREMENTING. THE STATUS/ LENGTH COUNT IS SENSED FOR AN HEX -81F2- (SPARE, I/O READY AND LENGTH COUNT INCREMENTING). A CONTROL 1 START I/O IS ISSUED (CONTROL CODE OF HEX -04-) TO FORCE AN OVERFLOS CONDITION. THE STATUS/LENGTH COUNT REGISTER IS SENSED FOR AN HEX -E0F2- (SPARE, END REQUEST AND INTERRUPT PENDING).

0E - TEST 3741 ABILITY TO INTERRUPT. 'PROGRAM INITIALIZE' 3741 (SEE PROGRAM 403 NOTES). LOAD AND SENSE INTERRUPT LEVEL 5 REGISTER WITH DIFFERENT PATTERNS TO VERIFY THAT REG. IS WORKING. PERFORM LOGICAL -OR- ON INTERRUPT ROUTINE STARTING ADDRESS WITH EXPECTED VALUE OF ARR. THE RESULT IS A SPECIAL ADDRESS. WHEN AN INTERRUPT OCCURS, THE CPU NORMALLY GOES TO THE ADDRESS IN THE INTERRUPT REGISTER. HOWEVER, A CERTAIN CPU BUG LOGICALLY OR'S THE INTERRUPT ADDRESS WITH THE ARR AND BRANCHES TO THIS SPECIAL ADDRESS. IF THIS HAPPENS, THE PROGRAM WILL CATCH IT.
THE DATA ADDRESS REGISTER IS PRELOADED. LENGTH COUNT REG IS LOADED WITH HEX -FF-. FUNCTION REGISTER IS LOADED WITH HEX -0082- (DIAGNOSTIC MODE AND DISCONNECT LATCH RESET).
INTERRUPTS ENABLED WITH AND SIO. SIO TO READ FOLLOWED BY TWO CONTROL 2 SIO'S ARE ISSUED.
THIS CAUSES A DATA BYTE TO BE TRANSFERRED. THIS CAUSES LENGTH COUNT OVERFLOW WHICH INITIATES THE INTERRUPT.
AFTER A SHORT DELAY, A CHECK IS MADE TO SEE IF THE INTERRUPT DID OCCUR. IF INTERRUPT DID NOT OCCUR, AN ERROR MESSAGE IS PRINTED. IF IT DID OCCUR, A BRANCH IS ISSUED TO SWITCH THE ARR REGISTER WITH THE INTERRUPT REGISTER. NEXT AN SIO IS ISSUED TO RESET THE INTERRUPT.
AND GIVE CONTROL BACK TO THE MAIN PROGRAM. THE INTERRUPT REGISTER WHICH IS NOW THE ARR REGISTER IS LOADED AND SENSED WITH TEST PATTERNS TO CHECK OUT THE ARR REGISTER.

0F - TRANSFER BAD PARITY DATA. THE 3741 IS FIRST PROGRAM INITIALIZED - SEE SECTION III NOTES. A DATA BYTE IS TRANSFERRED IN THE SAME WAY AS IS DONE IN ROUTINE 01. A CONTROL CODE OF AN HEX -C8- (WHICH GENERATES BAD DATA PARITY) IS USED IN THE CONTROL 2 START I/O 'S. THE STATUS BYTE IS SENSED FOR AN HEX -C9- (SPARE, END REQUEST, DATA PARITY CHECK AND I/O READY). THE I/O TRANSFER LINES ARE SENSED FOR A HEX -F8A2- TO VERIFY THE TEST. A START I/O RESET IS ISSUED TO 'CLEAR' THE ERROR, AND A TEST I/O IS ISSUED TO MAKE SURE THAT THE 3741 IS READY.
* NOTE 1 ---- THIS ROUTINE MUST BE DIALED IN BY DCP SSWS -F20F-.

** PROGRAM 403 NOTES

* EACH TEST ROUTINE BRANCHES TO A SUBROUTINE TO PROGRAM INITIALIZE THE 3741. THIS INITIALIZATION CONSISTS OF LOADING THE FUNCTION REGISTER WITH AN HEX -0080- (DIAGNOSTIC MODE), SETTING THE LENGTH COUNT REGISTER TO ZERO, CLEARING THE DATA ADDRESS REGISTER AND DOING A START I/O (N CODE 0, CONTROL CODE 0D) THAT RESETS THE 3741 LOGIC. BEFORE CONTROL IS GIVEN BACK TO THE ROUTINE, A TEST I/O FOR NOT READY COMMAND IS ISSUED TO BE SURE THAT THE 3741 IS READY.

4.4 PROGRAM 404

01 - - ROUTINE PRINTS THESE INSTRUCTIONS. 1) REMOVE WRAP CONNECTOR 2) INSERT I/O CONNECTOR 3) INSERT 3741 I/O ADAPTER WRAP DIAGNOSTIC DISKETTE P/N 2469460 OR A GOOD SCRATCH DISKETTE INTO DRIVE 1 4) FOLLOW PRINTED DIRECTIONS TO SET UP 3741 FOR DATA TRANSFER FROM S/3 TO 3741. 5) RESET THE SYSTEM/3 HALT. 404 WRITES 52 RECORDS TO 3741. THE FIRST PATTERN IS 128 BYTES OF X'55'. NEXT PATTERN- 128 BYTES OF X'AA'. THE HEXIDECIMAL PATTERNS CONTINUE WITH FF, 01, 00, 55, AA, FF, ETC. EACH RECORD CONTAINS 128 BYTES OF THE SAME BYTE. EXCEPTION -- A COUNTER WITHIN EACH 128 BYTE FIELD CAUSES EACH RECORD TO BE UNIQUE. THE COUNTER IS INCREMENTED FROM 001 TO 052 DURING WRITING.
A PRINTOUT AND HALT WILL OCCUR FOR ANY ERRORS WHICH OCCUR DURING READING OR WRITING.
INTERRUPTS ARE CHECKED THOROUGHLY. (ON MODELS 6 AND 10, INTERRUPT PENDING IS USED). ANY EXTRA INTERRUPT OR MISSING INTERRUPT WILL BE FLAGGED AS AN ERROR. ANY INTERRUPT WHICH DOES NOT OCCUR WITHIN 7 SECONDS IS CONSIDERED A MISSED INTERRUPT. THIS ALLOWS 3741 TIME FOR SEEKS AND RETRY.
CAUTION -- DUE TO INTERRUPT CHECKING, THE PROGRAM MUST BE AT HALT 'F1' OR 'F2' BEFORE THE 3741 IS SET UP.
(IF SYSTEM RESET WERE PERFORMED AFTER 3741 SET UP, THE PROGRAM WILL MISS THE 1ST INTERRUPT.)

02 - THIS ROUTINE IS A FREE LANCE AID. IT MAY ALSO BE REFERENCED BY THE 3741 MAPS. IT IS CALLED UP USING DCP'S DIAL UP OPTION ('F202') TO GO TO ROUTINE 2. THE ROUTINE PRINTS OUT BRIEF INSTRUCTIONS. SET UP THE 3741 TO READ OR WRITE. WHEN THE HALT IS RESET ONE RECORD WILL BE TRANSFERRED. IF THE OPERATION WAS A READ FROM 3741, THE DATA READ IS PRINTED OUT. IF IT WAS WRITTEN TO 3741, WHATEVER DATA IS IN THE PROGRAM'S BUFFER (EG. THE LAST RECORD READ) WILL BE WRITTEN TO 3741.

4.5 IPL FROM THE 3741. NOTE: THIS SECTION APPLIES TO THOSE CARDLESS SYSTEMS WITH 3741 IPL FEATURE. THE IPL DIAGNOSTIC PROCEDURE IS AS FOLLOWS: 1) TURN THE PROGRAM SELECTOR SWITCH TO ALTERNATE. 2) INSERT THE CPU MAP ENTRY DISKETTE INTO THE 3741. 3) SET UP THE 3741 FOR OUTPUT BY TYPING '41' AND THEN PRESSING THE UPPER 'FUNCT SEL' AND 'DUP' KEYS. 4) PRESS THE PROGRAM LOAD BUTTON ON THE S/3 PANEL. IF IPL DOES NOT OCCUR, REFER TO S/3 3741 CARDLESS FEATURE MAPS.

5. 3741 INFORMATION.

5.1 3741 COMMANDS.

ASSEMBLER INSTRUCTION	CORE IMAGE	DEFINITION
TIO	C1 4N XXXX	THE 3741 TEST I/O COMMAND HECKS FOR A CONDITION, AS SPECIFIED BY THE N CODE. IF THE CONDITION DOES EXIST A BRANCH TO CORE LOCATION XXXX OCCURS. IF THE CONDITION DOES NOT EXIST THEN THE INSTRUCTION IMMEDIATELY FOLLOWING THE TIO IS EXECUTED.
	N = 0	TEST FOR THE 3741 NOT READY CONDITION.
	N = 2	TEST FOR THE 3741 BUSY CONDITION.
SNS	30 4N XXXX	THE 3741 SENSE COMMAND TRANSFERS THE CONTENTS OF A 3741 REGISTER, DETERMINED BY THE N CODE, TO CORE. THE REGISTERS (TWO BYTES) ARE TRANSFERED DURING TWO EB CYCLES. DURING THE EB1 CYCLE BYTE 1 OF THE REGISTER IS PLACED INTO CORE AT LOCATION -XXXX-, BYTE 2 IS TRANSFERRED DURING THE EB2 CYCLE AND PLACED INTO CORE AT LOCATION -XXXX-1-.
	N = 1	CONTENTS OF THE FUNCTION REGISTER IS STORED.
	N = 2	THE STATUS BYTE (BYTE 2) AND LENGTH COUNT REGISTER (BYTE 1) ARE STORED.
	N = 3	CONTENTS OF THE I/O TRANSFER LINE REGISTER IS STORED.
	N = 4	THE ADDRESS IN THE DATA ADDRESS REGISTER IS STORED.
	N = 5	THE DIAGNOSTIC BYTE (BYTE 1) AND DATA TRANSFER REGISTER (BYTE 2) ARE STORED.
LIO	31 4N XXXX	THE 3741 LOAD I/O COMMAND LOADS THE REGISTER AS SPECIFIED BY THE N CODE, WITH DATA FROM CORE LOCATION -XXXX-. DATA IS TRANSFERRED DURING TWO EB CYCLES. DURING THE EB1 CYCLE THE BYTE OF DATA AT LOCATION -XXXX- IS LOADED INTO THE REGISTER AS BYTE 1. DATA FROM LOCATION -XXXX-1- IS LOADED INTO THE REGISTER AS BYTE 2 DURING EB2 CYCLE.
	N = 1	DATA IS LOADED INTO THE FUNCTION REGISTER.
	N = 2	DATA IS LOADED INTO THE LENGTH COUNT REGISTER DURING EB1 CYCLE. EB2 CYCLE IS NOT USED SINCE THE STATUS BYTE CAN NOT BE LOADED.
	N = 4	DATA (AN ADDRESS USUALLY) IS LOADED INTO THE DATA ADDRESS REGISTER.
	N = 5	DATA IS LOADED INTO THE DATA TRANSFER REGISTER DURING EB1 CYCLE. EB2 CYCLE IS NOT USED SINCE THE DIAGNOSTIC BYTE CAN NOT BE LOADED.
SIO	F3 4N YY	THE 3741 START I/O COMMAND CONTROLS THE MODE OF OPERATION OF THE 3741 BY SPECIFYING AN N CODE AND AN CONTROL CODE. THE CONTROL CODE IS USED WITH ALL N CODES EXCEPT N = 3 AND N = 4. IN THESE TWO CASES THE CONTROL CODE SPECIFIES CERTAIN I/O SELECTS THAT ARE SENT TO A DEVICE WHEN ATTACHED.
	N = 0	BASIC RESET COMMAND. THIS COMMAND DOES NOT PERFORM AN I/O FUNCTION. IT READYS THE 3741 FOR OTHER SIO COMMANDS AS SPECIFIED BY ITS CONTROL CODE -YY-.
	N = 1	READ CALL COMMAND. THIS COMMAND SETS THE LOGIC SO THAT DATA IS ALLOWED TO CYCLE STEAL INTO CORE FROM THE ATTACHED DEVICE. THE CONTROL CODE -YY- CAN BE USED WITH READ CALL.
	N = 2	WRITE CALL COMMAND. THIS COMMAND SETS THE LOGIC SO THAT DATA IS ALLOWED TO CYCLE STEAL FROM CORE TO THE DEVICE. THE CONTROL CODE -YY- CAN BE USED WITH THE WRITE CALL.
	YY = 01	THIS CONTROL CODE IS USED TO RESET AN INTERUPT REQUEST.
	YY = 02	THIS CONTROL CODE ENABLES THE DEVICE TO CAUSE AN INTERUPT WHEN READY TO.
	YY = 04	THIS CONTROL CODE RESETS THE ENABLE INTERUPT ABILITY.
	YY = 08	THIS IS A GENERAL 3741 RESET TO THE ADAPTER.
	**	THESE CONTROL CODES CAN BE USED IN ANY COMBINATION WITH N CODES OF 0, 1 AND 2.
	N = 3	CONTROL 1 COMMAND. THE CONTROL CODE -YY- USED WITH THIS COMMAND SPECIFIES WHICH COMBINATION OF I/O SELECTS (1 TO 8) TO ACTIVATE FOR THE ATTACHED DEVICE.
	N = 4	CONTROL 2 COMMAND. THE CONTROL CODE -YY- USED WITH THIS COMMAND SPECIFIES WHICH COMBINATION OF I/O SELECTS (9 TO 14 AND UNITS 1,2) TO ACTIVATE FOR THE ATTACHED DEVICE.

5.2 REGISTER'S BIT DEFINITIONS.

<table>
<tr><th>REGISTER</th><th>BIT NUMBER - DEFINITION WHEN ACTIVE</th></tr>
<tr><td>FUNCTION REGISTER

THIS REGISTER CONTROLS THE WAY THE 3741 AND ADAPTER 'FUNCTIONS' WHEN COMMANDS AND DATA ARE PASSED BACK AND FORTH BETWEEN THE DEVICE AND THE CPU.

DURING NORMAL OPERATION OF THE 3741, THE FUNCTION REGISTER IS LOADED WITH HEX -4000-.

EB2 EB1
0 ---- 7 0 ---- 7
-------- --------
| | |
--------- --------
FUNCTION</td><td>***** BYTE 2 EB2
BIT 0 - SERVICE RESPONSE LATCH WILL BE SET WHEN 3741 IS IN WRITE MODE.
BIT 1 - SERVICE RESPONSE LATCH WILL BE RESET 6 USEC AFTER SERVICE REQUEST HAS GONE NON-ACTIVE (DROPPED).
BIT 2 - THIS BIT ALLOWS I/O TRANSFER LINE 2 (WHEN ACTIVATED) TO CAUSE AN EOT (END OF TRANSMISSION) SIGNAL AND TO GENERATE I/O DISCONNECT. THIS WILL MAKE THE 3741 NOT BUSY AND BE READY FOR ANOTHER START I/O COMMAND.
BIT 3 - THIS BIT ALLOWS I/O TRANSFER LINE 1 (WHEN ACTIVATED) TO CAUSE AN EOT (END OF TRANSMISSION) SIGNAL AND TO GENERATE I/O DISCONNECT. THIS WILL MAKE THE 3741 NOT BUSY AND BE READY FOR ANOTHER START I/O COMMAND.
BIT 4 - DATA IS NORMALLY CHECKED FOR ODD PARITY BUT THIS BIT MAKES THE 3741 CHECK DATA FOR EVEN PARITY.
BIT 5 - THIS BIT CAUSES DATA TO BE TRANSFERRED INTO/OUT OF CORE 'BACKWARDS' BY DECREMENTING THE ADDRESS STORED IN THE DATA ADDRESS REGISTER. IF THIS BIT IS OFF, THE DATA ADDRESS REGISTER WILL BE INCREMENTED.
BIT 6 - THIS BIT CAUSES I/O 1 SELECT TO LATCH WHEN ACTIVATED. THE I/O 1 SELECT IS THEN RESET BY THE DEVICE VIA TRANSFER LINE 2.
BIT 7 - THIS BIT CONTROLS THE ABILITY TO LATCH I/O TRANSFER LINES 6 AND 7 WHEN THEY ARE ACTIVATED.
***** BYTE 1 EB1
BIT 0 - THIS BIT PLACES THE 3741 ADAPTER IN A DIAGNOSTIC MODE OF OPERATION. THIS ALLOWS START I/O'S TO BE ISSUED WITH A DEVICE NOT ATTACHED TO CHECK THE CURCUITRY.
BIT 1 - SPARE BIT.
BIT 2 - THIS BIT CAUSES I/O TRANSFER LINE 4 TO LATCH WHEN ACTIVATED.
BIT 3 - THIS BIT CAUSES I/O TRANSFER LINE 3 TO LATCH WHEN ACTIVATED.
BIT 4 - THIS BIT CAUSES I/O TRANSFER LINE 1 TO LATCH WHEN ACTIVATED.
BIT 5 - THIS BIT ALLOWS I/O TRANSFER LINE 3 TO RESET I/O DISCONNECT LATCH.
BIT 6 - THIS BIT CAUSES THE I/O DISCONNECT LATCH TO RESET AFTER 6 USEC.
BIT 7 - THIS BIT ALLOWS I/O TRANSFER LINE 5 TO RESET I/O DISCONNECT LATCH.</td></tr>
<tr><td>STATUS BYTE

THIS REGISTER SHOWS THE 'STATE' OF THE I/O DEVICE DURING OPERATION.

EB2 EB1
0 ---- 7 0 ---- 7
-------- --------
| | |
--------- --------
STATUS LCR

LENGTH COUNT REGISTER

THIS REGISTER CONTAINS THE VALUE OF 256 - NUMBER OF DATA BYTES TO TRANSFER.</td><td>***** BYTE 2 EB2 (BYTE 1 IS THE LENGTH COUNT REGISTER).
* BIT 0 - CE SPARE BIT.
* BIT 1 - END REQUEST IS ACTIVE.
BIT 2 - INTERUPT PENDING. THE DEVICE IS TRYING TO INTERUPT BUT CANN'T TILL INTERUPTS ARE ENABLED.
BIT 3 - I/O ATTENTION. THE DEVICE ATTACHED REQUIRES OPERATOR INTERVENTION TO MAKE IT READY.
BIT 4 - PARITY CHECK DETECTED ON BYTE OF DATA IN THE DATA TRANSFER REGISTER.
BIT 5 - THE LAST START I/O COMMAND WAS NO-OP'ED. THIS USUALLY HAPPENS WHEN THE 3741 DROPS READY BEFORE THE START I/O IS ISSUED.
BIT 6 - THE LENGTH COUNT REGISTER OVERFLOWED WHICH FORCES AN EOT (END OF TRANSMISSION).
BIT 7 - I/O READY. THIS SIGNIFIES THAT THE DEVICE HAS ACCEPTED THE COMMAND AND IS READY FOR THE NEXT COMMAND.
* THESE BITS ARE PROVIDED FOR DIAGNOSTICS AND ARE NOT USED IN THE I/O CONTROL PROGRAM.
***** BYTE 1 EB1
BIT 0 - 7 CONTAINS THE DATA LENGTH COUNT.</td></tr>
<tr><td>I/O TRANSFER LINES

THESE LINES ARE USED BY THE ATTACHED DEVICE TO CONVEY INFORMATION TO THE CPU.

EB2 EB1
0 ---- 7 0 ---- 7
-------- --------
| | |
--------- --------
I/O TRANSFER LINES</td><td>***** BYTE 2 EB2
BIT 0 ----/ THESE BITS MAKE UP THE DEVICE ID. UP TO 16 DEVICE ID'S ARE
BIT 1 ---/ POSSIBLE. THE DIAGNOSTIC CONNECTOR ID IS -F- ALL BITS ON.
BIT 2 --/
BIT 3 -/
BIT 4 - THIS BIT IS ACTIVE WHEN THE 3741 I/O CABLE IS ATTACHED.
BIT 5 - STATUS OF I/O TRANSFER LINE 11. (3741 ON LINE).
BIT 6 - STATUS OF I/O TRANSFER LINE 10. (WRITE TO ATTACHMENT).
BIT 7 - STATUS OF I/O TRANSFER LINE 9. (READ FORM ATTACHMENT).
***** BYTE 1 EB1
BIT 0 - STATUS OF I/O TRANSFER LINE 8. (NOT USED).
BIT 1 - STATUS OF I/O TRANSFER LINE 7. (NOT USED).
BIT 2 - STATUS OF I/O TRANSFER LINE 6. (3741 BUS IN PARITY ERROR).
BIT 3 - STATUS OF I/O TRANSFER LINE 5. (END OF RECORD).
BIT 4 - STATUS OF I/O TRANSFER LINE 4. (END OF JOB OUT).
BIT 5 - STATUS OF I/O TRANSFER LINE 3. (3741 ATTENTION REQUIRED).
BIT 6 - STATUS OF I/O TRANSFER LINE 2. (NOT USED).
BIT 7 - STATUS OF I/O TRANSFER LINE 1. (NOT USED).</td></tr>
</table>

5.2 REGISTER'S BIT DEFINITIONS. (CONTINUED)

REGISTER	BIT NUMBER - DEFINITION WHEN ACTIVE
DATA ADDRESS REGISTER (I/O LSR REGISTER) THE CONTENTS CONTAIN AN ADDRESS (THAT IS UPDATED) TO SHOW WHERE TO STORE THE CURRENT DATA BYTE.	***** BYTE 2 AND 1 MAKE UP A VALID ADDRESS FOR STORING DATA IN CORE. EB2 EB1 0 ---- 7 0 ---- 7
DIAGNOSTIC BYTE THIS BYTE IS USED TO AID IN FURTHER ANALYSIS OF THE OPERATION OF THE 3741.	***** BYTE 2 (BYTE 1 IS THE DATA TRANSFER REGISTER) * BIT 0 - STATUS OF THE 3741 REQUEST LATCH. * BIT 1 - STATUS OF SERVICE REQUEST LATCH. * BIT 2 - STATUS OF SERVICE RESPONSE. * BIT 3 - INTERRUPTS ARE ENABLED. * BIT 4 - I/O DISCONNECT IS ACTIVE. * BIT 5 - WRITE CALL IS ACTIVE. * BIT 6 - READ CALL IS ACTIVE. * BIT 7 - 3741 I/O OPERATION HAS BEEN SELECTED. * THES BITS ARE PROVIDED FOR DIAGNOSTICS AND ARE NOT USED IN THE I/O CONTROL PROGRAM.
DATA TRANSFER REGISTER THIS BYTE ACTS AS A BUFFER BETWEEN THE I/O DEVICE AND THE CPU.	***** BYTE 1 BIT 0 - 7 ONE BYTE OF DATA IS STORED HERE.
I/O CONTROL CODES THESE SIGNALS ARE SENT TO THE DEVICE WHEN A START I/O CONTROL 1 OR 2 IS ISSUED.	***** START I/O CONTROL 2 CONTROL CODE EB2 F344 BIT 0 - I/O 14 SELECT. (NOT USED). BIT 1 - I/O 13 SELECT. (NOT USED). BIT 2 - I/O 12 SELECT. (NOT USED). BIT 3 - I/O 11 SELECT. (NOT USED). BIT 4 - I/O 10 SELECT. (NOT USED). BIT 5 - I/O 9 SELECT. (ATTACHMENT BUSY). BIT 6 - I/O UNIT 2 SELECT. (NOT USED). BIT 7 - I/O UNIT 1 SELECT. (NOT USED). ***** START I/O CONTROL 1 CONTROL CODE EB1 F343 BIT 0 - I/O 8 SELECT. (BUS OUT PARITY ERROR). BIT 1 - I/O 7 SELECT. (END OF JOB IN). BIT 2 - I/O 6 SELECT. (END OF DATA SET IN). BIT 3 - I/O 5 SELECT. (SENSE RESPONSE). BIT 4 - I/O 4 SELECT. (FORCE RESPONSE). BIT 5 - I/O 3 SELECT. (SET UP ERROR). BIT 6 - I/O 2 SELECT. (NOT USED). BIT 7 - I/O 1 SELECT. (NOT USED).

5.3 DIAGNOSTIC CONNECTOR TIE BACKS.

FOR A CHART OF TIE BACKS REFER TO 3741 MAPS. PAGE 854.

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NOTE: 3270 DISPLAY SYSTEM IS CONNECTED TO S/3 MODEL 10 VIA LOCAL COMMUNICATIONS ADAPTER (LCA), BSCA-1 OR BSCA-2.

1. GENERAL PROGRAM SUMMARY

1.1 DEVICE TESTS AND OPTIONS

1.1.1 DEVICE TESTS

SECTION	ROUTINE	INTENT	APPLICABLE SENSE SWITCHES
871--GRAPHIC TEST PATTERNS	01	THE FIRST DISPLAY WILL BE GIVEN IN THIS ROUTINE. THIS IS MERELY AN INSTRUCTIONAL MESSAGE WHICH WILL EXPLAIN HOW TO USE THE RPTS.	11,1A
	02	THE FIRST ACTUAL TEST WILL BE DISPLAYED IN THIS ROUTINE. THE MAIN TEST PROVIDED IS ALPHABETIC AND SPECIAL CHARACTERS BEING DISPLAYED.	11,1A
	03	THE SECOND TEST WILL BE PROVIDED IN THIS ROUTINE. THIS TEST IS FOR THE 3277-1/3275-1 ONLY. THE ENTIRE SCREEN WILL BE OUTLINED BY E'S VERTICALLY AND H'S HORIZONTALLY.	11,1A
	04	THE THIRD TEST WILL BE PROVIDED IN THIS ROUTINE. ONLY THE 3277-2/3275-2 WILL BE TESTED . AS IN ROUTINE 3 THE ENTIRE SCREEN WILL BE OUTLINED BY E'S AND H'S.	11,1A
872--PRINTER TEST PATTERNS	01	THE FOURTH TEST IS PROVIDED IN THIS ROUTINE. CHECKS ARE MADE OF THE TERMINAL FUNCTION CODES.	11,1A
	02	THE FIFTH TEST IS PROVIDED IN THIS ROUTINE. 3270 UNIVERSAL CHARACTER SET IS TESTED.	11,1A
	03	THE SIXTH TEST IS PROVIDED IN THIS ROUTINE. NEW LINE FUNCTION CHECK IS MADE IN THIS TEST.	11,1A

1.1.2 OPTIONS

SENSE SWITCH OPTIONS

SENSE SWITCH NUMBER	OPTION PROVIDED WHEN SENSE SWITCH IS ON	SECTIONS WHERE USED
11	BYPASS PRINTING THE TRANSMITTED AND RECEIVED DATA (ALL OTHER INFORMATION WILL STILL BE PRINTED).	871, 872
12	DISABLE THE BSCA AND TERMINATE THE SECTION CURRENTLY BEING EXECUTED.	871, 872
13	REESTABLISH LINE CONNECTION(SWITCHED ONLY). THE PROGRAM AUTOMATICALLY TURNS THE SWITCH OFF AFTER THE CONNECTION HAS BEEN MADE.	871, 872
1A	TERMINALS ARE TO BE TESTED ON THE SECOND BSCA (PROGRAM HAS TO BE RELOADED TO USE THE FIRST BSCA AGAIN).	871, 872

1.2 TIMING ANALYSIS PROGRAMS -TAPS- AND OPTIONS

THERE WILL NOT BE ANY TAPS AVAILABLE FOR THE 3270 DISPLAY SYSTEM.

1.3 STAND ALONE TESTS

NO STAND ALONE TESTS ARE INCLUDED IN THE 3270 DISPLAY SYSTEM PACKAGE.

1.4 SYSTEM/3 DIAGNOSTIC LIMITATIONS FOR THE 3270

SYSTEM/3 WILL NOT PROVIDE THE 3270 FUNCTION/RELIABILITY DIAGNOSTICS OR THE 3270 CARD CALLING DIAGNOSTICS. THESE DIAGNOSTICS WILL BE PROVIDED TO THE 3270 SYSTEMS AS FOLLOWS:

A) DOMESTIC LOCATIONS - THESE TESTS WILL BE PROVIDED BY THE RALEIGH TEST CENTER. FED WILL USE THE T-DAT ACOUSTIC COUPLER TO CONTACT THE RALEIGH TEST CENTER WHEN THE CUSTOMER'S COMMUNICATION FACILITY DOES NOT PROVIDE DIAL UP CAPABILITIES.

B) WTC LOCATIONS - THESE TESTS (OR EQUIVALENT) WILL BE PROVIDED BY THE CASSETTE RECORDER ADAPTER UNIT, A PORTABLE CASSETTE RECORDER (P/N 5500746), PRE-RECORDED TAPES, THE PORTABLE INDICATOR/SWITCH UNIT, AND OTHER RELATED KINGSTON DEVELOPED SPECIAL AIDS.

ALSO, THE SYSTEM/3 'ON LINE TESTS', ID 809 AND 80A, SHOULD NOT BE USED FOR THE 3270 BECAUSE 809 AND 80A ARE NOT DESIGNED TO TEST THE 3270.

IT MUST BE NOTED THAT THE CORRECT 3270 TROUBLE SHOOTING MANUAL MUST BE USED IN CONJUNCTION WITH THE TEST PATTERNS PROVIDED IN THESE SYSTEM/3 PROGRAMS. THIS USER'S GUIDE DOES NOT PROVIDE SERVICE AID INFORMATION RELATED TO THE USE OF THE PATTERNS.

2. OPERATING PROCEDURES (DCP CONTROLLED SECTIONS)

THIS SECTION DESCRIBES THE USER INTERFACE FOR ALL PROGRAMS OPERATING UNDER THE DIAGNOSTIC CONTROL PROGRAM (DCP). MORE DETAIL IS PROVIDED IN THE DCP USERS GUIDE (BLOCK 10).

$$
FOR MODEL 15 SYSTEMS SEE BLOCK 10 (DCP USER'S GUIDE) FOR THAT MODEL.
$$

2.1 LOADING

THE CE MODE SELECTOR SWITCH MUST BE IN THE 'PROCESS' POSITION. ALL CE CONTROL PANEL TOGGLE SWITCHES SHOULD BE IN THE NORMAL (DOWN) POSITION.

2.1.1 LOADING ON A MODEL 10 FROM A MFCU.

1. IF DCP IS LOADED, SKIP TO STEP 5.
2. IF A DISK SYSTEM, PLACE -PROGRAM LOAD SELECTOR- IN MFCU POSITION.
3. PLACE DCP FOLLOWED BY TEST SECTION(S) INTO MFCU PRIMARY HOPPER. MAKE MFCU READY.
4. DEPRESS -PROGRAM LOAD- KEY. AFTER DCP IS LOADED, A -HA- HALT WILL OCCUR. COMMON SENSE SWITCHES MAY BE SET AT THIS TIME.
5. PLACE TEST SECTION/S INTO MFCU PRIMARY HOPPER AND MAKE MFCU READY (IF NOT ALREADY DONE).
6. IF A -HA- OR -HE- HALT OCCURS SKIP TO STEP 8.
7. DEPRESS -PROGRAM LOAD- KEY. DCP WILL PRINT SECTION, TERMINATE MESSAGE, AND HALT WITH A -HE-.
8. RESET THE HALT. DCP WILL LOAD THE SECTION AND DISPLAY A -HA- HALT.
9. MAKE DESIRED CONSOLE SWITCHES ENTRIES, IF ANY, AND RESET THE HALT.

2.1.2 LOADING ON A MODEL 10 FROM DISK WITH A 5424 (MFCU) ATTACHMENT.

1. SKIP TO STEP 5 IF DCP IS ALREADY LOADED.
2. PLACE THE CE PACK ON R1 AND MAKE DRIVE 1 READY.
3. PLACE THE -PROGRAM LOAD SELECTOR- IN REMOVABLE POSITION.
4. DEPRESS -PROGRAM LOAD- KEY. AFTER DCP IS LOADED, A -HA- HALT WILL OCCUR. COMMON SENSE SWITCHES MAY BE SET AT THIS TIME.
5. USE CONSOLE SWITCHES ENTRY -DXXX- (XXX - PROG ID) TO SPECIFY THE PROGRAMS TO BE LOADED. (SEE SECTION 2.4)
6. SET LEFTMOST SWITCH TO -0- AND RESET HALT. DCP WILL LOAD THE SECTION AND DISPLAY A -HA- HALT.
7. MAKE ANY CONSOLE SWITCH ENTRY DESIRED AND/OR RESET HALT.

2.1.3 LOADING ON A MODEL 10 FROM DISK WITH A 5422 ATTACHMENT, OR MODEL 8.

1. SKIP TO STEP 5 IF DCP IS ALREADY LOADED.
2. PLACE THE CE PACK ON R1 AND MAKE DRIVE 1 READY.
3. PLACE THE -PROGRAM LOAD SELECTOR- IN REMOVABLE POSITION.
4. PLACE -00FE- IN DATA SWITCHES AND DEPRESS -PROGRAM LOAD- KEY.

   CPU TESTS ARE LOADED AND RUN BEFORE DCP IS LOADED. TO RUN STORAGE TESTS, SEE BLOCK 5. THE ORDER OF HALTS IS LISTED BELOW. RESET THE HALTS IF THEY OCCUR IN THE FOLLOWING ORDER. IF THE HALTS AREN'T IN THE PROPER ORDER REFER TO BLOCK 5. WHEN THE -HE- HALT OCCURS GO TO STEP 5.

   HALTS
   A) -CC-
   B) -LL-
   C) -8P-
   D) -HE-

5. USE CONSOLE SWITCHES ENTRY -DXXX- (XXX - PROG ID) TO SPECIFY THE PROGRAM/S TO BE LOADED. (SEE SECTION 2.4)
6. SET LEFTMOST SWITCH TO -0- AND RESET HALT. DCP WILL LOAD THE SECTION AND DISPLAY THE -HA- HALT.
7. MAKE ANY CONSOLE SWITCH ENTRY DESIRED AND/OR RESET HALT.

2.1.4 LOADING ON A MODEL 6 FROM DISK.

1. SKIP TO STEP 8 IF DCP IS ALREADY LOADED.
2. LOAD THE CE PACK ON R1 AND MAKE DRIVE 1 READY.
3. PLACE THE -PROGRAM LOAD SELECTOR- IN REMOVABLE POSITION.
4. SET DATA SWITCHES TO -00FE- (-02FE- TO BYPASS STORAGE PROGRAMS OR -03FE- TO ALLOW SENSE SWITCH SETTING PRIOR TO PRINTING OR BYPASS THAT PORTION OF I/O LSRS INCLUDED IN THE CPU TESTS).
5. OPERATE PROGRAM LOAD.
6. THE FOLLOWING HALTS WILL OCCUR. AFTER EACH, OPERATE THE START KEY.

   A) -EE- (ABC 123)
   B) -FF5- (ABCD 12345)
   C) -805- (A 5) STORAGE SEPARATOR HALT.
   D) -805- (A 5) STORAGE SEPARATOR HALT.

   THE STORAGE SEPARATOR HALTS OCCUR ONLY IF THE DATA SWITCH ENTRIES ARE -00FE- OR -03FE-. OTHER HALTS OCCURRING AT THIS TIME SHOULD BE INVESTIGATED.

7. DCP WILL LOAD AND DISPLAY A -FA5- (ABCD 1 3 5) HALT.
8. USE CONSOLE SWITCHES ENTRY -DXXX- (XXX -PROG ID) TO SPECIFY THE PROGRAM/S TO BE LOADED. (SEE SECTION 2.4)
9. SET LEFTMOST SWITCH TO -0- AND RESET HALT. DCP WILL LOAD THE SECTION AND DISPLAY A -FA5- (ABCD 1 3 5) HALT.
10. MAKE ANY CONSOLE DATA SWITCH ENTRY DESIRED AND/OR RESET HALT.

2.2 PROGRAM RESTART

DCP STORES INSTRUCTIONS STARTING AT LOCATION '0000' TO PROVIDE FOR A PROGRAM RESTART. THESE INSTRUCTIONS ALSO CHECK THE CONSOLE SWITCHES FOR A VALID ENTRY. TO PERFORM A PROGRAM RESTART, SIMPLY DEPRESS SYSTEM RESET FOLLOWED BY CPU START.

2.3 TERMINATION

NORMAL DCP-CONTROLLED CHAINING FROM ROUTINE TO ROUTINE PROVIDES AN AUTOMATIC TERMINATION OF A SECTION. IN ADDITION, THE CE MAY TERMINATE A SECTION AT ANY TIME BY (1) ENTERING 'EE00' IN THE CONSOLE SWITCHES, OR BY (2) LOADING THE NEXT SECTION. IN ALL CASES, DCP PRINTS A MESSAGE AND PERFORMS HALT 'HE'. THE SECTION CAN STILL BE RESTARTED AT THIS TIME BY USING THE PROGRAM RESTART PROCEDURE. IF NO RESTART IS DESIRED, RESET THE HALT TO LOAD THE NEXT SECTION.

2.4 CONSOLE ADDRESS/DATA SWITCH COMMUNICATIONS

THE ROTARY DATA SWITCHES ARE THE MEANS BY WHICH THE CE CAN COMMUNICATE WITH THE DIAGNOSTICS. ENTRIES ARE MADE AS FOLLOWS--

1. STOP CPU.
2. SET UP ROTARY SWITCHES FOR ONE OF THE FOLLOWING OPTIONS. X'S INDICATE POSITIONS WHICH VARY WITH THE NEED.

```
     SWITCHES
  1   2   3   4
*** *** *** ***
 F   0   X   X  - TURN OFF SENSE SWITCH 'XX'.  (F008 WOULD TURN OFF SSW 08).
 F   1   X   X  - TURN ON SENSE SWITCH 'XX'.  (F108 WOULD TURN ON SSW 08).

 F   2   X   X  - GO TO ROUTINE 'XX' AFTER CONSOLE ENTRY FINISHED.  (F202 WOULD GO TO ROUTINE 2).

 E   E   0   0  - TERMINATE THE CURRENT SECTION.

 D   X   X   0  - DISK--EXECUTE SECTIONS FOR DEVICE WITH UNIT CODE 'XX'.  (DE00 - EXECUTE ALL 5203 PRINTER PROGRAMS)
 D   X   X   X  - DISK--EXECUTE SECTION XXX.  (DE01 - SECTION E01).      (DE01 - EXECUTE SECTION E01)

NOTE - UP TO FOUR  DISK INSTRUCTIONS MAY BE ENTERED DURING ONE ENTRY PHASE.
```

3. DEPRESS CPU START. (SYSTEM RESET FOLLOWED BY START WILL CALL IMMEDIATE ATTENTION TO THE SWITCHES--SEE NOTE BELOW).
4. WHEN DCP RECEIVES CONTROL, IT HALTS WITH 'HP' DISPLAYED. RESET THE HALT TO ENTER THE FIRST OPTION.
5. DCP WILL DISPLAY HALT 'HU' OR 'HP'. LOAD THE NEXT OPTION AND RESET THE HALT.
6. REPEAT STEP 5 FOR AS MANY OPTIONS AS DESIRED. ALTERNATING CODES 'HU' AND 'HP' WILL SIGNAL DCP ACCEPTANCE.
7. WHEN DONE, SET LEFTMOST SWITCH TO '0' AND RESET THE HALT.

NOTE - WHEN USING F2XX IN THE SWITCHES TO GO TO A ROUTINE AFTER A SECTION HAS BEGUN, SYSTEM RESET/START SHOULD BE PERFORMED BEFORE MAKING THE ENTRY. (THIS PREVENTS ERRORS FOUND IN ONE ROUTINE FROM BEING DETECTED IN SOME OTHER ROUTINE. IT SHOULD NOT BE PERFORMED IF OTHERWISE SPECIFIED IN THE MAPS.)

2.5 COMMON SENSE SWITCHES

SENSE SWITCHES ARE EQUIVALENT TO 48 TOGGLE SWITCHES NUMBERED HEXADECIMALLY 00-2F.
SENSE SWITCHES 00-0F ARE RESERVED FOR STANDARD OPTIONS PROVIDED BY DCP (LISTED BELOW).
SENSE SWITCHES 10-2F ARE SIGNIFICANT TO THE PARTICULAR SECTION BEING RUN.
INSTRUCTIONS FOR SETTING SENSE SWITCHES ARE CONTAINED IN SECTION 2.4.

SSW NUMBER	ON	OFF (NORMAL)
00	LOOP ON SECTION.	GO TO NEXT SECTION.
01	LOOP ON ROUTINE.	GO TO NEXT ROUTINE.
02	BYPASS MANUAL INTERVENTION ROUTINES.	EXECUTE ALL ROUTINES.
03	BYPASS ERROR PRINTING.	PRINT ERROR MESSAGES.
04	BYPASS NON-ERROR PRINTING.	PRINT NON-ERROR MESSAGES.
05	USE ALTERNATE PRINTER. PRINTER KEYBOARD,IF ATTACHED. OTHERWISE, MFCU.	NORMAL PRINTER.
06	BYPASS ERROR HALTS.	HALT AFTER ERROR.
07	LOAD AND GO. BYPASS COMMENTS AND PROMPTING HALTS.	PROMPTING MODE.
08	USE 5203 RIGHT CARRIAGE.	USE LEFT CARRIAGE.
09	DON'T CLEAR SECTION SENSE SWITCHES AFTER LOADING	CLEAR SECTION SENSE SWITCHES AFTER LOADING
0A-0F	RESERVED	

2.6 CONTROL PROGRAM HALTS.

ALL CONTROL PROGRAM (DCP) HALTS USE THE CHARACTER 'H' AS THE FIRST DIGIT OF THE HALT CODE. THE SECOND DIGIT IDENTIFIES THE CONDITION ACCORDING TO THE FOLLOWING TABLE.

HALT CODES MODEL 6	HALT CODES MODEL 8/10	CONDITION	ACTION REQUIRED
F05	H0	INVALID RECORD FOUND WHILE LOADING.	CORRECT INVALID RECORD AND RELOAD.
F15	H1	A DEVICE CALLED FOR BY THE TEST SECTION WAS NOT DEFINED IN THE UDT CARDS.	CHECK UDT CARDS AND RELOAD OR RESET HALT TO BYPASS THE ERROR (ERRORS COULD RESULT).
F25	H2	DATA SWITCH ENTRY ERROR.	CORRECT DATA SWITCHES AND RESET HALT.
F35	H3	INVALID ROUTINE PREFIX FOUND DURING CHAINING FROM ONE ROUTINE TO NEXT.	ENTER ROUTINE SELECT OPTION 'F2XX' IN DATA SWITCHES AND RESET HALT. IF THIS DOES NOT WORK, RELOAD SECTION.
F55	H5	MFCU NOT READY OR ERROR. ERROR INDICATION SHOULD BE DISPLAYED IN THE MFCU LIGHTS.	DC A NCN-PROCESS RUN-OUT, RELOAD DECK STARTING WITH RUNOUT CARD/S AND RESET THE HALT.
F65	H6	PRINTER NOT READY OR ERROR.	CLEAR CONDITION AND RESET THE HALT. IF FAILURE PERSISTS, RUN PRINTER FUNCTION TEST. SENSE SWITCHES 03 AND 04 MAY BE USED TO BYPASS PRINTING. SET SENSE SWITCH 05 TO USE ALTERNATE PRINTER.
F75	H7	DISK ERROR.	RESET HALT TO RETRY. IF ERROR PERSISTS, RELOAD.
FA5	HA	CONTROL PROGRAM IS PREPARED TO RECEIVE DATA SWITCH ENTRY. OCCURS AFTER DCP AND SECTION LOADING.	RESET THE HALT IF NO ENTRY DESIRED. TO LOAD OPTIONS, SET UP DATA SWITCHES AND RESET THE HALT. SSW 07 MAY BE USED TO BYPASS THIS HALT.
FC5	HC	DISK LOADER REQUIRES SPECIFICATION OF SECTIONS TO BE LOADED FROM DISK.	IF NO ENTRY HAS BEEN MADE PREVIOUSLY, LOAD PROGRAM SELECTION ENTRY 'DXXX' AND RESET THE HALT. UP TO EIGHT ENTRIES MAY BE MADE. IF ENTRIES HAVE EVER BEEN MADE, THE PROGRAMS MAY BE REPEATED BY RESETTING THE HALT.
FD5	HD	SECTION RUNNING OR LOAD TABLE HAS SPECIFIED NEXT SECTION TO BE RUN. ARR CONTAINS -DXXX- WHERE XXX IS THE PROGRAM ID TO BE RUN.	DISK SYSTEM - DXXX IS NOT ON DISK PACK, RESET THE HALT AND THE NEXT PROGRAM IN THE LOAD TABLE WILL BE LOADED. CARD SYSTEM - PLACE DECK XXX IN THE MFCU HOPPER AND RESET THE HALT.
FE5	HE	CURRENT SECTION TERMINATED.	RESET HALT TO LOAD NEXT SECTION. SECTION MAY BE RESTARTED BY SYSTEM RESET/START.
FF5 F05	HF HU-HP	DCP HALTS WITH 'HF' DISPLAYED WHENEVER A VALID DATA SWITCH ENTRY IS RECOGNIZED. AS DCP ACCEPTS ENTRIES, ALTERNATING HALTS 'HU' AND 'HP' OCCUR.	LOAD A VALID DATA SWITCH ENTRY AND RESET THE HALT. REPEAT FOR ALTERNATING HALTS 'HU' AND 'HP'. TO TERMINATE ENTRY PROCEDURE, ROTATE LEFT-MOST SWITCH TO ZERO AND RESET HALT.
D1	D1	IPL LOADER CAN'T LOAD DCP BECAUSE OF A DISK ERROR.	RESET HALT TO RETRY. IF HALT PERSISTS, GET A NEW DISK PACK.

3. INDEX TABLE FOR HALTS AND PRINTOUTS

3.1 ERROR HALTS

BECAUSE OF THE NATURE OF A TYPICAL BSCA CONFIGURATION VERY LITTLE HALTING IS DONE IN THE PROGRAMS. THEREFORE, UNLESS OTHERWISE NOTED, THE FOLLOWING WILL BE MESSAGE ID'S WITH NO HALTING.

3.1.1 SECTION 871 AND 3.1.2 SECTION 872

INDEX NUMBER 'XX'	MEANING OF ID	SECTION WHERE USED
01	INCORRECT RESPONSE AFTER AN ERASE/WRITE HAS BEEN TRANSMITTED. (ACK1 IS THE EXPECTED RESPONSE). TRANSMITTED AND RECEIVED DATA WILL ALSO BE PRINTED.	871,872
02	LINE ERROR. CHECK THE TRANSMITTED AND RECEIVED DATA PRINTOUT FOR THE EXACT ERROR INDICATION. IF A SELECT SEQUENCE HAS BEEN ISSUED WITH NO RESPONSE, CHECK TO ENSURE THE CORRECT SELECTION ADDRESS HAS BEEN ENTERED TO THE PROGRAM VIA REPLACE CARD(SEE SECTION 5.3)	871,872 871,872
03	DISPLAY X ERROR-RETRY NUMBER Y. INCORRECT RESPONSE WAS RECEIVED IN THE PROCESS OF HANDLING DISPLAY NUMBER X. Y WILL CONTAIN THE NUMBER OF THE RETRY. (WHEN AN ERROR IS DETECTED THE TRANSMISSION WILL BE REPEATED UP TO 3 TIMES BEFORE LINKING TO THE NEXT ROUTINE.)	871,872
04	IN THE PROCESS OF POLLING THE TERMINAL WAITING FOR THE TEST REQUEST KEY TO BE PRESSED, THE DISPLAY STATION INDICATED IT HAD STATUS TO SEND. THEREFORE THE TWO BYTES OF STATUS WILL BE PRINTED ALONG WITH THE TRANSMITTED AND RECEIVED DATA.	871,872
05	IN THE PROCESS OF POLLING THE DISPLAY STATION(OR RECEIVING FOR SWITCHED) AN INCORRECT RESPONSE WAS DETECTED. CHECK THE TRANSMITTED AND RECEIVED DATA PRINTOUT TO DETERMINE WHAT THE RESPONSE WAS.	871,872
06	NO SELECT OR POLLING ADDRESS AVAILABLE. THIS DATA MUST BE ENTERED (VIA REP CARD OR CONSOLE DATA SWITCHES) BEFORE THE PROGRAM CAN CONTINUE. NOTE: AFTER THIS ERROR MESSAGE THE PROGRAM WILL HALT. THE ERROR MESSAGE AND HALT WILL BE REPEATED UNTIL THE POLLING AND SELECTION ADDRESSES HAVE BEEN ENTERED.	871,872

3.2 NON-ERROR HALTS AND PRINTOUTS

3.2.1 SECTION 871 AND 3.2.2 SECTION 872

AS STATED ABOVE FOR THE ERROR HALTS, THE FOLLOWING WILL BE ID'S RATHER THAN HALTS.

A1	INCORRECT BUFFER SIZE IN THE REQUESTED ROUTINE. ROUTINE 3 IS FOR THE 3277-1/3275-1 ONLY WHILE ROUTINE 4 IS ONLY FOR THE 3277-2/3275-2. THE NEXT ROUTINE WILL AUTOMATICALLY BE SELECTED. ROUTINE 3 OR 4 IS EXECUTED ACCORDING TO THE UDT DEFINITION.	871
A2	NO INTERRUPT-NEXT TEST PATTERN INITIATED. AFTER EACH DISPLAY THE PROGRAM WAITS 90 SECONDS FOR AN OPERATOR RESPONSE. IF NONE IS RECEIVED, THIS IS INDICATED AND THE NEXT DISPLAY WILL BE AUTOMATICALLY TRANSMITTED.	871,872

4. DETAILED DESCRIPTION OF TESTS

4.1 SECTION 871 GRAPHIC TEST PATTERNS

4.1.1 ROUTINE 1

```
                                          COLUMN
         0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
  ROW    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
   1    |_9           T E S T   P A T T E R N   S E Q U E N C I N G                   |
   2    |                                                                             |
   3    | 1 .   P R E S S   T E S T   R E Q U E S T   T O   C A L L   N E X T         |
   4    |                                                                             |
   5    |    S E Q U E N T I A L   P A T T E R N .   S E C T I O N   W I L L          |
   6    |                                                                             |
   7    |    T E R M I N A T E   O N   L A S T   P A T T E R N .                      |
   8    |                                                                             |
   9    | 2 .   P R E S S   C A N C E L ( O R   P A 2 ) T O   D I S C O N N E C T   C P U|
  10    |                                                                             |
  11    |    A N D   L E A V E   P A T T E R N   F O R   O F F - L I N E   U S A G E .|
  12    |                                                         E8 A D R - _ _ _ _40|
```

NOTES ON ROUTINE 1

1. AFTER SECTION 871 HAS BEEN LOADED AND CONTACT WITH THE DISPLAY STATION HAS BEEN MADE, THIS INFORMATIONAL MESSAGE WILL BE TRANSMITTED. NO OTHER ACTION NEED BE TAKEN WITH THIS DISPLAY OTHER THAN FOLLOWING THE DIRECTIONS GIVEN.
2. WITH THIS DISPLAY AND ALL SUCCEEDING RPT'S THE CONTROL UNIT AND DISPLAY STATION SELECTION ADDRESSES WILL APPEAR AFTER 'ADR-'. IF THE PROGRAMS ARE BEING RUN UNDER THE DIAL-UP FEATURE, THE LETTERS 'DIAL' WILL APPEAR AFTER THE 'ADR -' RATHER THAN THE SELECTION ADDRESS.
3. NOTE THE START FIELD (SF) CONTROL CHARACTERS IN ROW 12 (E8 AND 40). BLANKS WILL APPEAR ON THE SCREEN WHERE THE CONTROL CHARACTERS RESIDE FOR THIS DISPLAY AND ALL SUCCEEDING DISPLAYS. SEE SECTION 5.1.2 FOR AN EXPLANATION OF THESE CODES.
4. IF THE CANCEL KEY (OR PA2) IS PRESSED, THE CURRENT DISPLAY WILL BE KEPT, BUT THE SECTION BEING EXECUTED WILL TERMINATE. THE KEYBOARD WILL BE RESET SO THAT DATA KEY FUNCTIONS MAY BE USED. THIS WILL ALLOW THE OPERATOR TO MAKE ADJUSTMENTS, ETC., USING THE DISPLAY WITHOUT REGARD TO THE PROGRAM TIMEOUT.

   NOTE THAT IF THE CANCEL KEY IS PRESSED ON THE 3275 WHICH HAS A 3284/3 ATTACHED, THE PATTERN WILL BE PRINTED AGAIN BY THE 3284/3 BEFORE THE KEYBOARD IS RESET FOR OFF-LINE USAGE. THE PATTERN IS REPEATED BECAUSE OF THE RESELECTION TO THE 3275.
5. THE CURSOR SHOULD APPEAR IN THE UPPER LEFT-HAND CORNER OF THE DISPLAY (ROW 1, COLUMN 1). THE CURSOR IS REPRESENTED IN THIS DISPLAY AND ANY SUCCEEDING DISPLAYS BY THE CHARACTER '_'.
6. THE DIGIT NINE (9) WILL APPEAR IN ROW 7, COLUMN 1 WHEN A 3277-2/3275-2 IS BEING TESTED. THIS NINE WILL APPEAR AS ILLUSTRATED ABOVE IN ROW 1, COLUMN 1 FOR THE 3277-1/3275-1 DISPLAYS.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 0000000001111111111222222222233333333334
       1234567890123456789012345678901234567890
ROW
 1          TEST PATTERN SEQUENCING
 2
 3     1. PRESS TEST REQUEST TO CALL NEXT
 4
 5       SEQUENTIAL PATTERN. SECTION WILL
 6
 7       TERMINATE ON LAST PATTERN.
 8
 9     2. PRESS CANCEL(OR PA2)TO DISCONNECT CPU
10
11       AND LEAVE PATTERN FOR OFF-LINE USAGE.
12                                 ADR-____
```

NOTES ON THE PRINTER OUTPUT

1. IF THE BUFFERED PRINTER IS BEING TESTED, THE BLANK LINES SHOULD NOT APPEAR BETWEEN THE LINES OF PRINT.
2. IF THE BUFFERED PRINTER IS BEING TESTED AND THE 1920 CHARACTER BUFFER HAS BEEN DEFINED, THE DIGIT NINE (9) WILL BE PRINTED IN THE FIRST POSITION OF THE LAST LINE OF PRINT. OTHERWISE PRINTING WILL TERMINATE WITH THE DATA AS SHOWN ABOVE.

4.1.2 ROUTINE 2 - TEST PATTERN 1

```
                                        COLUMN
         0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
 ROW     1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
  1    ---------------------------------------------------------------------------------
  2   |                                                                                 |
  3   |60 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  6C N O N   D I S P L A Y|
  4   |                                                                                 |
  5   |40_C O P Y   A B O V E   I N   T H I S   L I N E       40 I N S E R T   C K    |
  6   |60                                                                               |
  7   |E8 | @ # $ %4A & * ( ) _ +5A :7F < > ? - = ¬5E ' /F8 0 1 2 3 4 5 6 7 8 9 , . - A|
  8   |                                                                                 |
  9   |C8 C O P Y   A B O V E   I N   T H I S   L I N E  D8                             |
 10   |60                                                                               |
 11   |E4 ? S E L   P E N   T E S T     E8 > S E L   P E N   T E S T                   |
 12   |                                                        E8 A D R - _ _ _ _E8|
       ---------------------------------------------------------------------------------
```

NOTES ON RFT 1 (TEST PATTERN 1)

1. THE CURSOR WILL BE INSERTED IN ROW NUMBER 5 SUPERIMPOSED WITH THE FIRST CHARACTER. AT THIS POINT THE ALPHABET SHOULD BE COPIED EXACTLY AS IT APPEARS IN ROW 3.
2. IN ROW 9 COPY THE SPECIAL CHARACTERS LINE EXACTLY AS IT APPEARS IN ROW 7.
3. HEX 4A IN ROW 7 WILL APPEAR AS THE CENT SIGN.
4. HEX 5A IN ROW 7 WILL APPEAR AS AN EXCLAMATION POINT.
5. HEX 7F IN ROW 7 WILL APPEAR AS QUOTE MARKS.
6. HEX 5E IN ROW 7 WILL APPEAR AS A SEMI-COLON.
7. NOTE THAT THE INFORMATION IN ROW 3 ENTITLED 'NON DISPLAY' SHOULD NOT APPEAR ON THE SCREEN. THIS IS TO CHECK THE HEX 6C NON DISPLAY CONTROL CHARACTER TO ENSURE IT INHIBITS DISPLAYING.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 0000000001111111111222222222233333333334
       1234567890123456789012345678901234567890
  ROW
   1
   2
   3    ABCDEFGHIJKLMNOPQRSTUVWXYZ
   4
   5    COPY ABOVE IN THIS LINE     INSERT CK
   6
   7    |@#$% &*()_+ : <>?-=¬ '/ 0123456789,.-A
   8
   9    COPY ABOVE IN THIS LINE
  10
  11    ?SEL PEN TEST    >SEL PEN TEST
  12                                 ADR-____
```

NOTES ON THE PRINTER OUTPUT

1. IN ROW 7 BETWEEN THE % AND & SHOULD PRINT THE CENT SIGN.
2. IN ROW 7 BETWEEN THE + AND : SHOULD PRINT THE EXCLAMATION POINT.
3. IN ROW 7 BETWEEN THE : AND < SHOULD PRINT THE QUOTE MARKS.
4. IN ROW 7 BETWEEN THE ¬ AND ' SHOULD PRINT THE SEMI-COLON.
5. IF THE BUFFERED PRINTER IS BEING TESTED, THE BLANK LINES SHOULD NOT APPEAR BETWEEN THE LINES OF PRINT.

4.1.3 ROUTINE 3 - TEST PATTERN 2
4.1.4 ROUTINE 4 - TEST PATTERN 3

```
                                  COLUMN
        0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
  ROW   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0

   1   |E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E|
   2   |H                                                                             H|
   3   |H                                                                             H|
   4   |H                                                                             H|
   5   |H                                                                             H|
   6   |H                                    O O                                      H|
   7   |H                                    O O                                      H|
   8   |H                  T E S T   P A T T E R N   F O R   3 2 7 7 - 1 / 3 2 7 5 - 1H|
   9   |H                              A L I G N M E N T                              H|
  10   |H                *40_U N P R O T E C T E D   D A T A        60 *               H|
  11   |H                                                         E8 A D R - _ _ _ _60H|
  12   |E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E|
```

NOTES ON RPT 2 (TEST PATTERN 2)

1. RPT #3 (ROUTINE 4) IS SIMILIAR TO THE ABOVE DISPLAY EXCEPT IT IS FOR THE 3277-2/3275-2 1920 CHARACTER DISPLAY. THE DISPLAY SCREEN WILL BE OUTLINED AS ABOVE IN THE SAME FORMAT.
   NOTE: RPT #2 WILL BE USED ONLY ON THE 3277-1/3275-1 AND RPT #3 ONLY ON THE 3277-2/3275-2, ACCORDING TO HOW THE UDT HAS BEEN DEFINED.
2. THE CURSOR WILL BE SUPERIMPOSED WITH THE 'U' IN UNPROTECTED, ROW 10.
3. NOTE THE FOLLOWING CHANGES FOR THE 3277-2/3275-2 DISPLAY SYSTEMS (RPT 3, ROUTINE 4):
   A. 'TEST PATTERN FOR THE 3275-2/3277-2' WILL APPEAR IN ROW 7.
   B. 'ALIGNMENT' WILL APPEAR IN ROW 8.
   C. '*40 UNPROTECTED AREA 60*' APPEARS IN ROW 11.
   D. THE PAIR OF OO'S APPEAR IN ROWS 12 AND 13.
   E. 'E8ADR-____60' APPEARS IN ROW 23.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 0000000001111111111222222222233333333334
       1234567890123456789012345678901234567890
ROW
  1    EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE
  2    H                                      H
  3    H                                      H
  4    H                                      H
  5    H                                      H
  6    H                  OO                  H
  7    H                  OO                  H
  8    H         TEST PATTERN FOR 3277-1/3275-1H
  9    H               ALIGNMENT              H
 10    H       * UNPROTECTED DATA      *      H
 11    H                             ADR-____ H
 12    EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE
```

*** IF THE UDT IS DEFINED FOR THE 1920 CHAR BUFFER, PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 00000000011111111112222222222333333333344444444445555555555666666666677777777778
       12345678901234567890123456789012345678901234567890123456789012345678901234567890
ROW
  1    EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE
  2    H                                                                              H
  3    H                                                                              H
  4    H                                                                              H
  5    H                                                                              H
  6    H                                                                              H
  7    H     TEST PATTERN FOR 3275-2/3277-2                                           H
  8    H              ALIGNMENT                                                       H
  9    H                                                                              H
 10    H                                                                              H
 11    H       * UNPROTECTED AREA      *                                              H
 12    H                                        OO                                    H
 13    H                                        OO                                    H
 14    H                                                                              H
 15    H                                                                              H
 16    H                                                                              H
 17    H                                                                              H
 18    H                                                                              H
 19    H                                                                              H
 20    H                                                                              H
 21    H                                                                              H
 22    H                                                                              H
 23    H                                                                     ADR-____ H
 24    EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE
```

4.2 SECTION 872 PRINTER TEST PATTERNS

4.2.1 ROUTINE 1 - TEST PATTERN 4

```
                                      COLUMN
           0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
   ROW     1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
    1    |60 F O R   C L U S T E R E D   P R I N T E R S   D A T A   S H O U L D   S T A R|
    2    | T   N E X T   L I N E   H E R E   - - - - - - - > C H E C K I N G   P R O G R A|
    3    | M   T A B / E R A S E   U N P R O T .   T O   A D D R / D U P / F I E L D   M A|
    4    | R K   O R D E R S                                                              |
    5    |                                                                                |
    6    |                                                             E8 A D R - _ _ _ _60|
    7    |_F81 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1|
    8    |                                                                                |
    9    |C8 A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A|
   10    |                                                                       *5E 5 9 |
   11    |60 B B B B B B B B B B B B B B B B B B B B B B E B B B B B B B B B B B B B B B B|
   12    | B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B |
          --------------------------------------------------------------------------------
```

NOTES ON RFT 4 (TEST PATTERN 4)

1. THE CURSOR WILL APPEAR IN THE FIRST POSITION OF ROW 7, SUPERIMPOSED WITH THE ATTRIBUTE CHARACTER 'F8' (WHICH WILL APPEAR AS A BLANK ON THE SCREEN).
2. HEX 5E IN ROW 10 WILL APPEAR AS A SEMI-COLON ON THE DISPLAY SCREEN.
3. NOTE THAT THIS DISPLAY IS USED MAINLY TO CHECK PRINTER FUNCTIONS (IF ONE IS AVAILABLE). THE ABOVE WILL APPEAR AS ILLUSTRATED ONLY FOR THE 480 CHARACTER DISPLAY STATION.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 0000000001111111111222222222233333333334444444444555555555566666
       1234567890123456789012345678901234567890123456789012345678901234
  ROW
   1    FOR CLUSTERED PRINTERS DATA SHOULD START NEXT LINE HERE ------>
   2   CHECKING PROGRAM TAB/ERASE UNPROT. TO ADDR/DUP/FIELD MARK ORDERS
   3
   4                                                ADR-____  111111111111111
   5   1111111111111111111111111
   6    AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
   7              * 59    BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
   8   BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
```

NOTES ON THE PRINTER OUTPUT

1. IF PRINTING ON THE 3284/3(DEDICATED PRINTER), THE PRINTING WILL TERMINATE AT THE 9 IN ROW 7 AND THE B'S WILL NOT BE PRINTED.
2. IN ROW 7 A SEMI-COLON WILL BE PRINTED BETWEEN THE * AND THE 5.
3. IF THE BUFFERED PRINTER IS BEING TESTED, THE BLANK LINE WILL NOT APPEAR IN ROW 3.

4.2.2 ROUTINE 2 - TEST PATTERN 5

```
                                         COLUMN
          0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
  ROW     1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0

   1     |8182838485868788898A8C8D8E8F909192939495969798999A9D9E9F                  60|
   2     |A2A3A4A5A6A7A8A9AAACADAEAFBABBBCBDBEBF808B9B9CA0A1ABB0B1B2B3B475B6B7B879  40|
   3     |41424344454647484951525354555657585962636465666768697071727374757677787 9 60|
   4     |C1C2C3C4C5C6C7C8C9D1D2D3D4D5D6D7D8D9E2E3E4E5E6E7E8E9F0F1F2F3F4F5F6F7F8F9  40|
   5     |40506061C0D0E0E1                                                          60|
   6     |4A4B4C4D4E4F5A5B5C5D5E5F6A6B6C6D6E6F7A7B7C7D7E7F                          40|
   7     |CACBCCCDCECFDADBDCDDDEDFEAEBECEDEEEFFAFBFCFDFE                            60|
   8     | N / L   C H E C K 5 5 5 5 5                                                |
   9     | E O M   C H E C K 9 9                                                      |
  10     |                                                                          40|
  11     |_                                                                           |
  12     |                                                      E8 A D R - _ _ _ _40|
          ---------------------------------------------------------------------------
```

NOTES ON RPT 5 (TEST PATTERN 5)

NOTE: THE CONTENTS OF THIS DISPLAY WILL VARY ACCORDING TO THE FEATURES AVAILABLE TO THE PARTICULAR DISPLAY STATION. THEREFORE ONLY HEX VALUES HAVE BEEN GIVEN AS REFERENCE FOR THIS DISPLAY.

1. THE CURSOR WILL BE PLACED IN THE FIRST POSITION OF ROW 11.
2. IN ROW 1 HEX 81-89 AND 91-99 ARE LOWER CASE A THRU R. (EBCDIC)
3. IN ROW 2 HEX A2-A9 ARE LOWER CASE S THRU Z. (EBCDIC).
4. IN ROW 4 HEX C1-E9 ARE UPPER CASE A-Z (EBCDIC).
5. IN ROW 4 HEX F0-F9 ARE DECIMAL NUMBERS 0-9.
6. NOTE THAT THIS DISPLAY IS USED MAINLY TO CHECK PRINTER FUNCTIONS (IF ONE IS AVAILABLE). THE ABOVE WILL APPEAR AS ILLUSTRATED ONLY FOR THE 480 CHARACTER DISPLAY STATION.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

1. THIS PATTERN WILL PRINT ALL CHARACTERS AVAILABLE ON THE PRINTER BEING TESTED BEGINNING AT THE LEFT MARGIN AND ENDING AT THE RIGHT MARGIN. N/L CHECK WILL BE PRINTED FOLLOWED BY FIVE NEW LINE GENERATIONS. PRINTING WILL TERMINATE AFTER PRINTING 'EOM CHECK'. AN ACCURATE EXAMPLE OF PRINTER OUTPUT CANNOT BE GIVEN SINCE NUMEROUS SPECIAL PRINTER CHARACTERS CANNOT BE DUPLICATED IN THIS GUIDE.

4.2.3 ROUTINE 3 - TEST PATTERN 6

```
                                      COLUMN
        0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
 ROW    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
  1   |_N E W   L I N E   F U N C T I O N   C H E C K 5 N E W   L I N E   F U N C T I O|
  2   | N 5 N E W   L I N E 5 N E W 5 N E W   L I N E 5 N E W   L I N E   F U N C T I O|
  3   | N 5 N E W   L I N E   F U N C T I O N   C H E C K 54C T H I S   D A T A   N O T|
  4   |   V I S I B L E / E O M   A N D   N / L   I G N O R E D 5 940 E N D - O F - M E|
  5   | S S A G E - T E R M I N A T E S   P R I N T 9 5 2 N D   E O M   L I N E   N O T|
  6   | O N   P R I N T E R   O U T P U T 9                                            |
  7   |                                                                                |
  8   |                                                                                |
  9   |                                                                                |
 10   |                                                                                |
 11   |                                                                                |
 12   |                                                          E8 A D R - _ _ _ _40|
```

NCTES ON BFT 6 (TEST PATTERN 6)

1. NOTE THAT THIS DISPLAY HAS A PORTION WHICH SHOULD NOT BE VISIBLE AT THE DISPLAY STATION. (BEGINNING IN ROW 3 -4CTHIS DATA NOT VISIBLE/EOM AND N/L IGNORED 5 9- WILL NOT BE VISIBLE).
2. NOTE ALSO THAT VARIOUS PRINTER FUNCTIONS ARE BEING CHECKED BY THIS TRANSMISSION. IF ATTACHED, CHECK THE PRINTER OUTPUT TO ENSURE THAT THESE FUNCTIONS HAVE BEEN CORRECTLY EXECUTED.
3. THE CURSOR WILL BE SUPERIMPOSED WITH THE 'N' IN 'NEW LINE FUNCTION CHECK' IN ROW 1.
4. NOTE THAT THIS DISPLAY IS USED MAINLY TO CHECK PRINTER FUNCTIONS (IF ONE IS AVAILABLE). THE ABOVE WILL APPEAR AS ILLUSTRATED ONLY FOR THE 480 CHARACTER DISPLAY STATION.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 00000000011111111112222222222333333333344444444445555555555666666666677777777778
       12345678901234567890123456789012345678901234567890123456789012345678901234567890
 ROW
  1    NEW LINE FUNCTION CHECK
  2    NEW LINE FUNCTION
  3    NEW LINE
  4    NEW
  5    NEW LINE
  6    NEW LINE FUNCTION
  7    NEW LINE FUNCTION CHECK
  8                                                  END-OF-MESSAGE-TERMINATES PRINT
```

4.3 SPECIFIC SECTION INFORMATION

4.3.1 ROUTINE FORMAT

THE FOLLOWING SEQUENCE WILL BE UTILIZED FOR EACH ROUTINE:

```
CPU   ENABLE   . SELECT         . ERASE/WRITE       TEST      EOT
      BSCA     .                . RESET KEYBOARD    PATTERN
               .  (SEE NOTE 1)  .
DS             .          ACK0  .          ACK1       ACK0
               . . . . . . . . .
```

```
WHERE, SELECT FORMAT IS   E  P  S  S  C  C  D  D  E
                          O  A  Y  Y  U  U  S  S  N
                          T  D  N  N  A  A  A  A  Q
```

CUA IS THE CONTROL UNIT ADDRESS FOR SELECTING.
DSA IS THE DISPLAY STATION ADDRESS FOR SELECTING.
SEE SECTION 5.1.3 FOR VALID 3270 CONTROL UNIT AND DISPLAY STATION ADDRESSES.

NOTE 1 - IF RUNNING UNDER A SWITCHED NETWORK, THE SELECT SEQUENCE WILL BE REPLACED BY THE FOLLOWING:

```
      E                                                                  A
 (ID) N , AND THE DISPLAY STATION WILL HAVE AS ITS FIRST POSITIVE RESPONSE (ID) C
      Q                                                                  K
                                                                         0
```

OTHERWISE THE RESPONSES WILL FOLLOW THE ABOVE SEQUENCE.

```
ERASE/WRITE SEQUENCE IS AS FOLLOWS:  S  E          E
                                     T  S  F5  C2  T , WHERE HEX F5 IS THE COMMAND FOR ERASE/WRITE AND
                                     X  C          X   HEX C2 IS THE WCC (WRITE CONTROL CHARACTER).
                                                       IF ACK1 IS NOT RECEIVED AS THE RESPONSE TO THIS
                                                       TRANSMISSION, THE PROGRAM WILL CONTINUALLY LOOP ON
                                                       THE SELECTING AND ERASE/WRITE UNTIL THE ERROR HAS CLEARED.
```

```
THE TEST PATTERN FORMAT FOLLOWS:  S  E  C  M          E
                                  T  S  M  S  .  .  . T , WHERE THE CMD'S ARE VARIOUS 3270 DISPLAY
                                  X  C  D  G          X   SYSTEM CONTROL COMMANDS (SEE SECTION 5.1.2).
                                                          THE MSG VARIES ACCORDING TO WHAT EACH RFT REQUIRES.
```

AFTER A DISPLAY HAS BEEN TRANSMITTED, THE PROGRAM STARTS POLLING TO WAIT FOR THE TEST REQUEST KEY TO BE PRESSED. APPROXIMATELY EVERY 4 SECONDS A POLL WILL BE TAKEN OF THE DISPLAY STATION. THEREFORE THE OPERATOR MAY NOTE A SLIGHT DELAY BETWEEN THE TIME THE KEY IS DEPRESSED AND THE TIME THE PROGRAM RESPONDS. IF AN EOT IS THE RESPONSE TO THE POLL, NO ACTION IS TAKEN. OTHER RESPONSES CHECKED FOR ARE THE FOLLOWING. NOTE THAT IN THE SWITCHED CONFIGURATION THE POLL IS REPLACED BY A RECEIVE ONLY. A TIMEOUT WILL BE EXPECTED AND PRINTED UNTIL SOME ACTION HAS BEEN INITIATED AT THE DISPLAY STATION.

```
A)  S        S  C  D  S  S                     S        S  S  S
    O  %  R  T  U  S  S  S  FOR MULTIPOINT OR  O  %  R  T  S  S  IF SWITCHED NETWORK
    H        X  A  A  0  1                     H        X  0  1
```

THE ABOVE SEQUENCE INDICATES THAT THE DISPLAY STATION HAS STATUS (SS0 AND SS1) TO SEND TO THE CPU. IF THIS RESPONSE IS DETECTED, THE STATUS WILL BE PRINTED ALONG WITH THE TRANSMITTED AND RECEIVED DATA. THIS IS CONSIDERED AN ERROR CONDITION SO THE DISPLAY WILL BE RETRANSMITTED UP TO THREE TIMES BEFORE THE NEXT DISPLAY WILL BE INITIALIZED.

```
B)  S
    O  %  /
    H
```

THE ABOVE RESPONSE INDICATES THAT THE TEST REQUEST KEY WAS PRESSED. PER INSTRUCTIONS GIVEN IN DISPLAY 1 THE NEXT TEST PATTERN WILL BE INITIALIZED.

```
C)  S  C  D  C                      S  C
    T  U  S  N   FOR MULTIPOINT OR  T  N   IF SWITCHED NETWORK WHERE, CNL IS A HEX 6E.
    X  A  A  L                      X  L
```

THIS SEQUENCE INDICATES THAT THE CANCEL KEY (OR PA2 KEY IF THE CANCEL KEY IS NOT PRESENT) HAS BEEN PRESSED. IN THIS CASE THE DISPLAY STATION KEYBOARD WILL BE RESET, THE CURRENT SECTION WILL TERMINATE, AND THE NEXT SECTION MAY BE LOADED.

```
D)  E
    O
    T
```

THE EOT INDICATES NO ACTION INITIATED FROM THE DISPLAY STATION. THE POLLING SEQUENCE WILL BE REPEATED FOR APPROXIMATELY ONE MINUTE. AFTER THIS TIMEOUT, THE NEXT ROUTINE IS AUTOMATICALLY INITIALIZED.

4.3.2 LINKING FROM ROUTINE TO ROUTINE

AS PREVIOUSLY STATED THE NEXT RFT WILL BE INITIALIZED ONCE THE PROGRAM HAS DETECTED THAT THE TEST REQUEST KEY HAS BEEN PRESSED. THE POLL THAT IS TAKEN WHICH INDICATES THE TEST REQUEST HAS BEEN PRESSED ALSO CAUSES THE SCREEN TO BECOME BLANK. THE PROGRAM THEN CONTINUES ON TO THE NEXT ROUTINE WHICH WILL SETUP TO SELECT THE DISPLAY STATION FOR THE NEXT RFT. WHEN THE DISPLAY STATION IS SELECTED, THE OPERATOR MAY NOTICE A SLIGHT FLICKER ON THE SCREEN WHICH IS CAUSED FROM THE LAST DISPLAY BEING REDISPLAYED FROM THE DISPLAY STATION BUFFER. IMMEDIATELY AFTER THE SELECT HAS BEEN CORRECTLY ACCEPTED, THE SCREEN WILL BE ERASED SO THE CORRECT TEST PATTERN CAN BE DISPLAYED.

5. GENERAL 3270 DISPLAY SYSTEM INFORMATION

5.1 CONTROL CHARACTERS

5.1.1 BSCA CONTROL CHARACTERS

NAME OF FUNCTION	FUNCTIONAL MNEMONIC	EBCDIC CODE	ASCII CODE
START OF HEADING	SOH	01	01
START OF TEXT	STX	02	02
END OF TRANSMISSION BLOCK	ETB	26	17
END OF TEXT	ETX	03	03
END OF TRANSMISSION	EOT	37 PAD**	04 PAD**
ENQUIRY	ENQ	2D	05
NEGATIVE ACKNOWLEDGE	NAK	3D PAD**	15 PAD**
SYNCHRONOUS IDLE	SYN	32	16
DATA LINK ESCAPE	DLE	10	10
END OF INTERMEDIATE TRANSMISSION BLOCK	ITB	1F	1F
EVEN ACKNOWLEDGE	ACK0	1070	1030
ODD ACKNOWLEDGE	ACK1	1061	1031
WAIT BEFORE TRANSMIT POSITIVE ACK.	WACK	106B	103B
MANDATORY DISCONNECT	DISC	1037	1004
REVERSE INTERRUPT	RVI	107C	103C
TEMPORARY TEXT DELAY	TTD	022D	0205
TRANSPARENT START OF TEXT	XSTX	1002	
TRANSPARENT INTERMEDIATE BLOCK	XITB	101F	
TRANSPARENT END OF TEXT	XETX	1003	
TRANSPARENT END OF TRANSMISSION BLOCK	XETB	1026	
TRANSPARENT SYNCHRONOUS IDLE	XSYN	1032	
TRANSPARENT BLOCK CANCEL	XENQ	102D	
TRANSPARENT TTD	XTTD	1002102D	
DATA DLE IN TRANSPARENT MODE	XDLE	1010	

NOTE: ** PAD IS 4 LOW-ORDER BITS OF 1'S (MORE BITS MAY OPTIONALLY BE ON)

5.1.2 3270 CONTROL CHARACTERS AND COMMAND CODES

THE FOLLOWING COMMANDS HAVE BEEN DEFINED FOR THE 3270 DISPLAY SYSTEM:

COMMAND	HEX	GRAPHIC
WRITE	F1	1
ERASE/WRITE	F5	5
DIAGNOSTIC WRITE	F9	9
READ BUFFER	F2	2
READ MODIFIED	F6	6
DIAGNOSTIC READ	7A	:
COPY	F7	7
ERASE ALL UNPROTECTED	6F	?

THE FOLLOWING CONTROL CHARACTERS ARE USED IN THE VARIOUS RFTS:

HEX	DEFINITION
60	PROTECTED, NORMAL INTENSITY
6C	PROTECTED, NON DISPLAY
E8	PROTECTED, HIGH INTENSITY, SELECTOR PEN
F8	PROTECTED, HIGH INTENSITY, AUTO SKIP
E4	PROTECTED, NORMAL INTENSITY, SELECTOR PEN
40	UNPROTECTED, NORMAL INTENSITY
C8	UNPROTECTED, HIGH INTENSITY
D8	UNPROTECTED, HIGH INTENSITY, NUMERIC
4C	NON DISPLAY, NON PRINT, NON DETECTABLE

5.1.3 VALID 3270 CONTROL UNIT AND DISPLAY STATION ADDRESSES

CU OR DVC NUMBER	DVC SELECTION, SPECIFIC POLL, CU POLL, OR DS POLL	CONTROL UNIT AND DS SELECTION ADDRESS	CU OR DVC NUMBER	DVC SELECTION, SPECIFIC POLL, CU POLL, OR DS POLL	CONTROL UNIT AND DS SELECTION ADDRESS
0	40 (BLANK)	60 (-)	16	50 (&)	F0 (0)
1	C1 (A)	61 (/)	17	D1 (J)	F1 (1)
2	C2 (B)	E2 (S)	18	D2 (K)	F2 (2)
3	C3 (C)	E3 (T)	19	D3 (L)	F3 (3)
4	C4 (D)	E4 (U)	20	D4 (M)	F4 (4)
5	C5 (E)	E5 (V)	21	D5 (N)	F5 (5)
6	C6 (F)	E6 (W)	22	D6 (O)	F6 (6)
7	C7 (G)	E7 (X)	23	D7 (P)	F7 (7)
8	C8 (H)	E8 (Y)	24	D8 (Q)	F8 (8)
9	C9 (I)	E9 (Z)	25	D9 (R)	F9 (9)
10	4A (CENT SIGN)	6A	26	5A (EXCLAMATION)	7A (:)
11	4B (.)	6B (,)	27	5B ($)	7B (#)
12	4C (<)	6C (%)	28	5C (*)	7C (@)
13	4D (()	6D (_)	29	5D ())	7D (')
14	4E (+)	6E (>)	30	5E (SEMI-COLON)	7E (=)
15	4F (|)	6F (?)	31	5F (¬)	7F (QUOTE)

NOTE THE FOLLOWING WHEN USING THIS TABLE OF ADDRESSES:

1) THE ABOVE ADDRESS ARE ALL GIVEN IN HEX FOLLOWED BY THE GRAPHIC CHARACTER IN PARENTHESIS.

2) SEE SECTION 5.3 FOR AN EXPLANATION ON HOW THIS INFORMATION IS ENTERED TO THE PROGRAM.

5.2 EBCDIC-ASCII, ASCII-EBCDIC TRANSLATION TABLE

CHARACTER	EBCDIC	ASCII	CHARACTER	EBCDIC	ASCII	CHARACTER	EBCDIC	ASCII
A	C1	41	M	D4	4D	Y	E8	59
B	C2	42	N	D5	4E	Z	E9	5A
C	C3	43	O	D6	4F	0	F0	30
D	C4	44	P	D7	50	1	F1	31
E	C5	45	Q	D8	51	2	F2	32
F	C6	46	R	D9	52	3	F3	33
G	C7	47	S	E2	53	4	F4	34
H	C8	48	T	E3	54	5	F5	35
I	C9	49	U	E4	55	6	F6	36
J	D1	4A	V	E5	56	7	F7	37
K	D2	4B	W	E6	57	8	F8	38
L	D3	4C	X	E7	58	9	F9	39

5.3 ENTERING POLLING AND SELECTING ADDRESSES TO THE PROGRAM (MULTIPOINT OR POINT TO POINT)

THE POLLING AND SELECTION ADDRESSES MUST BE PROVIDED TO THE PROGRAM VIA REPLACE CARD. FORMAT OF THE REPLACE CARD IS AS FOLLOWS: (SEE NOTE 1 AND 2 BELOW)

```
COL    1     R
       2     BLANK
     3-6     1FF0
       7     BLANK
    8-15     HEXIDECIMAL SELECTING ADDRESS (IN THE ORDER CUACUA,DSADSA)
   16-23     HEXIDECIMAL POLLING ADDRESS (IN THE ORDER CUACUA,DSADSA)  WHERE,
             CUA IS THE CONTROL UNIT ADDRESS AND DSA IS THE DISPLAY STATION ADDRESS.
```

AS AN EXAMPLE IF THE SELECTING ADDRESS IS IN HEX 6040 (CUADSA) AND THE POLLING ADDRESS IS 4040 (CUADSA) THE REPLACE CARD WOULD BE AS FOLLOWS: (SEE NOTE 3 BELOW)

```
                          1                   2
COL    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
CHAR   R   1 F F 0   6 0 6 0 4 0 4 0 , 4 0 4 0 4 0 4 0
```

5.4 ENTERING THE TELEPHONE NUMBER FOR AUTO CALL (SWITCHED ONLY)

IF THE BSCA HAS THE AUTO CALL FEATURE AND IT IS SO DESIGNATED BY THE CORRECT UDT OPTION BEING ON, PLACE THE TELEPHONE NUMBER INTO CORE BY REPLACE CARD. TO INSURE CORRECT BILLING OF A CALL DO NOT USE THE AUTO CALL FACILITY WHEN CONTACTING RALEIGH TEST CENTER ON TOLL CALLS. FORMAT OF THE REPLACE CARD IS AS FOLLOWS: (SEE NOTE 1 BELOW) IF SECTION 872 IS USED, THE REPLACE CARD MUST BE USED WITH THE SECTION AND THE NUMBER REDIALED.

```
COL    1     R
       2     BLANK
     3-6     1FD0
       7     BLANK
     8-9     HEXIDECIMAL LENGTH OF TELEPHONE NUMBER(MAXIMUM OF ELEVEN DIGITS)
     10-     TELEPHONE NUMBER IN FORM 0X0Y...0Z, WHERE X,Y,...Z ARE THE ACTUAL DIGITS OF THE TELEPHONE NUMBER
```

AS AN EXAMPLE IF THE TELEPHONE NUMBER IS '1-507-285-1234' THE REPLACE CARD WOULD BE AS FOLLOWS: (SEE NOTE 3 BELOW)

```
                          1                   2                   3
COL    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
CHAR   R   1 F D 0   0 B 0 1 , 0 5 0 0 0 7 , 0 2 0 8 0 5 , 0 1 0 2 0 3 0 4
```

5.5 ENTERING THE DISPLAY STATION ID (SWITCHED ONLY)

IF THE DISPLAY STATION REQUIRES ID VERIFICATION, THE ID MAY BE ENTERED (MAXIMUM OF 15 CHARACTERS) TO THE PROGRAM VIA REPLACE CARD. SWITCHED NETWORK MUST ALSO BE DEFINED AS A 3270 UDT OPTION. FORMAT OF THE REPLACE CARD IS AS FOLLOWS: (SEE NOTE 1 BELOW) IF SECTION 872 IS USED, THE REPLACE CARD MUST BE USED WITH THE SECTION AND THE CONNECTION REESTABLISHED.

```
COL    1     R
       2     BLANK
     3-6     1FE0
       7     BLANK
     8-9     HEXIDECIMAL NUMBER OF ID CHARACTERS
     10-     HEXIDECIMAL REPRESENTATION OF THE ID
```

AS AN EXAMPLE IF THE ID REQUIRED IS THE WORD 'ROCHESTER' THEN THE REPLACE CARD WOULD BE AS FOLLOWS: (SEE NOTE 3)

```
                          1                   2
COL    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8
CHAR   R   1 F E 0   0 9 D 9 D 6 C 3 C 8 C 5 E 2 E 3 C 5 D 9
```

NOTE 1 - IF LOADING FROM DISK ENTER THE REPLACE CARD INFORMATION AS INDICATED IN THE GENERAL USER'S GUIDE FOR SYSTEM/3. PROGRAM 'FF6' IS USED TO KEY THIS INFORMATION TO THE SECTION.

NOTE 2 - THE ABOVE REPLACE CARDS SHOULD BE INCLUDED WITH SECTION 871 AT LOAD TIME. IF THIS IS DONE, REPLACE CARDS NEED NOT BE ENTERED FOR SECTION 872 IF IT IS EXECUTED IMMEDIATELY FOLLOWING SECTION 871.

NOTE 3 - COMMAS MAY BE USED WHERE DESIRED IN THE DATA PORTION OF THE REPLACE CARD.

5.6 STATUS BYTES 0 AND 1

THE FOLLOWING BITS HAVE BEEN DEFINED FOR STATUS BYTES 0 AND 1 WHICH ARE RECEIVED FROM A DISPLAY STATION:

STATUS BYTE 0 BIT #		STATUS BYTE 1 BIT #	
0	SEE BELOW	0	SEE BELOW
1	ALWAYS 1	1	ALWAYS 1
2	RESERVED	2	COMMAND REJECT
3	RESERVED	3	INTERVENTION REQUIRED
4	DEVICE BUSY	4	EQUIPMENT CHECK
5	UNIT SPECIFY	5	DATA CHECK
6	DEVICE END	6	CONTROL CHECK (NOT USED BY REMOTE SINGLE)
7	TRANSMISSION CHECK (NOT USED BY THE CLUSTER)	7	OPERATION CHECK

BIT 0 FOR BOTH SENSE BYTE 0 AND SENSE BYTE 1 ARE 0 OR 1 DEPENDING ON BITS 2-7.

5.7 UDT OPTIONS

FOUR UDT OPTIONS HAVE BEEN DEFINED FOR THE 3270 DISPLAY SYSTEM PROGRAMS (ID 871 AND 872). OPTION 1 IS FOR THE ASCII TERMINAL, OPTION 2 IS FOR THE 1920 CHARACTER BUFFER TERMINAL (3275-2 OR 3277-2), OPTION 3 IS FOR THE AUTO CALL FEATURE, AND OPTION 4 IS FOR SWITCHED NETWORKS.

OPTION 0 MUST BE ON IN THE CASE WHEN THE 3284/3 IS ATTACHED TO THE 3275 SINCE EACH PATTERN THAT IS DISPLAYED WILL ALSO BE PRINTED. IF NO PRINTING IS DESIRED ON THE 3284/3, OPTION 0 MUST BE OFF AND THE DEDICATED PRINTER FEATURE CARD REMOVED FROM THE 3275.

IT MUST BE NOTED THAT ONLY THE UDT OPTIONS REFERRING TO THE DEVICE WHOSE ADDRESSES FOR SELECTING AND POLLING ARE ENTERED TO THE PROGRAM MAY BE SET AT ANY ONE TIME. OTHERWISE INVALID RESULTS MAY BE OBTAINED.

************LAST PAGE************

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1. GENERAL PROGRAM SUMMARY

1.1 DIAGNOSTIC PROGRAM DESCRIPTIONS

1.1.1 SECTION 891 BASIC ATTACHMENT CHECKOUT

RTN	DESCRIPTION	
1	INITIAL ATTACHMENT CONDITIONS TEST PART-1	
2	INITIAL ATTACHMENT CONDITIONS TEST PART-2	
3	HDB INITIALIZATION	
4	OP DECODE REGISTER TEST	
5	OP DECODE TEST AND HIGH HDB TEST	
6	MICRO INSTRUCTION ADDRESS REGISTER (MIAR) TEST	
7	LIO/SNS MICROCONTROLLER STORAGE TEST	
8	CONTROL STORE MEMORY AND BRANCHING TEST	
9	SHIFT LEFT (SL)	MICRO INSTRUCTION TEST
A	BRANCH ON CONDITION (BOC)	MICRO INSTRUCTION TEST
B	SET BITS ON (SBN)	MICRO INSTRUCTION TEST
C	SET BITS OFF (SBF)	MICRO INSTRUCTION TEST
D	INSERT CHARACTER (IC)	MICRO INSTRUCTION TEST
E	TEST BITS ON (TBN)	MICRO INSTRUCTION TEST
F	TEST BITS OFF (TBF, TBFR)	MICRO INSTRUCTION TEST
10	EXCLUSIVE 'OR' REGISTER (XR)	MICRO INSTRUCTION TEST
11	COMPARE IMMEDIATE REGISTER (CIR)	MICRO INSTRUCTION TEST
12	COMPARE IMMEDIATE (CI)	MICRO INSTRUCTION TEST
13	BRANCH REGISTER (BR)	MICRO INSTRUCTION TEST
14	INCREMENT REGISTER (INC)	MICRO INSTRUCTION TEST
15	LOAD REGISTER (LR)	MICRO INSTRUCTION TEST
16	TEST SIGNAL ON (TSN)	MICRO INSTRUCTION TEST
17	SET SIGNAL OFF/ON (SSF/SSN)	MICRO INSTRUCTION TEST
18	BRANCH AND LINK (BAL) (FIRST 1K)	MICRO INSTRUCTION TEST
19	LOAD EXTERNAL AND LOAD REGISTER (LE) (LR)	MICRO INSTRUCTION TEST
1A	CONTROL STORE ADDRESSING ABOVE 1K	
1B	BRANCH AND LINK (BAL) AND BRANCH REGISTER (BR)	MICRO INSTRUCTION TEST
1C	HDB REGISTERS 10-TO-3F ADDRESSING, CIR OP	MICRO INSTRUCTION TEST
1D	HDB REGISTERS 10-TO-3F ADDRESSING, SHIFT OP	MICRO INSTRUCTION TEST
1E	HDB REGISTERS 10-TO-3F ADDRESSING, XR, TBFR, INC OPS	MICRO INSTRUCTION TEST
1F	HDB REGISTERS 10-TO-3F ADDRESSING, BR OP	MICRO INSTRUCTION TEST
20	MESSAGE BUFFER ADDRESS REG (MBAR) & CURSOR ADDRESS REG (CURAR) TEST	
21	CHECK OF ENTIRE MESSAGE BUFFER	
22	MESSAGE BUFFER INTERACTION TEST	
23	ATTACHMENT CHECK DETECTION	
24	CONTROL STORE EXERCISE	
25	SPARE	
26	TSN-9 TEST	
27	SPARE	
28	SPARE	
29	TSN-0 AND TSN-1 CHECKED IN DIAGNOSTIC MODE	
2A	A 13-BIT CONTROL WORD CONTAINING ALL 1'S IS WRAPPED WHILE IN DIAGNOSTIC MODE	
2B	SAME AS ROUTINE 1F EXCEPT ALL 0'S ARE USED	
2C	SAME AS ROUTINE 1F EXCEPT ALTERNATE BIT PATTERN USED	
2D	SAME AS 21 EXCEPT OPPOSITE ALTERNATE BIT PATTERN USED	
2E	IN DIAGNOSTIC MODE, TRANSMIT ZEROS HARDWARE CHECKED	
2F	CHECKOUT OF SSN-6 INSTRUCTION OPERATION	
30	CHECKOUT OF SSN-B INSTRUCTION OPERATION	
31	CHECKS FOR A CURSOR WHEN MBAR = CURAR	
32	CHECKS CONDITIONS OF ATTACHMENT RESET	
33	SPARE	
34	SPARE	
35	SPARE	
36	BSCA-2 SIO, ENABLE/DISABLE	

RTN	DESCRIPTION
37	BSCA-2 SIO, ENABLE/DISABLE WITH TIMEOUT REQUEST
38	BSCA/-2 SIO NON-IMMEDIATE AND TIO BUSY.
39	BSCA-2 INTERRUPT TEST
3A	BSCA-2 TIO NOT READY/UNIT CHECK
3B	BSCA-2 CYCLE STEAL TEST
3C	DRIVER/RECEIVER WRAP.
3D	SPARE
3E	SPARE
3F	DEVICE POLLING.
40	MANUAL INTEPVENTION TEST.
41 *	SPECIAL ROUTINE WHICH ALLOWS CE SELECTION OF HIS OWN MICRO INSTRUCTIONS
42 *	CHECKS CE TEST BOX
43 *	DUMPS HDB'S AND CONTROL STORAGE
*	ROUTINES MUST BE MANUALLY SELECTED

1.1.2 SECTION 893 MICROCODE LOADER

RTN	DESCRIPTION
1	THE MICROCODE IS LOADED INTO CONTROL STORE. THE CONTROL STORE IS THEN SENSED TO DETERMINE IF THE MICROCODE WAS ENTERED CORRECTLY.

1.1.3 SECTION 894 UNIT FUNCTION TEST (3277, 3284/86/87/88 AND 129)

RTN	DESCRIPTION
1	CHECK DEVICE AVAILABILITY OR RESTART AND UPDATE TO NEXT DEVICE
2	MODEL & DEVICE TYPE DETERMINATION
3	RIPPLE DATA TEST
4	SINGLE CHARACTER TEST
5	READ MODIFIED TEST
6	WRITE FUNCTION TESTS & EAU
7	INVALID ADDR. DETECTION
8	INVALID DATA DETECTION
9	UPPER/LOWER CASE ALPHA TEST & CONTINUOUS POLL
A	TEST PATTERN INSTRUCTIONS
B	TEST PATTERN 1
C	TEST PATTERN 2 OR 3
D	TEST PATTERN 4
E	TEST PATTERN 5
F	TEST PATTERN 6
10	KEYBOARD FUNCTION TEST
11	UPPER/LOWER CASE ALPHA KEYBOARD TEST
12	DISPLAY OR PRINT END OF MESSAGE
13	MANUALLY SELECTED C.E. EXERCISER. (SELECTED VIA DCP OPTION 'F213') NOTE: ROUTINE 01-02 MUST BE RUN BEFORE THIS ROUTINE CAN BE SELECTED.
14	MANUALLY SELECTED ROUTINE (VIA OPTION 'F214') TO PUNCH DATA CARDS ON THE 129. NOTE: ROUTINE 01-02 MUST BE RUN BEFORE THIS ROUTINE CAN BE SELECTED.
15	MANUALLY SELECTED ROUTINE (VIA OPTION 'F215') TO PUNCH PROGRAM CARDS ON THE 129. NOTE: ROUTINE 01-02 MUST BE RUN BEFORE THIS ROUTINE CAN BE SELECTED.
16	MANUALLY SELECTED ROUTINE (VIA OPTION 'F216') TO READ AND PRINT CARDS FROM THE 129 NOTE: ROUTINE 01-02 MUST BE RUN BEFORE THIS ROUTINE CAN BE SELECTED.

1.1.4 MICROPROGRAM DECK (PROGRAM ID = FC7)

THE DA MICROCODE DECK CONTAINS THE PROGRAM FOR OPERATING THE UNITS. THE MICROCODE DECK(FC7) IS USED IN CONJUNCTION WITH THE MICROCODE LOADER (893) AND WITH THE PROGRAM TO UPDATE THE DA MICROCODE ON THE CUSTOMERS SYSTEM PACK (FC8).

1.1.5 PROGRAM TO UPDATE DA MICROCODE ON CUSTOMERS SYSTEM PACK (PROGRAM ID = FC8)

THIS PROGRAM WILL TAKE THE DA MICROCODE (FC7) FROM THE DIAGNOSTIC PACK OR CARD DECK AND WILL PLACE IT ON THE CUSTOMERS SYSTEM PACK. THE SYSTEM PACK MUST HAVE A FILE ALLOCATED FOR THE FC7 DECK. IF UPDATING FROM DISK, THE PROGRAM (FC8) SHOULD BE USED AFTER THE DA MICROCODE (FC7) HAS BEEN UPDATED ON THE DIAGNOSTIC PACK.

1.2 OPTIONS

SENSE SWITCH OPTIONS

SENSE SWITCH NUMBER	OPTION PROVIDED WHEN SENSE SWITCH IS ON	SECTIONS WHERE USED
10	ALLOW OPTIONS TO BE USED WHILE LOADING CONTROL STORE OPTIONS: 01-LOAD,SENSE, & PRINT. 02 - LOAD & SENSE. 03- SENSE & PRINT.	893
10	PRINT CONTENTS OF HDB'S AS THEY ARE SENSED (ROUTINE 465)	891
10	SELECT DEVICES FROM CONSOLE SWITCHES.	894
11	RESTART ROUTINE 1 COMPLETELY-REESTABLISH DEVICE AVAILABILITY.	894
12	PRINT CONTENTS OF CONTROL STORE IN ROUTINE 7.	891
12	DISABLE 90 SECOND TIMEOUT THAT AUTOMATICALLY ADVANCES TEST PATTERNS.	894
13	DISPLAY HAS SELECTOR PEN BUT NO KEYBOARD	894
14	DISPLAY HAS NEITHER SELECTOR PEN OR KEYBOARD	894
15	ENTER CHARACTER FROM DATA SWITCHES IN ROUTINE 4	894
16	BYPASS 90 SECOND TIME OUT FOR PRINTERS ROUTINE 0A-0F	894
17	USED WITH SSW01 TO PUT ROUTINES INTO A TIGHT LOOP WHICH BYPASSES CONTROL STORE LOAD AFTER FIRST PASS	891
1C	BYPASS ROUTINE 24 (CONTROL STORE EXERCISE)	891
20	SKIP TEST PATTERNS OR DO ONLY THOSE SELECTED BY SSW 21 THRU 26 AS FOLLOWS:	894
21	DO TEST PATTERN 1 IF SSW 20 IS ON	894
22	DO TEST PATTERN 2 IF SSW 20 IS ON	894
23	DO TEST PATTERN 3 IF SSW 20 IS ON	894
24	DO TEST PATTERN 4 IF SSW 20 IS ON	894
25	DO TEST PATTERN 5 IF SSW 20 IS ON	894
26	DO TEST PATTERN 6 IF SSW 20 IS ON	894
27	SKIP THE FULL BUFFER PRINTOUTS IN ROUTINES 03, 04	894
28	ON A MODEL 4 CPU ONLY, DEVICE 40 IS NOT A KEYBOARDLESS 3277 MODEL 1 DISPLAY.	894
2A	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-F1 AND CLEAR UNDER SSW 29 CONTROL.	80E
2B	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-R1 AND CLEAR UNDER SSW 29 CONTROL.	80E
2C	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-F1 AND CLEAR UNDER SSW 29 CONTROL.	80E
2C	USED ONLY WHEN FC8 IS LOADING 893, AND SHOULD BE IGNORED AND NEVER SET BY THE C.E..	893
2D	PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-R1 AND CLEAR UNDER SSW 29 CONTROL.	80E
2D	SYSTEM PACK FOR DA MICROCODE RESIDES ON 3340.	FC8
2E	SYSTEM PACK FOR DA MICROCODE RESIDES ON 5444.	FC8
2E	ERAP DATA LOCATED ON 5444 F1.	80E
2F	ERAP DATA LOCATED ON 3340 SIMULATED F1.	80E

1.3 3270 TROUBLE SHOOTING GUIDES AND REFERENCE MANUALS

IT MUST BE NOTED THAT THE CORRECT 3270 TROUBLE SHOOTING GUIDES MUST BE USED IN CONJUNCTION WITH THE TEST PATTERNS PROVIDED IN THESE SYSTEM/3 PROGRAMS. THIS USER'S GUIDE DOES NOT PROVIDE SERVICE AID INFORMATION RELATED TO THE USE OF THE PATTERNS. ALSO USE ANY PRINTOUTS IN 894 TO DEVELOP SYMPTOMS WHICH CAN BE RELATED TO THE SYMPTOM INDEX IN THE APPROPRIATE TROUBLE SHOOTING GUIDE.

THE TROUBLE SHOOTING GUIDES ARE:

- 3277 DISPLAYS - SY27-2314 (SY27-2330 IF KATAKANA)
- 3284/86 PRINTERS - SY27-2315 (SY27-2331 IF KATAKANA)
- 3287 PRINTERS - SY18-2002 OR SY27-0171
- 3288 PRINTERS - SY27-2401
- 129 DATA RECORDERS - SY09-1004 (ALSO SEE GA09-1600)

THE 3270 INFORMATION DISPLAY SYSTEM COMPONENT DESCRIPTION MANUAL (GA27-2749 OR GA18-1017 IF KATAKANA) SHOULD BE USED FOR AN OVERALL SYSTEM REFERENCE ONLY. DISPLAY ADAPTER SIMULATES A BSCA CONNECTED TO A 3271 CONTROL UNIT AS DESCRIBED IN THE REMOTE OPERATIONS SECTION OF THIS MANUAL.

2. OPERATING PROCEDURES (DCP CONTROLLED SECTIONS)

FOR DETAILED INSTRUCTIONS ON USER GUIDE INTERFACE BETWEEN THESE SECTIONS AND DCP, REFER TO USER'S GUIDE BLOCK 10.

3. INDEX TABLE FOR HALTS AND PRINTOUTS

3.1 PROGRAM OPERATOR HALTS -A0- THROUGH -FF-

HALT ID	SECT RTN	DESCRIPTION	MAP REF
08	80E	ERROR PRINTOUT. SEE PRINTOUT.	
A3	893 FC8	DA MICRO-CODE BEING LOADED.	
A4	893 FC8	MICRO-CODE (LEVEL X) LOADED SUCCESSFULLY. NOTE THAT 'X' WILL BE REPLACED WITH THE LEVEL OF MICROCODE.	
E1	893 FC8	MICROCODE DECK WHICH WAS LOADED IS TOO LARGE FOR THE SYSTEM CONTROL STORAGE. SET DATA SWITCHES TO 04 AND RESET HALT TO PRINT MICROCODE DECK.	
E2	893 FC8	LOADING ERROR. SET DATA SWITCHES TO 05 AND RESET HALT TO RELOAD CONTROL STORE WITH THE MICROCODE ALREADY IN MEMORY.	
E3	893	ATTACHMENT CHECK WHILE LOADING MICRO-CODE.	
E4	FC8 893	AFTER LOADING MICRO-CODE HDB'S WERE NOT ZERO.	
E7	FC8	32XX MICRO-CODE NOT LOADED AND YOU ARE USING IT FOR COMMUNICATIONS.	
E8	FC8	32XX OPERATOP CONSOLE ERROR. RESET HALT TO RESTART.	
EC	893 FC8	PATCH FORMAT ERROR. CORRECT PATCH IN 893 & RELOAD.	
F0	893 FC8	SSW 10 OPTION HALT. SELECT LOADER OPTION IN DATA SWITCHES AND RESET HALT. OPTIONS: 01 - LOAD, SENSE, & PRINT. 2 - LOAD & SENSE. 03 - SENSE & PRINT.	
F0	FC8	MOUNT SYSTEM PACK ON R1/D2 AND MAKE READY. VERIFY DATA SET NAME IF ENTERED FROM DATA SWITCHES. RESET HALT TO CONTINUE.	
F0/F1	894	SSW 10 WAS TURNED ON, INSERT HEX DEVICE CODES INTO DATA SWITCHES 3&4, AND RESET HALT. HALTS WILL ALTERNATE TO INDICATE DEVICE WAS ACCEPTED. SET DATA SW 3&4=FF TO TERMINATE DEVICE SELECTION. IF AN ATTEMPT IS MADE TO SELECT AN INVALID DEVICE THE CURRENT HALT WILL NOT CHANGE AND AN ERROR MESSAGE IS PRINTED.	
F1-F6	FC8	ENTER DATA SET NAME 1 CHARACTER AT A TIME IN DATA SWITCHES 3 AND 4. HALT ADVANCES FOR EACH CHARACTER ENTERED.	
F1	893 FC8	CHECK TO MAKE SURE THAT DATA DECK FC7 FOR MICROCODE LOADER IS IN PRIMARY HOPPER. RESET HALT TO CONTINUE.	
F2	893 FC8	CARD SEQUENCE OF DECK ID FC7 IS OUT OF ORDER. SEQUENCE CARDS AND RERUN SECTION.	
F3	893 FC8	NO END CARD TO DECK FC7, OR DECK IS TOO LONG. CORRECT DECK FC7 AND RERUN SECTION.	
F3	894	SSW 15 IS ON.ROUTINE 4 IS BEING DONE. INSERT CHARACTER IN DATA SWITCHE 3 & 4 REPEATED IN DEVICE BUFFER. CAUTION: IF THIS CHARACTER IS NOT VALID, ERROR PRINTOUTS MAY RESULT.	
F4	893 FC8	DECK ID IS NOT FC7. PLACE DECK FC7 IN READER AND RERUN SECTION.	
F7	FC8	MICRO-CODE OBJECT FILE ON SYSTEM PACK DIDN'T CONTAIN 17 SECTORS OF SPACE. MAKE SURE THE MICRO-CODE FILE HAS 17 SECTORS BEFORE RUNNING FC8.	
F8	80E	MANUAL INPUT NEEDED. SEE PRINTOUT.	
F9	80E	SET SSW 2A FOR D1-F1, 2B FOR D1-R1, 2C FOR D3-F1, OR 2D FOR D3-R1	
F9	FC8	COULDN'T OPEN MICRO-CODE OBJECT FILE ON SYSTEM PACK. CHECK TO SEE IF FILE NAME GIVEN IS CORRECT. RERUN SECTION.	
FA	FC8	UNABLE TO CONVERT 5444 ADDRESS TO 3340 ADDRESS. SYSTEM PACK MUST BE A VALID PACK TO CONVERT ADDRESSES.	
FB	FC8	3340 ERROR. RERUN SECTION.	
FC	FC8	DISK ERROR. RESET HALT TO RETRY. IF ERROR PERSISTS, RUN DISK DIAGNOSTICS.	
FD	80E	DISK NOT READY, MAKE DRIVE 1 READY AND RESET HALT	
FE	80E	DISK ERROR, RESET HALT TO RETRY.	
FE	FC8	DISK DRIVE 1 NOT READY. MAKE DRIVE 1 READY AND RESET HALT.	
FE	894	ROUTINES 01-02 HAVE NOT BEEN RUN TO CONFIGURE THE PROGRAM TO THE CURRENT DEVICE. RESULTS ARE INVALID IF YOU CONTINUE.	
FF	891 FC8	MANUAL INPUT NEEDED. SEE PRINTOUT.	
FF	894	ROUTINE 1 HAS BEEN TESTING DEVICE AVAILABILITY. A DEVICE AVAILABILITY LIST HAS BEEN PRINTED OUT. EXAMINE THIS LIST AND IF RESULTS ARE FAVORABLE, RESET HALT FF TO GO TO ROUTINE 2.	
FF	80E	COULD NOT FIND BSCA X FILE TERMINAL STATISTICS (X = 1 OR 2)	

3.2.1

SECTION 891

ROUT	HALT	MEANING OF ID
01	01	WITH THE ATTACHMENT DISABLED, A TIO FOUND IT READY.
01	03	WITH THE ATTACHMENT DISABLED, A TIO FOUND AN ATTACHMENT CHECK.
02	81	TIO BSCA-2 SHOULD BRANCH NOT READY AND DID NOT.
02	82	TIO BSCA-2 SHOULD NOT BRANCH ON OP END INT PENDING BUT DID.
02	83	TIO BSCA-2 SHOULD NOT BRANCH ON BUSY BUT DID.
02	84	TIO BSCA-2 SHOULD NOT BRANCH ON ITB INT PENDING BUT DID.
02	85	TIO BSCA-2 SHOULD NOT BRANCH ON ANY INT PENDING BUT DID.
04	09	THE OP DECODE REGISTERS WERE LOADED WITH THE PROPER INFORMATION. THE ADAPTER WAS LEFT ENABLED AND A TIO THEN FOUND IT READY.
04	0B	AN ATTEMPT WAS MADE TO LOAD HDB 0-1 WITH 0000 AND FFFF, BUT IT WAS FOUND THAT NEITHER HDB WOULD CHANGE.
04	0C	SAME AS HALT 0B EXCEPT THAT ONLY HDB 0 WOULD NOT CHANGE.
04	0D	SAME AS HALT 0B EXCEPT THAT ONLY HDB 1 WOULD NOT CHANGE.
04	0E	AFTER THE OP DECODE REGISTERS WERE LOADED, A FAILURE WAS NOTED. EITHER THE OP DECODE REGISTERS CANNOT BE LOADED PROPERLY OR THERE IS A FAILURE IN THE DIAGNOSTIC HARDWARE THAT BLOCKS THE PARITY BIT.
04	10	AFTER LOADING AND SENSING HDB'S, THERE WAS AN ATTACHMENT CHECK.
04	11	AFTER LOADING HDB'S, THE DATA SENSED WAS NOT THAT EXPECTED.
04	12	AFTER LOADING AND SENSING THE LOW HDB'S, IT WAS NOTED THAT THE HI HDB'S HAD CHANGED.
05	09	THE OP DECODE REGISTERS WERE LOADED WITH THE PROPER INFORMATION. THE ADAPTER WAS LEFT ENABLED AND A TIO THEN FOUND IT READY.
05	0B	AN ATTEMPT WAS MADE TO LOAD HDB 0-1 WITH 0000 AND FFFF, BUT IT WAS FOUND THAT NEITHER HDB WOULD CHANGE.
05	0C	SAME AS HALT 0B EXCEPT THAT ONLY HDB 0 WOULD NOT CHANGE.
05	0D	SAME AS HALT 0B EXCEPT THAT ONLY HDB 1 WOULD NOT CHANGE.
05	0E	AFTER THE OP DECODE REGISTERS WERE LOADED, A FAILURE WAS NOTED. EITHER THE OP DECODE REGISTERS CANNOT BE LOADED PROPERLY OR THERE IS A FAILURE IN THE DIAGNOSTIC HARDWARE THAT BLOCKS THE PARITY BIT.
05	10	AFTER LOADING AND SENSING HDB'S, THERE WAS AN ATTACHMENT CHECK.
05	11	AFTER LOADING HDB'S, THE DATA SENSED WAS NOT THAT EXPECTED.
05	12	AFTER LOADING AND SENSING THE LOW HDB'S, IT WAS NOTED THAT THE HI HDB'S HAD CHANGED.
06	13	WHILE DOING LIO'S TO CONTROL STORAGE, THE MIAR ADDRESS DUMPED INTO HDB 1F WAS FOUND TO BE NOT INCREMENTING CORRECTLY.
07	14	AN ATTEMPT WAS MADE TO WRITE 0000 AND FFFF INTO CONTROL STORE, BUT IT WAS FOUND THAT THE ENTIRE WORD COULD NOT BE CHANGED.
07	15	SAME AS HALT 14, EXCEPT THAT THE HI BYTE ONLY COULD NOT BE CHANGED.
07	16	SAME AS HALT 14, EXCEPT THAT THE LO BYTE ONLY COULD NOT BE CHANGED.
07	17	WHILE DOING A LIO TO CONTROL STORE, AN ATTACHMENT CHECK OCCURRED.
07	18	CONTROL STORE WAS LOADED, BUT WHILE SENSING THE DATA IN CONTROL STORAGE IT WAS FOUND TO BE INCORRECT. CAUTION - INCORRECT UDT AND/OR MODEL 2 SUPPORT HARDWARE CAN CAUSE THIS HALT.
07	1A	WHILE DOING LIO'S TO CONTROL STORAGE, THE MIAR DID NOT INCREMENT PROPERLY.
08	1C	WHILE DOING BOS,0 MICROINSTRUCTIONS, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED LOCATION INDICATING BOS, 0 DOES NOT FUNCTION PROPERLY. CAUTION - IF THE STOP SWITCH IS DEPRESSED WHILE ROUTINE 08 IS RUNNING, THIS ERROR WILL OCCUR WHEN THE PROGRAM IS RESTARTED.
08	1E	UDT SHOWS THAT KATAKANA IS NOT INSTALLED, BUT BOS,3 BRANCHED ANYHOW. FEATURE TIE-UP SHOULD NOT BE INSTALLED.
08	1F	UDT SHOWS THAT KATAKANA IS INSTALLED, BUT BOS,3 DID NOT BRANCH. FEATURE TIE-UP SHOULD BE INSTALLED.
08	20	AFTER THE MICROCONTROLLER WAS ENABLED, A TIO FOUND THE ADAPTER WAS NOT READY.
08	21	AFTER THE MICROCONTROLLER WAS ENABLED, A TIO FOUND THERE WAS AN ATTACHMENT CHECK.
09	25	WHILE DOING THE SL MICROINSTRUCTION, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED ADDRESS.
09	26	THE SL MICROINSTRUCTION FAILED WHILE TRYING TO SHIFT DATA 00 & FF (DATA SHOULD HAVE REMAINED THE SAME).
09	27	THE SL MICROINSTRUCTION FAILED WHILE TRYING TO SHIFT DATA AA & 55 (DATA SHOULD HAVE CHANGED TO 55 & AA).
0A	2A	THE BOC (BRANCH ON CONDITION) MICROINSTRUCTION WAS FOUND TO BE FAILING.
0B	30	SBN MICROINSTRUCTIONS FAILED TO CHANGE DATA FROM 0000 TO 55AA.
0B	31	SBN MICROINSTRUCTIONS FAILED TO CHANGE DATA FROM 55AA TO FFFF.
0B	32	SBN MICROINSTRUCTIONS FAILED TO CHANGE DATA FROM 55AA TO F5AF.
0B	2F	WHILE DOING THE SBN (SET BITS ON) MICROINSTRUCTION, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED ADDRESS.

SECTION 891--CONTINUED

ROUT	HALT	MEANING OF ID
0C	36	WHILE DOING THE SBF (SET BITS OFF) MICROINSTRUCTION, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED ADDRESS.
0C	37	SBF MICROINSTRUCTIONS FAILED TO CHANGE DATA FROM FFFF TO 55AA.
0C	38	SBF MICROINSTRUCTIONS FAILED TO CHANGE DATA FROM 55AA TO 0480.
0D	3C	WHILE DOING THE IC (INSERT CHARACTER) MICROINSTRUCTION, THE MICROPROGRAM DID NOT STOP AT THE EXPECTED ADDRESS.
0D	3E	IC INSTRUCTIONS FAILED TO CHANGE DATA FROM FFFF TO 55AA.
0D	3F	IC INSTRUCTIONS FAILED TO CHANGE DATA FROM 00FF TO FF00.
0E	42	THE TBN (TEST BITS ON) MICROINSTRUCTION HAS FAILED.
0F	44	THE TBF (TEST BITS OFF) OR TBFR (TEST BITS OFF REG. TO REG.) MICROINSTRUCTION HAS FAILED.
10	4A	THE XR (EXCLUSIVE OR REGISTER) MICROINSTRUCTION HAS FAILED.
11	48	THE CIR (COMPARE IMMEDIATE REGISTER) MICROINSTRUCTION HAS FAILED.
12	46	THE CI (COMPARE IMMEDIATE) MICROINSTRUCTION HAS FAILED.
13	4E	THE BR (BRANCH REGISTER) MICROINSTRUCTION HAS FAILED.
14	50	THE INC (INCREMENT REGISTER) MICROINSTRUCTION HAS FAILED.
15	52	THE LR (LOAD REGISTER) MICROINSTRUCTION HAS FAILED.
16	54	THE TSN (TEST SIGNAL ON) MICROINSTRUCTION HAS FAILED.
17	56	THE SSN (SET SIGNAL ON) OR THE SSF (SET SIGNAL OFF) MICROINSTRUCTION HAS FAILED.
18	34	THE BRANCH AND LINK MICRO-OP FAILED.IN FIRST 1K ADDRESSES.
19	3A	LR OP AFFECTED LE OP, OR, LE OP AFFECTED LR OP.
19	3C	LIO TO HDB'S 00/01 AND HDB'S 20/21 NOT THE SAME.
1A	60	BRANCH AND LINK FAILED IN 2ND 1K ADDRESSES.
1A	61	BRANCH AND LINK FAILED IN 3RD 1K ADDRESSES.
1B	5C	MICROCODE DOING BRANCH REGISTER TO SOME ADDRESS, WITH BAL BACK TO WORD 000. FAILURE.
1C	30	CIR MICRO-OP FAILURE IN HDB'S 20-3F.
1D	31	SHIFT MICRO-OP FAILURE IN HDB'S 10-3F.
1E	32	FAILURE IN EXERCISING HDB'S 10-3F USING XR, TBFR, OR INC OPS.
1F	33	FAILURE IN EXERCISING HDB'S 10-3F USING BRANCH REGISTER OP
20	58	THE MICROPROGRAM WHICH TESTS MOVING MBAR (MESSAGE BUFFER ADDRESS REGISTER) TO CURAR (CURSOR ADDRESS REGISTER) HAS FAILED TO TERMINATE IN THE EXPECTED ADDRESS.
20	59	WHEN TRYING TO MOVE MBAR TO CURAR, THE CURAR DOES NOT CONTAIN THE EXPECTED DATA.
21	5C	ALL LOCATIONS IN THE MESSAGE BUFFER WERE LOADED AND CHECKED FOR EXPECTED DATA. AN ERROR HAS OCCURRED IN THE MESSAGE BUFFER. CAUTION - INCORRECT UDT AND/OR MODEL 2 SUPPORT HARDWARE CAN CAUSE THIS HALT.
22	70	MICROPROGRAM WRITE TO SOME HDB DESTROYED MBAR.
22	71	LIO TO SOME HDB DESTROYED MBAR.
23	5A	AN HDB WAS LOADED WITH BAD PARITY. DURING THE FOLLOWING SNS COMMAND, AN HDB/EXT CHECK DID NOT OCCUR.
23	5B	AN OP-DECODE CHECK WAS EXPECTED AFTER DOING A LIO TO OP-DECODE REG. 15. IT DID NOT OCCUR.
23	5D	AN OP-DECODE CHECK WAS EXPECTED AFTER DOING A LIO TO OP-DECODE REG. 05. IT DID NOT OCCUR.
23	5E	A MICRO-PROGRAM USING BAD PARITY IN HDB'S DID NOT STOP AT THE EXPECTED LOCATION.
23	5F	AN ATTACHMENT CHECK INDICATING BAD PARITY IN HDB'S DID NOT OCCUR AS EXPECTED.
23	60	A MICRO-PROGRAM USING BAD PARITY IN HDB'S DID NOT STOP AT THE EXPECTED LOCATION.
23	61	AN ATTACHMENT CHECK INDICATING BAD PARITY IN HDB'S DID NOT OCCUR AS EXPECTED.
23	62	BAD PARITY WAS PUT IN MBAR LOW AND A CONTROL STORE ADDRESS CHECK DID NOT OCCUR AS EXPECTED.
23	68	BAD PARITY WAS PUT IN MBAR HI AND A CONTROL STORE ADDRESS CHECK DID NOT OCCUR AS EXPECTED.
23	6B	A CONTROL STORE ADDRESS CHECK DID NOT OCCUR AS EXPECTED AFTER THE MICROCONTROLLER WAS ENABLED WITH THE DIAGNOSTIC NO. 2 LATCH ON.
23	6D	A CONTROL STORE WRITE DATA CHECK DID NOT OCCUR AS EXPECTED WHILE ATTEMPTING TO PUT BAD PARITY INTO THE MESSAGE BUFFER.
23	74	BAD PARITY WAS WRITTEN INTO THE EVEN BYTE IN CONTROL STORE. WHEN THE MICROCONTROLLER WAS ENABLED, A CONTROL STORE DATA CHECK DID NOT OCCUR AS EXPECTED.
23	7B	BAD PARITY WAS WRITTEN INTO THE ODD BYTE IN CONTROL STORE. WHEN THE MICROCONTROLLER WAS ENABLED, A CONTROL STORE AND HDB PARITY CHECK DID NOT OCCUR AS EXPECTED.
24	8B	AN ERROR HAS OCCURRED WHILE EXERCISING CONTROL STORAGE. (FIRST FET STG CARD)
24	8C	SAME AS ROUTINE 24,HALT 8B,EXCEPT 2ND FET STG CARD
24	8D	SAME AS ROUTINE 24,HALT 8B,EXCEPT 3RD FET STG CARD

SECTION 891--CONTINUED

ROUT	HALT	MEANING OF ID
26	69	AFTER AN SSF-C TO RESET TSN-9, TSN-9 STILL BRANCHED.
26	6A	AFTER DOING A LIO TO HDB 1A, TSN-9 DID NOT BRANCH.
26	6C	AFTER TSN-9 WAS RESET, A LIO WAS DONE TO ALL HDB'S EXCEPT HDB 1A. TSN-9 BRANCHED AND IT SHOULD NOT HAVE.
29	80	WHILE TRYING TO TRANSMIT DATA IN DIAGNOSTIC MODE, A FAILURE HAS OCCURRED INDICATING A PROBLEM WITH TSN-0 OR TSN-1.
2A	82	A FAILURE HAS OCCURRED WHILE TRYING TO WRAP A CONTROL WORD WITH ALL BITS ON.
2B	84	A FAILURE HAS OCCURRED WHILE TRYING TO WRAP A CONTROL WORD WITH NO BITS ON.
2C	86	A FAILURE HAS OCCURRED WHILE TRYING TO WRAP A CONTROL WORD WITH ALTERNATE BITS ON.
2D	88	SAME AS HALT 86 IN ROUTINE 21, BUT THE OPPOSITE ALTERNATE BIT PATTERN IS USED.
2E	8A	A FAILURE HAS OCCURRED WHILE EXERCISING THE TRANSMIT ZEROS CONTROLS (SSN-0).
2F	8E	A FAILURE HAS OCCURRED WHILE EXERCISING THE DIAGNOSTIC FUNCTION TO BLOCK BIT 12 OF THE CONTROL WORD (SSN-6) INDICATING TROUBLE WITH SSN-6, PARITY CHECK CIRCUITS, OR TSN-B (TEST FOR RECEIVE CHECK).
30	90	WHILE CHECKING RECEIVE DATA MODE, A FAILURE WAS DETECTED IN MOVING MBAR TO CURAR WHEN BIT 3 (CURSOR) IS RECEIVED. TROUBLE IN SSN/SSF-B OR CURAR CONTROLS IS INDICATED.
30	91	ACTUAL VALUE OF MBAR (HDB 1A/1B) DOESN'T EQUAL EXPECTED VALUE (HDB 02/03)
31	93	A FAILURE HAS OCCURRED IN THE CONTROLS WHICH CAUSE BIT 3 OF THE I/O REG. TO BE TURNED ON WHEN MBAR = CURAR WHILE TRANSMITTING DATA.
32	99	ATTACHMENT RESET IS NOT RESETTING ALL THE SIGNALS THAT IT SHOULD.
36	35	BSCA ENABLED AND SHOULDN'T BE.
36	36	BSCA NOT ENABLED AND SHOULD BE.
36	37	BSCA ENABLED AND SHOULDN'T BE
37	36	BSCA ENABLED AND SHOULDN'T BE AND/OR 2-SECOND TIMEOUT REQUEST ON AND SHOULDN'T BE.
37	37	BSCA 2-SECOND TIMEOUT ON AND SHOULDN'T BE OR BSCA NOT ENABLED AND SHOULD BE.
37	38	BSCA 2-SECOND TIMEOUT NOT ON AND SHOULD BE.
37	39	BSCA 2-SECOND TIMEOUT WASN'T RESET.
37	3A	BSCA 2-SECOND TIMEOUT WAS RESET IN ERROR.
37	3B	BSCA NOT DISABLED OR 2-SECOND TIMEOUT REQUEST NOT RESET.
38	37	BSCA BUSY (SIO-SVC REQ) IS ON IN ERROR
38	38	BSCA NOT ENABLED, OR, SIO-SVC-REQ BSCA BUSY NOT ON, OR,IQ,IR BYTES NOT GOOD IN 26,27
38	39	BSCA BUSY NOT RESET
38	40	BSCA NOT BUSY AND SHOULD BE.
38	41	BSCA BUSY IN ERROR
38	42	BSCA BUSY NOT SET BY SIO
38	43	BSCA BUSY NOT RESET PROPERLY
38	44	HDB'S 16 AND 17 CHANGED IN ERROR BY BSCA SIO
38	45	HDB'S 26 AND 27 CHANGED IN ERROR
38	47	SIO WITH IQ=89. IQ DIDN'T GET TO HDB 27 PROPERLY.
38	48	BSCA BUSY NOT RESET PROPERLY
38	49	BSCA BUSY TO TIO. SHOULDN'T BE.
39	39	NO BSCA INT PENDING. SHOULD BE.
39	3A	BSCA OP END INTERRUPT SHOULD BE PENDING AND ISN'T.
39	3C	UNEXPECTED BSCA INTERRUPT.
39	40	SIO DISABLE BSCA DIDN'T RESET BSCA INTERRUPT PENDING.
39	41	BSCA ITB INTERRUPT PENDING AND SHOULDN'T BE.
39	42	BSCA OP END INTERRUPT REQUEST NOT RESET PROPERLY.
39	43	NO BSCA INTERRUPT OCCURRED
39	44	BSCA INT REQUEST NOT RESET BY MICROCODE.
39	48	ATTATCHMENT CHECK DIDN'T CAUSE A BSCA INTERRUPT.
3A	39	BSCA TIO NOT RDY/UNIT CHECK SHOULD BRANCH ON NOT READY AND DIDN'T.
3A	3A	BSCA TIO NOT RDY/UNIT CHECK SHOULD BRANCH ON NOT READY AND DIDN'T.
3A	3C	BSCA UNIT CK SET BY MICROCODE. BSCA TIO UNIT CHECK DOESN'T BRANCH.
3A	41	BSCA UNIT CK NOT RESET PROPERLY.
3A	42	ERROR IN MICROCODE WHILE TRYING TO ENABLE BSCA.
3A	43	ERROR IN MICROCODE WHILE TRYING TO SET BSCA UNIT CHECK
3A	44	BSCA WENT NOT-READY ERRONEOUSLY.
3A	49	BSCA UNIT CHECK RESET ERRONEOUSLY.

SECTION 891 - CONTINUED

ROUT	HALT	MEANING OF ID
3B	3B	BSCA CYCLE STEAL REQUEST CANNOT BE SET ON BY MICROCODE.
3B	3C	BSCA NOT BUSY. SHOULD BE.
3B	3D	BSCA BUSY. SHOULD NOT BE.
3B	3E	BSCA NOT ENABLED WHEN SHOULD BE, OR, BSCA CYCLE STEAL REQUEST LATCH NOT SETTING OK
3B	3F	FIRST TWO BYTES OF BSCA CYCLE STEAL DATA NOT CORRECT.
3B	40	SEC'D TWO BYTES OF BSCA CYCLE STEAL DATA NOT CORRECT.
3B	41	BSCA CYCLE STEAL DATA INCORRECT.
3B	42	ERROR IN MICROCODE WHILE TRYING TO INITIATE FETCH CYCLE STEAL.
3B	44	BSCA DIDN'T GO BUSY.
3B	45	BSCA BUSY. SHOULD NOT BE.
3B	46	BSCA BUSY. SHOULD NOT BE.
3B	47	BSCA CYCLE STEAL LATCH RESET IN ERROR
3C	5F	DATA WRAP THRU DRIVER/RECEIVERS WITH NONE SELECTED SHOULD FAIL, BUT WAS SUCCESSFUL
3C	10	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 40 FAILED. SEE NOTE
3C	11	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE C1 FAILED. SEE NOTE
3C	12	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE C2 FAILED. SEE NOTE
3C	13	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE C3 FAILED. SEE NOTE
3C	14	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE C4 FAILED. SEE NOTE
3C	15	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE C5 FAILED. SEE NOTE
3C	16	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE C6 FAILED. SEE NOTE
3C	17	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE C7 FAILED. SEE NOTE
3C	20	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE C8 FAILED. SEE NOTE
3C	21	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE C9 FAILED. SEE NOTE
3C	22	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 4A FAILED. SEE NOTE
3C	23	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 4B FAILED. SEE NOTE
3C	34	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 4C FAILED. SEE NOTE
3C	35	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 4D FAILED. SEE NOTE
3C	36	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 4E FAILED. SEE NOTE
3C	37	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 4F FAILED. SEE NOTE
3C	30	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 50 FAILED. SEE NOTE
3C	31	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE D1 FAILED. SEE NOTE
3C	42	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE D2 FAILED. SEE NOTE
3C	43	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE D3 FAILED. SEE NOTE
3C	44	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE D4 FAILED. SEE NOTE
3C	45	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE D5 FAILED. SEE NOTE
3C	46	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE D6 FAILED. SEE NOTE
3C	47	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE D7 FAILED. SEE NOTE
3C	50	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE D8 FAILED. SEE NOTE
3C	51	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE D9 FAILED. SEE NOTE
3C	52	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 5A FAILED. SEE NOTE
3C	53	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 5B FAILED. SEE NOTE
3C	54	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 5C FAILED. SEE NOTE
3C	55	DATA WRAP THRU DRIVER/RECEIVER CIRCUIT FOR DEVICE 5D FAILED. SEE NOTE
3C	5F	ERROR IN MICROCODE WHILE TRYING TO WRAP DATA WITH NO DRIVER/RECEIVER SELECTED. (WRAP SHOULD FAIL)
3F	5E	LISTED DEVICE(S) DIDN'T RESPOND TO POLL
3F	FE	FORCED HALT IF SSW 2E ON. USED IN MANUFACTURING FOR TESTING.
40	98	WITH ATTACHMENT CHECK ON, THE I/O CHECK LIGHT WAS NOT ON.
40	9A	DEPRESSING CHECK RESET DID NOT CAUSE THE I/O CHECK LIGHT TO GO OFF.
40	9E	AN INVALID SIO, SNS, OR LIO DID NOT CAUSE A PROCESSOR CHECK.
41	9F	A MANUALLY STORED MICROPROGRAM ENTERED BY THE CE DID NOT STOP AT THE EXPECTED LOCATION.

NOTE - POWER OFF OR AN OPEN COAX AT A TERMINAL MIGHT CAUSE THIS FAILURE. OPENING COAX AT THE CPU WILL AVOID THIS EXPOSURE. *** BE SURE TO RECONNECT AFTER TEST ***

3.2.2

SECTION 894

MEANING OF ID

HALT ID	RTN	DESCRIPTION OF ERROR
01	ALL	A UNIT CHECK OCCURRED OR DA IS NOT ENABLED.
02	ALL	AFTER RECEIVING A SIO NON-IMMEDIATE, THE ATTACHMENT HAS BEEN BUSY LONGER THAN APPROXIMATELY 1 SECOND.
03	ALL	THE INTERRUPT ROUTINE WAS ENTERED, BUT NO INTERRUPT IS PENDING.
04	ALL	THE RESPONSE RECEIVED WAS UNEXPECTED.
05	ALL	AN ATTACHMENT CHECK HAS OCCURRED. IT IS MOST LIKELY NECESSARY TO RELOAD MICRO-CODE BEFORE CONTINUING.
06	ALL	AN ITB INTERRUPT OCCURRED. THIS SHOULD BE IMPOSSIBLE ON THIS ATTACHMENT.
07	ALL	AFTER A SIO NON-IMMEDIATE, BUSY DROPPED BUT NO INTERRUPT OCCURRED.
08	ALL	THERE WAS A DATA MISCOMPARE ERROR. BOTH EXPECTED AND RECEIVED DATA IS PRINTED OUT.
09	ALL	THE DEVICE IS HUNG BUSY.
0A	ALL	THE ATTACHMENT IS NOT READY.
0B	ALL	WACK WAS RECEIVED IN RESPONSE TO A SELECT INDICATING THAT THE DEVICE IS BUSY.
0C	ALL	UNKNOWN RESPONSE.
0F	ALL	THE MICRO-CODE IS NOT LOADED, RUN 893 TO LOAD IT.
10	ALL	AN INCORRECT RESPONSE WAS RECEIVED. BOTH THE EXPECTED AND RECEIVED WILL BE PRINTED.
13	07	AN INVALID ADDRESS WAS ACCEPTED IN ROUTINE 7.
14	08	WHEN INVALID DATA WAS SENT TO THE DEVICE IN ROUTINE 8 THE RESPONSE WAS NOT EOT.
15	ALL	INCORRECT STATUS WAS RECEIVED. BOTH EXPECTED AND RECEIVED STATUS ARE PRINTED OUT.
16	09	DURING THE MICRO-POLL TEST IN ROUTINE 9, AN INTERRUPT OCCURRED. THERE SHOULD HAVE BEEN NO STATUS PENDING AT THIS TIME.
17	09	IN ROUTINE 9, AFTER A MICRO-POLL RESPONSE WITH A SHORT XMIT/RECEIVE FIELD, CAR DID NOT EQUAL SAR.
18	09	THE RESPONSE RECEIVED FROM MICRO-POLL WAS NOT STATUS.
19	16	AID CHARACTER RECEIVED FROM 129 WAS NOT A PF-10 AS EXPECTED.
1F	ALL	AFTER AN RVI TO SELECT (HALT 20) OR AN EOT TO COMMAND(HALT 40), YOU ARE INSTRUCTED TO RESET THE HALT TO OBTAIN THE STATUS. WHEN THIS IS DONE THE DEVICE IS POLLED AND THE STATUS OBTAINED AND PRINTED OUT. HALT'1F' THEN OCCURS. WHEN THIS HALT IS RESET, THE NEXT ROUTINE IS STARTED.
20	ALL	RVI WAS RECEIVED IN RESPONSE TO A SELECT. RESET THIS HALT TO OBTAIN DEVICE STATUS.
40	ALL	EOT WAS RECEIVED IN RESPONSE TO A COMMAND. RESET THIS HALT TO OBTAIN DEVICE STATUS.

3.2.2.1 ERROR PRINTOUTS

EACH ERROR PRINTOUT CONTAINS:

1. AN ERROR HEADER, CONTAINING THE ROUTINE, HALT CODE, DEVICE ID, AND A BRIEF DESCRIPTIVE MESSAGE.
2. DA STATUS (CORRESPONDS TO BSCA-2 STATUS), CAR, TAR, AND SAR ADDRESS.
3. THE CONTENTS OF THE TRANSMIT/RECEIVE FIELD.
4. IF THE TRANSMIT/RECEIVE FIELD CONTAINS DEVICE STATUS, IT IS DECODED AND PRINTED OUT.
5. IN SOME CASES, BOTH EXPECTED AND RECEIVE DATA ARE PRINTED OUT. WHEN THIS DONE A '.' IS PRINTED OVER MISCOMPARING DATA SO THAT IT IS SIMPLE TO FIND THE PART OF THE DATA THAT IS IN ERROR.

4. DETAILED DESCRIPTION OF TESTS

4.1

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*************************************************************
*                                                           *
*                       SECTION 891                         *
*                                                           *
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01 AFTER SYSTEM RESET, THE ATTACHMENT SHOULD HAVE NO CONDITIONS PENDING. THIS ROUTINE CHECKS WITH TIO'S THAT THE ATTACHMENT IS NOT READY, THAT NO INTERRUPTS ARE PENDING, THAT THE ATTACHMENT IS NOT BUSY, AND THAT THERE IS NO ATTACHMENT CHECK.

02 THIS ROUTINE USES BSCA'TIO'S TO INSURE NO CONDITIONS ARE PENDING, THAT THE ATTATCHMENT IS NOT READY, THAT NO OP-END INTERRUPT IS PENDING, THAT'BSCA' IS NOT BUSY, THAT NO ITB INTERRUPT IS PENDING, AND NO OTHER INT IS PENDING.

03 THIS ROUTINE INITALIZES HDB'S WITH ZERO'S.

04 THIS ROUTINE FIRST LOADS THE OP DECODE REGISTERS, AND AGAIN CHECKS FOR NO CONDITIONS PENDING AS IN ROUTINE 01. THEN, THE FIRST 32 HDB'S ARE LOADED AND SENSED WITH PATTERNS 0000, FFFF, AA55, 55AA, 0202 AND THE ACTUAL HDB ADDRESS (00,01-----1E,1F) TO CHECK ALL BITS AND HDB ADDRESSING.
TO PRINT OUT THE HDB'S AT EACH STEP OF THE TEST, SET SSW 10 ON.

05 THIS ROUTINE IS THE SAME AS ROUTINE 04 EXCEPT THAT THE SECOND 32 HDB'S ARE CHECKED TO PRINT OUT 'HDB'S AT EACH STEP OF THE TEST,SET SSW 10 ON.

06 THIS ROUTINE CHECKS THAT THE MICROPROGRAM INSTRUCTION ADDRESS REGISTER (MIAR) IS INCREMENTED PROPERLY. THE MIAR IS DUMPED INTO HDB 1F EACH CYCLE SO IT CAN BE SENSED (ONLY THE LO 8 BITS). LIO'S ARE DONE TO CONTROL STORAGE (DATA UNIMPORTANT) AND THE MIAR CHECKED TO BE SURE THAT IT INCREMENTS BY ONE EACH TIME.

07 THIS ROUTINE CHECKS THE CONTROL STORAGE BY LOADING AND SENSING ALL POSITIONS WITH THE FOLLOWING PATTERNS:

```
        PART 1 : 0000
        PART 2 : FFFF
        PART 3 : 0000-00FF IN 1ST 256 WORDS
                 0100-01FF IN 2ND 256 WORDS
                 0200-02FF IN 3RD 256 WORDS
                 0300-03FF IN 4TH 256 WORDS
                 0400-04FF IN 5TH 256 WORDS - - ETC.    (HI BYTE IS A HEX COUNT OF 256 WORD BLOCKS)
```

TO PRINT OUT CONTROL STORAGE AT EACH STEP, SET SSW 12 ON.

08 THIS ROUTINE CHECKS THE BOS,0 (UNCONDITIONAL BRANCH) AND BOS,3 (BRANCH ON I/O SERVICE REQUEST). FIRST, A PATTERN OF UNCONDITIONAL BRANCHES IS LOADED IN CONTROL STORAGE. THE MICROCONTROLLER IS THEN STARTED FOR THE FIRST TIME AND, AFTER A FIXED LENGTH OF TIME, IT IS STOPPED. IF THE BRANCH IS WORKING PROPERLY, A SNS WILL YIELD A PREDICTABLE VALUE ALLOWING OPERATION TO BE CHECKED. THEN BOS,3 INSTRUCTIONS ARE LOADED AND CHECKED THAT THEY DO BRANCH WHEN SIO SERVICE REQUEST IS ON AND DO NOT BRANCH IF IT IS OFF.
CAUTION: SINCE PRESSING THE STOP BUTTON STOPS CPU INSTRUCTIONS BUT DOES NOT STOP THE MICROCONTROLLER. ERROR WILL RESULT IF THE STOP BUTTON IS PRESSED DURING THE TIME ROUTINE 06 IS RUNNING.

09 THIS ROUTINE CHECKS THE SHIFT LEFT (SL) MICROINSTRUCTION BY LOADING 00, FF, AA AND 55 INTO HDB'S AND THEN DOING A SL TO EACH ONE LOADED. THE HDB'S ARE THEN CHECKED TO SEE THAT THEY NOW ARE 00, FF, 55 AND AA.
(ONLY THE FIRST 16 HDB REGISTERS ARE ADDRESSED.)

0A THIS ROUTINE CHECKS ALL CONDITIONS OF THE BOC (BRANCH ON CONDITION) INSTRUCTION. THIS IS DONE BY SHIFTING A SINGLE BIT THROUGH AN HDB TO GENERATE CONDITIONS 1 (HI 4 BITS = 0) AND 2 (LO 4 BITS = 0) AND THEN SHIFTING NO BITS TO GET CONDITION 3 (ALL 8 BITS = 0).

0B THIS ROUTINE CHECKS THE SBN (SET BITS ON) INSTRUCTION. HDB'S ARE LOADED WITH 0000, 55AA AND 55AA. USING THE SBN INSTRUCTION, 0000 IS CHANGED TO 55AA, 55AA IS CHANGED TO FFFF, AND 55AA IS CHANGED TO F5AF.

0C THIS ROUTINE CHECKS THE SBF (SET BITS OFF) INSTRUCTION. HDB'S ARE LOADED WITH FFFF AND 55AA. USING THE SBF INSTRUCTION, THEY ARE CHANGED TO 55AA AND 0480.

0D THIS ROUTINE CHECKS THE IC (INSERT CHARACTER) INSTRUCTION. HDB'S ARE INITIALIZED TO FFFF AND 00FF AND THEN, USING THE IC INSTRUCTION, THEY ARE CHANGED TO 55AA AND FF00.

0E THIS ROUTINE CHECKS THE TBN (TEST BITS ON) INSTRUCTION. BIT PATTERNS ARE LOADED AND THE TBN INSTRUCTION TRIED FOR SEVERAL COMBINATIONS.

0F THIS ROUTINE CHECKS THE TBF (TEST BITS OFF) INSTRUCTION. BIT PATTERNS ARE LOADED AND THE TBF INSTRUCTIONS TRIED FOR SEVERAL COMBINATIONS. THE TBFR (TEST BITS OFF REG. TO REG.) WHICH IS THE SAME EXCEPT THAT THE MASK COMES FROM AN HDB IS ALSO TRIED.

10 THIS ROUTINE CHECKS THE XR (EXCLUSIVE 'OR' REGISTER) INSTRUCTION. BIT PATTERNS ARE LOADED AND THEN CHANGED USING THE XR INSTRUCTION AND CHECKED FOR CORRECT RESULTS.
(ONLY THE FIRST 16 HDB REGISTERS ARE ADDRESSED.)

11 THIS ROUTINE CHECKS THE CIR (COMPARE IMMEDIATE REGISTER) INSTRUCTION. BIT PATTERNS ARE LOADED AND THE CIR INSTRUCTION USED TO GENERATE ALL POSSIBLE CONDITION BRANCHES.
(ONLY THE FIRST 16 HDB REGISTERS ARE ADDRESSED.)

12 THIS ROUTINE CHECKS THE CI (COMPARE IMMEDIATE) INSTRUCTION. BIT PATTERNS ARE LOADED AND THEN CHECKED USING THE CI INSTRUCTION TO GENERATE ALL POSSIBLE CONDITION BRANCHES.

13 THIS ROUTINE CHECKS THE BR (BRANCH REGISTER) INSTRUCTION. PATTERNS ARE LOADED AND BRANCHES SET UP TO GO FROM ADDRESSES IN THE 1ST 256 WORDS TO THE 3RD 256 WORDS, FROM THE 2ND TO THE 3RD, FROM THE 3RD TO THE 1ST, FROM THE 2ND TO THE 1ST, FROM THE 3RD TO THE 3RD AND FROM THE 1ST TO THE 1ST.
(ONLY THE FIRST 16 HDB REGISTERS ARE ADDRESSED.)

14 THIS ROUTINE CHECKS THE INC (INCREMENT REGISTER) INSTRUCTION. AN HDB IS INCREMENTED FROM 00-FF AND FROM FF-00. EACH STEP IS CHECKED.
(ONLY THE FIRST 16 HDB REGISTERS ARE ADDRESSED.)

15 THIS ROUTINE CHECKS THE LR (LOAD REGISTER) INSTRUCTION. ONLY THE BASIC INSTRUCTION WHICH LOADS FROM ONE HDB TO ANOTHER HDB IS CHECKED. EXTERNALS WILL BE CHECKED LATER.

16 THIS ROUTINE CHECKS THE BASIC TSN (TEST SIGNAL ON) INSTRUCTION. ONLY TSN'S WHICH ARE IN A KNOWN QUIET STATE ARE CHECKED. THE OTHERS ARE CHECKED LATER.

17 THIS ROUTINE CHECKS THE SSF/SSN (SET SIGNAL OFF/ON) INSTRUCTION. IT DOES THIS BY MANIPULATING BITS 2, 3, AND 13 OF THE I/O REG. AND USING TSN'S TO CHECK THE RESULTS. THIS ALSO GIVES FURTHER TESTING OF OTHER SSN'S AND SSF'S ARE TESTED LATER.

18 THIS ROUTINE CHECKS THE BRANCH AND LINK (BAL) MICRO OP WITHIN THE FIRST 1K ADDRESSES OF CONTROL STORAGE BY DOING A BAL TO VARIOUS ADDRESSES AND THEN CHECKING THE LINK INFORMATION IN HDB'S 3E AND 3F.

19 THIS ROUTINE CHECKS FOR INTERFERENCE BETWEEN THE LOAD-EXTERNAL OP (LE) AND THE LOAD REGISTER OP (LR). DATA IS MOVED TO AND FROM VARIOUS REGISTERS,BOTH WITHIN THE HDB AND EXTERNAL TO IT, USING THE SAME DECODES FOR EACH OF THE 2 OPS. THE DATA IS THEN VERIFIED.

1A THIS ROUTINE USES THE SECOND AND THIRD (IF PRESENT) FET STORAGE CARD. THE FIRST PART LOADS MICROCODDE THE SECOND FET STORAGE CARD. ADDRESS 000 BAL'S TO IT AND THEN SEVERAL 'BOC OPS ARE DONE WITHIN IT. THE SECOND PART DOES THE SAME WITH THE THIRD FET STORAGE CARD IF PRESENT.

SECTION 891--CONTINUED

1B THIS ROUTINE LOADS ALL OF CONTROL STORAGE WITH MICRO-OP'D000' WHICH IS A BAL TO ADDRESS ZERO. THE FIRST 256 WORDS ARE THEN OVERLAYED WITH A MICROPROGRAM. THIS MICROPROGRAM DOES A BRANCH-REGISTER TO EACH ADDRESS IN CONTROL STORE. AFTER THE BAL RETURNS THE LINK INFORMATION IS CHECKED.

1C THIS ROUTINE DOES ADDITIONAL CHECKING OF THE CIR OP. IT IS SIMILAR TO ROUTINE 11 EXCEPT THAT IT CHECKS THE LAST 16 HDB REGISTERS.

1D THIS ROUTINE DOES ADDITIONAL CHECKING OF THE SHIFT OP. IT IS SIMILAR TO ROUTINE 09 EXCEPT THAT IT CHECKS THE LAST 16 HDB REGISTERS.

1E THIS ROUTINE DOES ADDITIONAL CHECKING OF THE XR, TBFR, AND INC OPS. THESE OPS HAVE BEEN USED PREVIOUSLY IN THE FIRST 16 HDB REGISTERS. THIS ROUTINE EXERCISES THEM IN THE LAST 48 REGISTERS.

1F THIS ROUTINE DOES ADDITIONAL CHECKING OF THE BR OP. IT IS SIMILAR TO ROUTINE 13 EXCEPT THAT IT USES THE LAST 48 HDB REGISTERS

20 THIS ROUTINE CHECKS MBAR (MESSAGE BUFFER ADDRESS REG.) AND CURAR (CURSOR ADDRESS REG.) HARDWARE. IT ALSO GIVES FURTHER TESTING TO LR AND SSN INSTRUCTIONS. MBAR IS SET TO VARIOUS PATTERNS AND THEN MOVED TO CURAR. THE VALUES USED ARE 7FF, 000, 555 AND 2AA. THE BOS,1 INSTRUCTION WHICH BRANCHES WHEN MBAR IS EQUAL TO CURAR IS ALSO TESTED.

21 THIS ROUTINE CHECKS THAT THE ENTIRE (512 OR 1920 BYTES) MESSAGE BUFFER IS FUNCTIONING PROPERLY. IT ALSO GIVES A FURTHER CHECK OF THE LR INSTRUCTION INVOLVING EXTERNALS. THE FOLLOWING PATTERNS ARE LOADED AND CHECKED: FF, AA, 55, AND INCREMENTED DATA (1ST 256 BYTES = 00-FF, 2ND 256 BYTES = 01-FF,00). MESSAGE BUFFER ADDRESSING IS ALSO CHECKED.

22 THIS DOES A LIO TO HDB 00/01 (MBAR). THEN ALL HDB REGISTERS THAT ARE 'ONE-ADDRESS-BIT-AWAY' ARE WRITTEN TO BOTH BY MICROCODE AND LIO. THE CONTENTS OF MBAR ARE THEN VERIFIED.

23 THIS ROUTINE CHECKS ALL OF THE ATTACHMENT CHECK CIRCUITS. OP-DECODE, HDB/EXT, CONTROL STORE DATA, CONTROL STORE ADDRESS AND CONTROL STORE WRITE DATA ERRORS ARE FORCED AND CHECKED FOR PROPER INDICATION.

24 THIS ROUTINE IS A COMPLETE EXERCISE OF ALL OF CONTROL STORAGE INCLUDING THAT PART USED AS THE MESSAGE BUFFER. IT DOES THIS BY PUTTING INCREMENTING DATA IN EACH BYTE. 256 PASSES ARE MADE SO THAT EACH BYTE WILL HAVE ALL COMBINATIONS OF DATA WRITTEN IN IT. THE DATA IS WRITTEN AND READ AND CHECKED BY ADDRESSING ALL OF CONTROL STORE WITH MBAR IN A MICROPROGRAM. THIS ROUTINE IS DONE IN TWO PHASES. FIRST PHASE, THE MICROPROGRAM IS LOADED AND EXECUTED IN THE 3RD 256 WORDS AND THE FIRST 1024 BYTES OF CONTROL STORAGE ARE EXERCISED. IN THE SECOND PHASE, THE MICROCODE IS LOADED AND EXECUTED IN THE FIRST WORDS AND THE SECOND 1024 BYTES OF CONTROL STORE ARE EXERCISED. SINCE THIS ROUTINE IS RATHER LENGTHY, IT CAN BE BYPASSED BY SETTING ON SENSE SWITCH '1C'.

25 SPARE

26 THIS ROUTINE CHECKS TSN-9 WHICH TELLS WHETHER HDB 1A HAS BEEN LOADED OR NOT. TSN-9 IS FIRST RESET BY SSF-C AND CHECKED FOR NO BRANCH. HDB 1A IS THEN LOADED WITH A LIO AND TSN-9 IS CHECKED TO BE SURE IT DOES BRANCH.

27 SPARE

28 SPARE

29 THIS ROUTINE CHECKS THAT WHEN IN DIAGNOSTIC MODE, TSN-0 (TRANSMIT WORD READY) AND TSN-1 (RECEIVE WORD READY) WILL FUNCTION PROPERLY AND THAT A 13-BIT CONTROL WORD CAN BE WRAPPED WITHIN THE ATTACHMENT. NO CHECK IS MADE UPON THE DATA BEING WRAPPED.

2A IN DIAGNOSTIC MODE, A 13-BIT CONTROL WORD CONTAINING ALL 1'S IS WRAPPED AND CHECKED FOR THE CORRECT RESULT. THIS IS REPEATED 255 TIMES.

2B SAME AS ROUTINE 2A EXCEPT THAT ALL 0'S (EXCEPT FOR BIT 1 WHICH MUST ALWAYS BE ON) ARE USED.

2C SAME AS ROUTINE 2A EXCEPT THAT AN ALTERNATE BIT PATTERN IS USED.

2D SAME AS ROUTINE 2A EXCEPT THAT THE OPPOSITE ALTERNATE BIT PATTERN IS USED.

2E IN DIAGNOSTIC MODE, THE TRANSMIT ZEROS HARDWARE IS CHECKED. (SSN-0 SHOULD CAUSE 13 ZEROS TO BE TRANSMITTED INSTEAD OF THE DATA IN THE I/O REG.) SSN-0 IS TURNED ON AND THE I/O REG. IS LOADED TWICE. AT THE END OF 13 CYCLES, RECEIVE WORD READY MUST NOT BE ON (INDICATES ZEROES WERE TRANSMITTED). THEN, 13 MORE CYCLES LATER, RECEIVE WORD READY MUST COME ON INDICATING THAT DATA WAS TRANSMITTED. THE DATA IS THEN CHECKED TO BE SURE THAT IT IS THE SAME AS THAT TRANSMITTED.

2F THIS ROUTINE CHECKS THAT SSN-6, WHICH IS USED TO BLOCK BIT 12 OF THE I/O REG. (PARITY), IS FUNCTIONING MOREOVER, IT CHECKS THAT PARITY ERRORS IN RECEIVED DATA CAN BE DETECTED AND INDICATED PROPERLY. ALL ARE USED IN BOTH THEIR 0 AND 1 STATES TO TEST THE PARITY CHECK CIRCUITS.

30 THIS ROUTINE CHECKS THAT WHEN THE ATTACHMENT IS RECEIVING DATA WITH SSN-B (RECEIVE DATA MODE) ACTIVATE MBAR WILL BE MOVED TO CURAR WHEN A CURSOR BIT (BIT 3) IS RECEIVED. THE VALUES OF MBAR MOVED ARE 0AA AND 155. CURAR IS THEN RESET TO ZERO AND RECEIVE DATA MODE IS TURNED OFF. THE TEST IS THEN REPEATED TO BE SURE MBAR DOES NOT GET TRANSFERRED TO CURAR IN THIS CASE.

31 THIS ROUTINE TESTS THAT A CURSOR (BIT 3) IS TRANSMITTED WHEN MBAR = CURAR. IT IS DONE BY TRANSMITTING DATA IN DIAGNOSTIC MODE AND CHECKING THAT BIT 3 IS ALWAYS OFF UNLESS MBAR = CURAR. ADDRESSES WHERE BIT 3 IS INJECTED ARE 0AA AND 155.

32 THIS ROUTINE CHECKS THAT TSN-0, TSN-1, TSN-E, TSN-B, SSN-F, AND BOS,3 ARE ALL RESET BY ATTACHMENT RESET

33 SPARE

34 SPARE

35 SPARE

36 THIS ROUTINE CHECKS OUT SIO ENABLING AND DISABLING OF BSCA

37 THIS ROUTINE CHECKS OUT SIO ENABLING AND DISABLING OF BSCA WITHE2-SECOND TIMEOUT REQUEST, CHECKING THE SET AND RESET OF BOTH.

38 THIS ROUTINE INSURES THAT A BSCA SIO NON-IMMEDIATE MAKES THE ATTCHMENT BUSY TO A BSCA TIO. IT INSURE THAT THAT SIO CAUSES A SERVICE REQUEST TO THE MICROCODE. IT INSURES THAT THE IQ AND IR BYTES OF THE SIO WERE PROPERLY STORED IN THE HDB. IT INSURES THAT THE MICROCODE CAN RESET THE SERVICE REQUEST AND THUS THE BUSY.

39 THIS ROUTINE CHECKS INTERRUPT REQUEST, ACTUAL BSCA INTERRUPTS (ON INTERRUPT LEVEL-2), AND THE RESET OF OP-END INT REQ AND INT REQUEST.

3A THIS ROUTINE INSURES BSCA 'NOT-READY' TO TIO AND 'READY TO TIO, BSCA 'UNIT-CHECK' TO TIO AND NOT ' UNIT-CHECK TO TIO

3B THIS ROUTINE INSURES PROPER OPERATION OF THE BSCA CYCLE STEAL LATCH. CYCLE STEAL OPERATION IS VERIFYED BY FOUR 'STORE' CYCLE STEALS AND FOUR 'FETCH' CYCLE STEALS.

3C THIS ROUTINE FIRST TRYS TO WRAP SERIAL DATA THROUGH THE DRIVER/RECEIVERS WITH NONE SELECTED. THE WRAP SHOULD BE UNSUCCESSFUL UNLESS ONE OF THE DRIVER/RECEIVERS IS 'STUCK' ON. THE ROUTINE THEN WRAPS SERIAL DATA THROUGH ALL DRIVER/RECEIVERS THAT ARE DEFINED IN THE UDT.

3D SPARE

3E SPARE

3F POLL COMMANDS ARE ISSUED TO ALL DEVICES THAT MAY BE ATTACHED. THE UDT DEFINES THE NUMBER OF DRIVER/ RECEIVER CARDS. EACH CARD HAS 3 DRIVER/RECEIVER CIRCUITS. THERE MAY OR MAY NOT BE DEVICES ATTACHED. A LIST IS THEN PRINTED OF DEVICES THAT RESPONDED AND DEVICES THAT DIDN'T.

SECTION 891--CONTINUED

40 THIS MANUAL INTERVENTION ROUTINE CHECKS THE FOLLOWING:

LIGHTING OF THE I/O CHECK LIGHT
SYSTEM RESET TO ATTACHMENT
CHECK RESET TO ATTACHMENT
THAT INVALID I/O INSTRUCTIONS (SIO, SNS, LIO, TIO) WILL CAUSE PROCESSOR CHECKS
COMMAND REJECT DUE TO BUSY OR BSCA DISABLED.

TO RUN THIS ROUTINE, FOLLOW THE PRINTED OUT INSTRUCTIONS EXACTLY.

41 THIS ROUTINE MAY BE MANUALLY SELECTED BY THE CE TO INSERT HIS OWN LIMITED MICROPROGRAMS IF DESIRED. IN ORDER TO USE THIS ROUTINE, SECTION 891 MUST BE CAPABLE OF RUNNING AT LEAST TO THE END OF ROUTINE 05 ERROR FREE. THIS INSURES THAT THE OP-DECODE REGISTERS CAN BE LOADED AND THAT THE HDB'S AND CONTROL STORAGE ARE ALL RIGHT.
THE CE'S MICROPROGRAM MUST BE MANUALLY ENTERED INTO MAIN STORAGE. THERE IS ROOM FOR A MAXIMUM OF 32 CONTROL WORDS. THE FIRST WORD MUST BE PLACED IN MAIN STORAGE LOCATION 3FC0-3FC1. THE REST FOLLOW IN SUCCESION. WITH NO PROGRAM INSERTED, MAIN STORAGE 3FC0-3FFF CONTAINS 32 BOS,0 CONTROL WORDS. EACH BRANCHES TO ITSELF. THE CE STORES HIS PROGRAM OVER THIS AS REQUIRED. THE PROGRAM THUS ENTERED IN STORAGE IS THEN ENABLED FOR ABOUT 518 CYCLES AND THEN DISABLED. A PROPER MICROPROGRAM WILL HALT AT A PREDICTABLE LOCATION AND A SENSE OF CONTROL STORAGE WILL GIVE PREDICTABLE RESULTS IF THE PROGRAM EXECUTED PROPERLY. IF THE PROGRAM DID NOT STOP AT THE EXPECTED LOCATION, A 9F HALT WILL OCCUR. THE CE MUST ALSO ENTER THE EXPECTED HANG ADDRESS (00-1F) IN MAIN STORAGE LOCATION 3FBF. THE FOLLOWING IS AN EXAMPLE OF A SIMPLE PROGRAM THAT WILL LOAD HDB 02 WITH X'01', SHIFT IT LEFT ONCE, INCREMENT IT AND TEST IT FOR CONTAINING THE CORRECT RESULT (03). IF THE RESULT IS INCORRECT, THE MICROPROGRAM HANGS AT CONTROL STORE ADDRESS 005. IF THE RESULT IS CORRECT, THE MICROPROGRAM WILL HANG AT ADDRESS 006.

PROGRAM STEP DESCRIPTION	M.S ADDR	C.S. ADDR	CONTENTS
INSERT '01' IN HDB 02	3FC0-3FC1	000	7201
SHIFT IT LEFT 1 BIT	3FC2-3FC3	001	1240
INCREMENT BY ONE	3FC4-3FC5	002	1210
TEST HDB 02 FOR '03'	3FC6-3FC7	003	E203
BRANCH TO ADDR 006 IF OK	3FC8-3FC9	004	9C06
HANG AT ADDR 005 IF NOT	3FCA-3FCB	005	5005
HANG AT ADDR 006 IF OK	3FCC-3FCD	006	5006

TO LOAD AND RUN THE ABOVE PROGRAM:
A. LOAD AND RUN SECTION 891 (MUST RUN ERROR FREE PAST ROUTINE 05).
B. SINCE THE PROGRAM IS WRITTEN TO HANG AT CONTROL STORE ADDRESS 006, STORE A '06' AT MAIN STORE 3FBF.
C. STORE THE MICRO-WORDS (CONTENTS) IN MAIN STOPAGE (M.S ADDR). THESE MICRO-WORDS WILL BE LOADED BY ROUTINE 41 IN SEQUENTIAL CONTROL STORE LOCATIONS (C.S. ADDR). THE REST OF CONTROL STORE WILL BE AUTOMATICALLY FILLED WITH BOS,0 TO THE ADDRESS SO THE MICROPRORAM WILL HANG IN THESE WORDS IF IT GETS THERE.
D. SELECT AND RUN ROUTINE 41.
E. A NORMAL TERMINATE INDICATES CORRECT OPERATION.
F. A 9F HALT INDICATES THE PROGRAM DID NOT RUN AS EXPECTED. THE ACTUAL AND EXPECTED CONTROL STORE CONTENTS WHERE THE MICROPROGRAM STOPPED OR HUNG WILL BE PRINTED OUT.
G. THE ROUTINE CAN BE LOOPED IN THE NORMAL MANNER TO SCOPE SIGNALS.

42 THIS ROUTINE IS MANUALLY SELECTED TO PROVIDE A PROGRAM USED TO CHECK OUT THE CE TEST BOX. INSTRUCTIONS FOR USE OF THIS ROUTINE ARE INCLUDED WITH THE INSTRUCTIONS FOR USE OF THE CE TEST BOX.

43 THIS ROUTINE MAY BE MANUALLY SELECTED TO CAUSE THE CONTENTS OF CONTROL STORAGE AND/OR MESSAGE BUFFER PRINTED OUT. THE DUMP IS IN 256 WORD (512 BYTE) INCREMENTS. MIAR INDICATES THE ACTUAL CONTROL STORE (16 BITS) ADDRESS AND MBAR INDICATES THE ACTUAL BYTE ADDRESS. NORMALLY, CONTROL STORE OCCUPIES THE FIRST 1792 WORDS AND THE MESSAGE BUFFER IS CONTAINED IN THE LAST 256 WORDS (512 BYTES). HOWEVER, IF MODEL 2 SUPPORT IS INSTALLED, THE FIRST 2048 WORDS ARE CONTROL STORE AND THE LAST 1024 WORDS (2048 BYTES) ARE THE MESSAGE BUFFER.

TO SUPPRESS PRINTING 1ST 256 WORDS TURN ON SSW 18.
TO SUPPRESS PRINTING 2ND 256 WORDS TURN ON SSW 19.
TO SUPPRESS PRINTING 3RD 256 WORDS TURN ON SSW 1A.
TO SUPPRESS PRINTING 4TH 256 WORDS TURN ON SSW 1B.

IF AN ATTACHMENT CHECK OCCURS, THE ADDRESS AND DATA THAT CAUSED THE FIRST ONE IS PRINTED OUT.

4.2 SECTION 893 DA MICROCODE LOADER

THIS PROGRAM LOADS THE DA CONTROL STORE WITH THE MICROCODE. THE MICROCODE DATA DECK ID IS FC7.

4.2.1 PROGRAM LOADING

4.2.1.1 LOADING FROM DISK

ONCE SECTION 893 IS LOADED, IT WILL AUTOMATICALLY BRING IN THE MICROCODE DATA DECK FC7.

4.2.1.2 LOADING FROM CARDS

THE MICROCODE DECK (ID = FC7) MUST BE THE NEXT DECK TO BE READ IN AFTER THE DA MICROCODE LOADER DECK (ID = 893). THE MICROCODE LOADER WILL HALT WITH -F1- PRIOR TO READING IN THE MICROCODE DECK (ID = (FC7). RESETTING THE HALT WILL START THE LOADING OF CONTROL STORE.

4.2.1.3 LOADING WITH SENSE SWITCH 10 ON FROM DISK OR CARDS

WHEN SECTION 893 IS LOADED, THE FOLLOWING INFORMATION WILL BE PRINTED PRIOR TO -F0- HALT:

```
-                                                                    -
-     DA  MICRO-CODE LOADER PROGRAM                                  -
-                                                                    -
-    SELECT OPTION BY PUTTING ONE OF FOLLOWING VALUES INTO DATA SWITCHES
-    AND RESET HALT                                                  -
-                                                                    -
-    01 - LOAD CONTROL STORE, SENSE CONTROL STORE, AND PRINT OBJECT CODE
-                                                                    -
-    02 - LOAD AND SENSE CONTROL STORE ONLY                          -
-                                                                    -
-    03 - SENSE AND PRINT CONTENTS OF CONTROL STORE                  -
-                                                                    -
```

AFTER SELECTING OPTION ON DATA SWITCHES, RESET HALT -F0-.

4.2.2 PROGRAM EXECUTION

4.2.2.1 SENSE SWITCH 10 OFF - SEE NOTE 1

PROGRAM DEFAULTS TO OPTION 02 - LOAD AND SENSE CONTROL STORE ONLY (SEE EXPLANATION 4.2.2.2.2)

4.2.2.2 SENSE SWITCH 10 ON - SEE NOTE 1

4.2.2.2.1 OPTION 01 - LOAD CONTROL STORE, SENSE CONTROL STORE, AND PRINT OBJECT CODE

THE MICROCODE DECK (FC7) IS READ INTO THE SYSTEM/3 MEMORY. THE DA CONTROL STORE IS THEN LOADED WITH THE COMPLETE MICROPROGRAM. THE MICROCODE IS THEN SENSED FROM THE CONTROL STORE AND COMPARED WITH THE MICROCODE THAT WAS LOADED. THE SENSED MICROCODE IS THEN PRINTED OUT. IF DATA COMPARES, SECTION TERMINATES. IF NOT, ERROR DUMP & RETRY USING OPTION 5.

4.2.2.2.2 OPTION 02 - LOAD AND SENSE CONTROL STORE ONLY

THE MICROCODE DECK (FC7) IS READ INTO THE SYSTEM/3 MEMORY. THE DA CONTROL STORE IS THEN LOADED WITH THE COMPLETE MICROPROGRAM. THE MICROCODE IS THEN SENSED FROM THE CONTROL STORE AND COMPARED WITH THE MICROCODE THAT WAS LOADED. IF DATA COMPARES, SECTION TERMINATES. IF NOT, ERROR DUMP AND RE-TRY USING OPTION 5.

4.2.2.2.3 OPTION 03 - SENSE AND PRINT DA CONTROL STORE

THE MICROCODE DECK (FC7) IS READ INTO THE SYSTEM/3 MEMORY. THE CONTENTS OF THE DA CONTROL STORE IS SENSED AND COMPARED TO THE MICROCODE IN THE DATA DECK (FC7). THE INFORMATION IS PRINTED OUT IN A DOUBLE COLUMN. THE LEFT COLUMN CONTAINS MICROCODE FROM THE MICROCODE DECK (FC7). THE RIGHT COLUMN CONTAINS MICROCODE SENSED FROM THE DA CONTROL STORE. IF THE TWO LINES OF MICROCODE DO NOT COMPARE, A DOLLAR SIGN ($) IS ENTERED TO THE RIGHT OF THE LINE IN ERROR.

```
-                                                                         -
- ADDR      CODE READ INTO STORAGE              CODE SENSED FROM DA    ERR -
-                                                                         -
- 0000  00000001000200030004000500060007  00000001000200030004000500060007    -
- 0008  00080009000A000B000C000D000E000F  00080009000A000B000C000D000E000F    -
- 0010  00100011001200130014001500160017  001000110012001300140015 0016FFFF $  -
- 0018  00180019001A001B001C001D001E001F  FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF $  -
-                                                                         -
```

4.2.2.2.4 OPTION 04 - PRINT DA MICROCODE DECK IMAGE FROM SYSTEM/3 STORAGE

THIS OPTION IS AVAILABLE ONLY IF A LOADING ERROR HAS OCCURRED. THE MICROCODE DECK WHICH WAS LOADED IS TOO LARGE FOR THE SYSTEM DA CONTROL STORAGE. SETTING THE DATA SWITCHES TO 04 AND RESETTING -E1- HALT WILL DUMP THE DA MICROCODE DECK IMAGE FROM SYSTEM/3 STORAGE.

4.2.2.2.5 OPTION 05 - RETRY LOADING DA CONTROL STORE

THIS OPTION IS AVAILABLE ONLY IF A LOADING ERROR HAS OCCURRED. SETTING DATA SWITCHES TO 05 AND RESETTING -E2- HALT WILL RELOAD THE DA CONTROL STORE WITH THE MICROCODE ALREADY IN SYSTEM/3 MEMORY. OPTION 05 IS LIKE OPTION 02 EXEPT THE SOURCE CODE IS ALREADY IN SYSTEM/3 MEMORY.

NOTE 1: NEVER INSERT ANY SSW CARDS AT THE END OF 893. IF THIS IS DONE, 893 WILL NOT FUNCTION CORRECTLY WHEN USED BY FC8. TURN ANY SENSE SWITCHES ON AND OFF THRU CONSOLE SWITCHES.

4.2.3 PATCHING

4.2.3.1 STORAGE LOCATION 7000 IS DESIGNATED AS A PATCH AREA. PATCHES ARE REP'D INTO STORAGE AS PART OF THE 893 AND INSERTED EACH TIME 893 IS RUN. IF LOCATION 7000 CONTAINS HEX FF, NO PATCHING IS DONE.

4.2.3.2 ALL PATCHES MUST START AT LOCATION 7000 AND ARE IN THE FOLLOWING FIXED FORMAT:

AAAA = 4 HEX DIGITS OF MICRO ADDRESS.

XXXX = 4 HEX DIGITS OF DATA TO BE PLACED AT THE MICRO ADDRESS.

0000 = HEX CONSTANT 0000 USED AS A DELIMITER BETWEEN GROUPS OF DATA.

FFFF = HEX CONSTANT FFFF USED TO TERMINATE THE PATCH.

SAMPLE PATCH FORMAT:

AAAAXXXX0000AAAAXXXXXXXXFFFF

THE ABOVE PATCH PUTS THE FIRST DATA WORD XXXX AT FIRST ADDRESS AAAA. THE 0000 INDICATES NO MORE PATCHING AT THAT ADDRESS. THE NEXT AAAA GIVES A NEW PATCH ADDRESS. THE FIRST XXXX FOLLOWING IT IS PLACED AT AAAA AND THE NEXT XXXX IS PLACED AT AAAA+1. THE FFFF TERMINATES THE PATCH.

4.2.3.3 NOTE THAT 0000 AND FFFF CANNOT BE USED AS DATA. HOWEVER, THESE COMBINATIONS ARE ILLOGICAL AND ARE NOT USED. ALL PARAMETERS WHETHER THEY BE ADDRESS, DATA OR DELIMITERS MUST BE COMPOSED OF 4 HEX DIGITS AND MUST BE CONTIGUOUS.

4.2.3.4 SAMPLE PATCH AT STORAGE LOCATION 7000:

01011111000002F322223333444400001E35555FFFF

THIS PATCH WOULD INSERT THE FOLLOWING DATA:

ADDR	DATA
0101	1111
02F3	2222
02F4	3333
02F5	4444
01E3	5555

THE ENTIRE PATCH MAY BE ELMINATED BY PUTTING AN FF AT ADDRESS 7000.

4.2.3.5 WHENEVER ANY PATCHING IS DONE,THE PROGRAM COMPUTES A NEW CHECK SUM SO THAT NO CHECKING CAPABILITY IS LOST.

4.2.3.6 CAUTION: ANY PATCHES ARE PRINTED OUT WHEN MICRO-CODE IS LOADED. BE SURE THEY ARE APPLICABLE. IF, NOT REP AN FF INTO STG. ADDRESS 7000 OF PROGRAM 893 TO DELETE THE PATCH AND THEN RELOAD MICRO-CODE.

4.3

```
*************************************************************
*                                                           *
*                       SECTION 894                         *
*                                                           *
*************************************************************
```

NOTE: A. IF SECTION 891 HAS JUST BEEN RUN, SECTION 893 MUST BE EXECUTED BEFORE THIS SECTION SO THE MICRO-CODE WILL BE RESTORED.

B. THIS USERS GUIDE DOES NOT PROVIDE SERVICE AID INFORMATION RELATED TO THE USE OF THE TEST PATTERNS IN ROUTINES 0A - 0F. REFER TO THE 3277, 3284/86/87/88 OR 129 TROUBLESHOOTING GUIDES FOR THIS INFORMATION.

C. ALL TEST PATTERNS (ROUTINES 0A - 0F) WAIT APPROXIMATELY 90 SECONDS FOR AN INTERRUPT FROM THE TEST REQUEST KEY OR THE CANCEL KEY. IF AN INTERRUPT IS NOT RECEIVED IN THIS TIME, A PROGRAM TIMEOUT WILL OCCUR AND THE NEXT TEST PATTERN WILL BE INITIATED. THEREFORE, THE CANCEL KEY SHOULD BE PRESSED TO AVOID THE TIMEOUT AND LEAVE THE TEST PATTERN AVAILABLE FOR USE WITH THE TROUBLESHOOTING MANUAL. SSW 12 MAY BE SET TO DISABLE THE 90 SECOND TIMEOUT.

D. USE PROBLEMS AND PRINTOUTS FROM RUNNING 894 TO DEVELOP SYMPTOMS AND USE THE APPPROPRIATE TROUBLE SHOOTING GUIDE TO SERVICE THE DEVICE.

E. AVOID DEPRESSING SYSTEM RESET WHILE RUNNING 894. GOOD PRACTICE IS TO DEPRESS STOP FIRST. IF SYSTEM RESET IS DEPRESSED WHILE DA IS DOING A WRITE TO A DEVICE, THE DEVICE BUFFER MAY BE DESTROYED. THIS MAY CAUSE AN ERROR WHEN THE PROGRAM IS RESTARTED.

F. CONFIGURATION MUST BE CORRECT. INCORRECT CONFIGURATION CAN CAUSE DEVICES TO BE SKIPPED OR DATA MISCOMPARES TO OCCUR.

G. YOU MUST RUN THRU AT LEAST ROUTINES 01-02 BEFORE TRYING TO MANUALLY SELECT A ROUTINE.

H. ON A MODEL 4 ONLY, DEVICE ADDR 40 IS NORMALLY A KEYBOARDLESS 3277 MODEL 1 DISPLAY AND IS USED AS THE OPERATOR CONSOLE. ALL KEYBOARD ROUTINES AND TEST PATTERNS ARE THEREFORE NORMALLY SKIPPED FOR DEVICE ADDR 40. HOWEVER, TEST PATTERNS MAY BE SELECTED USING SSW 20-26. SSW 28 IS PROVIDED TO ALLOW PROPER OPERATION IN CASE DEVICE 40 IS NOT A KEYBOARDLESS 3277 MODEL 1 DISPLAY.

I. UNLESS OTHERWISE NOTED, FOR ALL TESTS ON THE 129, IT MUST BE SET UP AS FOLLOWS:

1. PUT BLANK CARDS IN THE HOPPER
2. SET 'REC ADV/CARD FEED' SWITCH TO 'AUTO'
3. SET 'PROGRAM MODE' SELECTOR TO 'DATA READ'
4. SET 'LINE MODE' SWITCH TO 'ON'
5. WHILE HOLDING 'MULT PCH' DEPRESSED, MOMENTARILY LIFT 'RESET/CLEAR'
6. THEN, DEPRESS 'FEED' TWICE TO REGISTER CARDS

01 ON THE FIRST PASS THRU ROUTINE 01 AFTER LOADING OR AFTER SSW 11 HAS BEEN SET, THE UDT IS EXAMINED AND A GROUP OF POINTERS SET UP TO INDICATE WHICH DEVICES ARE INSTALLED. THESE DEVICES ARE THEN POLLED IN SEQUENCE AND IF ANY STATUS OTHER THAN INTERVENTION REQUIRED OR CONTROL CHECK IS RECEIVED, THE DEVICE IS LOGGED AS AVAILABLE.
AFTER ALL DEVICES HAVE BEEN POLLED, AN FF HALT WILL OCCUR SO THE CE CAN EXAMINE THE PRINTED LIST AND TAKE APPROPRIATE ACTION IF DEVICES WHICH SHOULD RESPOND DID NOT. ALL DEVICES LOGGED AS UNAVAILABLE ARE DROPPED FROM THE REMAINING TESTS.
IF SSW 10 HAS BEEN SET, A PRINTER MESSAGE DIRECTS YOU TO ENTER YOUR OWN LIST OF DEVICES TO BE TESTED FROM THE CONSOLE SWITCHES. THIS ENABLES YOU TO TEST ONLY THE DEVICE OR DEVICES OF YOUR CHOOSING.
IF SSW 11 HAS BEEN SET, ALL CONDITIONS ARE RESET AND THE PROGRAM IS ENTERED AS IF IT WERE THE FIRST PASS AFTER LOADING. SSW 10 AND SSW 11 ARE AUTOMATICALLY RESET AFTER THEY ARE USED.
WHEN THE FF HALT IS RESET, THE LINE POINTERS ARE SET TO THE FIRST AVAILABLE DEVICE AND ROUTINE 02 IS ENTERED.
AFTER THE FIRST PASS HAS BEEN MADE, ROUTINE 01 IS RE-ENTERED EACH TIME ALL TESTS ARE COMPLETED ON THE CURRENT DEVICE. ROUTINE 01 IN THIS CASE, UPDATES THE POINTERS TO THE NEXT DEVICE TO BE TESTED AND RE-ENTERS ROUTINE 02. IF THERE ARE NO MORE DEVICES TO BE TESTED, THE PROGRAM TERMINATES.

02 THIS ROUTINE TESTS THAT THE DEVICE CAN BE SELECTED, AN ERASE/WRITE DONE TO IT AND THAT THE DATA CAN BE READ BACK CORRECTLY. IN THE PROCESS OF DOING THIS, IT ALSO DETERMINES WHETHER THE BUFFER SIZE IS 480 CHARACTERS (MODEL 1) OR 1920 CHARACTERS (MODEL 2), AND IF THE DEVICE IS A PRINTER OR A DISPLAY. THIS INFORMATION IS USED IN ALL THE FOLLOWING ROUTINES.
NOTE - ROUTINES 01 THRU 02 MUST BE RUN FOR A DEVICE BEFORE ANY OTHER ROUTINES ARE RUN. REMEMBER THIS BEFORE ATTEMPTING TO MANUALLY SELECT ROUTINES. A MESSAGE WILL WARN YOU IF ROUTINE 01 - 02 WERE NOT RUN FOR THE CURRENT DEVICE.

ROUTINE 2 PUTS ON THE DISPLAY, PRINTS ON THE PRINTER OR PUNCHES IN 1 CARD ON THE 129, THE FOLLOWING:

DEVICE XX

WHERE XX IS THE DEVICE ADDRESS.

03 THIS ROUTINE WRITES 80 CHARACTER RIPPLE PATTERNS TO THE DEVICE UNTIL THE DEVICE BUFFER IS FULL. IT DOES THIS BY SENDING MULTIPLE WRITES (6 FOR A MODEL 1 OR 24 FOR A MODEL 2). THE BUFFER ADDRESS IS NOT SPECIFIED IN ANY WRITE COMMAND. THEREFORE, RETENTION OF THE CORRECT BUFFER ADDRESS BETWEEN TRANSMISSIONS IS CHECKED. AFTER THE ENTIRE BUFFER IS FILLED, A READ BUFFER COMMAND IS DONE TO CHECK THE DATA.

IF THE DEVICE IS A PRINTER, THE FOLLOWING OUTPUT WILL OCCUR UNLESS SSW 27 HAS BEEN SET ON:

***DEVICE XX** ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789 SPECIAL CHARACTERS(DIFFERENT IN WORLD TRADE MACHINES)

XX IS DEVICE ADDRESS, LINE LENGTH IS 80 CHARACTERS.
LINE WILL BE REPEATED 6 TIMES ON MODEL 1 PRINTERS AND 24 TIMES ON MODEL 2 PRINTERS.

ONE CARD WILL BE PUNCHED IF THE DEVICE IS A 129. IF THE 'LINE MODE' SWITCH IS 'ON', THERE WILL BE A BLANK IN COLUMNS 1 AND 16 WITH ALL OTHER COLUMNS PUNCHED. IF THE 'LINE MODE' SWITCH IS IN 'SPEC' AND COMPRESSED DATA MODE IS INSTALLED, COLUMNS 79-80 WILL BE BLANK WITH ALL OTHERS PUNCHED.

04 THIS ROUTINE WRITES A SINGLE CHARACTER OVER THE ENTIRE BUFFER USING THE REPEAT TO ADDRESS FUNCTION. NORMALLY THE CHARACTER USED IS A '*'. HOWEVER, IF SSW 15 IS SET, AN F3 HALT WILL OCCUR AND ANY OF THE 64 VALID EBCDIC CHARACTERS MAY BE ENTERED FROM CONSOLE SWITCHES 3 AND 4. CAUTION - IF THIS CHARACTER IS NOT ONE OF THE 64 VALID (128 IF KATAKANA) CHARACTERS RECOGNIZED BY THE 3270 SYSTEM, ERRORS MAY RESULT.

IF THE DEVICE IS A PRINTER, THE CHARACTER WILL BE PRINTED OVER THE ENTIRE LENGTH OF THE CARRIAGE UNLESS SSW 27 IS SET ON. A CHARACTER IS PRINTED ONCE FOR EACH CHARACTER IN THE BUFFER (480 OR 1920).

NO CARDS WILL BE PUNCHED ON THE 129.

05 THIS ROUTINE WRITES A PATTERN WITH MODIFIED DATA IN IT. A READ MODIFIED COMMAND IS THEN DONE TO ENSURE CORRECT OPERATION.

06 THIS ROUTINE DOES A WRITE TO THE DEVICE THAT WILL CHECK THE FOLLOWING FUNCTIONS:
INSERT CURSOR
REPEAT TO ADDRESS
PROGRAM TAB
ERASE UNPROTECTED TO ADDRESS
SET BUFFER ADDRESS
AFTER WRITING THE PATTERN, A READ BUFFER IS DONE TO CHECK THAT THE RESULTS ARE CORRECT.
THEN, AN ERASE ALL UNPROTECTED COMMAND IS ISSUED AND AGAIN, A READ BUFFER IS DONE TO CHECK THE RESULTS.

07 THIS ROUTINE SENDS AN INVALID ADDRESS USING THE SBA ORDER. THIS INVALID ADDRESS IS ONE HIGHER THAN THE CAPACITY OF THE DEVICE.
UPON RECEIPT OF THE INVALID ADDRESS, THE ATTACHMENT SHOULD SEND AN EOT BACK TO THE CPU. WHEN THE EOT IS RECEIVED, THE CPU ISSUES A POLL AND SHOULD GET BACK OC (OPERATION CHECK) STATUS.

08 THIS ROUTINE MODIFIES ONE WORD IN CONTROL STORAGE SO THAT THE PARITY BIT IN DATA WORDS SENT TO THE DEVICE WILL BE BLOCKED. THIS FORCES BAD PARITY AT THE DEVICE.
THE DEVICE IS FIRST SELECTED. THEN, BAD DATA IS SENT TO THE DEVICE AND AN EOT RESPONSE TO THE CPU IS EXPECTED. THE EOT IS ANSWERED BY A POLL AND THE STATUS RECEIVED SHOULD BE DC, US (DATA CHECK, UNIT SPECIFY). SEVERAL DIFFERENT CHARACTERS ARE SENT WITH BAD PARITY TO EXCERCISE THE PARITY DETECTION CIRCUITS. BETWEEN EACH TRANSMISSION WITH BAD PARITY, THE DEVICE IS REFRESHED WITH GOOD PARITY.

CAUTION - IF YOU SHOULD SYSTEM RESET DURING ROUTINE 08 AND IMMEDIATELY LOAD ANOTHER PROGRAM, YOU COULD POSSIBLY LEAVE THE MICRO CODE SO THAT IT WILL SEND BAD PARITY TO THE DEVICE. ALL ROUTINES WITHIN SECTION 894 WILL CHECK THE MICRO CODE FOR BLOCKING THE PARITY BIT AND CORRECT IT IF NECESSARY.

09 THE FIRST PART OF ROUTINE 09 SENDS BOTH UPPER AND LOWER CASE ALPHABET CHARACTERS TO THE DEVICE. A READ BUFFER IS THEN DONE TO ENSURE THEY ARE HANDLED CORRECTLY.

IF THE DEVICE IS A PRINTER, THE FOLLOWING IS PRINTED OUT:

UPPER CASE-ABCDEFGHIJKLMNOPQRSTUVWXYZ LOWER CASE-ABCDEFGHIJKL
MNOPQRSTUVWXYZ

IF THE DEVICE IS A 129, ONE CARD WILL BE PUNCHED WITH THE ABOVE DATA IN COLUMNS 1-37 AND 42-78.

NOTE THAT ON KATAKANA DEVICES, LOWER CASE IS REPLACED BY KATAKANA CHARACTERS.

THE SECOND PART OF ROUTINE 09 CHECKS CONTINUOUS POLL BY SENDING A SEQUENCE WITH A COUNT OF FF.
THE CURRENT DEVICE ADDRESS IS REPEATED TWO TIMES IN THE DEVICE LIST. SINCE NO STATUS SHOULD BE PENDING IN THE DEVICE, NO RESPONSE SHOULD OCCUR.
AFTER 1 SECOND, A 2 SEC. TIMEOUT IS SENT. THIS SHOULD CAUSE THE CONT. POLL TO TERMINATE. EOT SHOULD BE SENT TO THE CPU AND AN INTERRUPT SHOULD OCCUR.
NEXT THE COUNT IS CHANGED TO 01 AND THE CONT. POLL IS SENT AGAIN. AGAIN THERE SHOULD BE NO RESPONSE.
HOWEVER SINCE THE COUNT IS 01 THE EOT AND INTERRUPT WILL OCCUR AFTER 1 PASS THRU THE POLL SEQUENCE.
THE ATTACHMENT IS THEN DISABLED AND ENABLED AGAIN. THIS WILL CAUSE DE (DEVICE END) STATUS TO BE PENDING FOR ALL DEVICES. NOW, A CONT. POLL IS SET UP WITH A COUNT OF 01 AND THE CURRENT DEVICE REPEATED IN THE POLLING LIST 254 TIMES. THE SAR IS SET UP SHORT SO THAT IT WILL CUT OFF THE REPLY BEFORE IT IS ALL PUT BACK INTO STORAGE.
WHEN THE CONTINUOUS POLL IS ISSUED, A DEVICE END STATUS SHOULD BE RECEIVED IMMEDIATELY. THE REPLY IS CUT SHORT AND CAR SHOULD BE EQUAL TO SAR. NEXT, A NAK IS SENT AND THE STATUS MESSAGE IS RETRANSMITTED IN ITS ENTIRETY.

0A-0F THESE ROUTINES ARE ALL SIMILAR IN THAT THEY SEND TEST PATTERNS TO THE DEVICES. THE FIRST PATTERN (ROUTINE 0A) IS AN INSTRUCTION PATTERN.
ALL ROUTINES ARE SIMILAR IN THAT TO STEP TO THE NEXT PATTERN (FOR DISPLAYS), TST REQ IS DEPRESSED. IF TST REQ IS NOT DEPRESSED WITHIN 90 SEC. THE NEXT PATTERN IS AUTOMATICALLY STEPPED TO UNLESS SSW 12 IS SET. IF PA-2(CNCL) IS DEPRESSED, SECTION 894 WILL TERMINATE AND LEAVE THE SELECTED PATTERN ON THE DEVICE FOR OFF-LINE USE.

IF THE DEVICE IS A PRINTER, TO ADVANCE TO THE NEXT PATTERN (AFTER THE CURRENT PATTERN HAS STOPPED PRINTING) FOR PRINTERS 3284/86 LIFT THE TOP COVER BRIEFLY (LESS THAN 5 SEC.) AND THE NEXT PATTERN WILL BE PRINTED. IF THE COVER IS LEFT UP FOR MORE THAN 5 SEC. SECTION 894 WILL TERMINATE AND LEAVE THE PATTERN FOR OFF LINE USE. IF THE DEVICE IS A 3287 THERE IS NO INTERLOCK FOR THE COVER, TO BYPASS 90 SEC. DELAY SET SENSE SWITCH 16 ON.
SSW 20-26 ARE PROVIDED SO THAT THE TEST PATTERNS CAN BE SKIPPED IN PART OR COMPLETELY.
THE USE OF THE TEST PATTERNS IS DESCRIBED IN SEC. 4.6

IF THE DEVICE IS A 129, TO ADVANCE TO THE NEXT PATTERN (AFTER THE CURRENT PATTERN HAS BEEN PUNCHED) RAISE 'RESET/CLEAR' MOMENTARILY AND THEN FEED TWO CARDS WITHIN 5 SECONDS AFTER THE TRANSPORT CLEARS. IF TWO CARDS ARE NOT FED WITHIN APPROX. 5 SECONDS AFTER TRANSPORT CLEARS, SECTION 894 WILL TERMINATE.

10 THIS ROUTINE IS PROVIDED TO CHECK THE OPERATION OF THE KEYBOARD AND/OR THE SELECTOR PEN FEATURE. IT IS RUN BY FOLLOWING THE DIRECTIONS ON THE DISPLAY SCREEN. SINCE THE CE MAY BE UP TO 2000 FT AWAY FROM THE CPU, KEYBOARD ERRORS WILL NOT CAUSE HALTS. INSTEAD, INSTRUCTIONS WILL BE PUT ON THE SCREEN INFORMING THE CE OF THE ERROR AND GIVING HIM THE CHANCE TO RETRY (MOST KEYBOARD ERRORS WILL BE HUMAN ERRORS). IN SOME CASES LOGOUT MAY BE LEFT ON THE SYSTEM PRINTER WHERE IT IS IMPRACTICAL TO PUT THE INFORMATION ON THE DISPLAY.
PROVISIONS ARE PROVIDED TO SKIP OVER KEYS OR FEATURES NOT ON ALL KEYBOARDS.
NOTE - SOME DEVICES MAY HAVE NO KEYBOARDS. SSW 13 AND 14 ARE PROVIDED TO FACILITATE SKIPPING KEYBOARD ROUTINES IN THIS CASE. DEVICES WHICH REQUIRE SSW 13 OR 14 TO BE SET SHOULD BE TESTED SEPARATELY.

11 THIS ROUTINE IS PROVIDED TO TEST THE ABILITY OF THE KEYBOARD TO ENTER BOTH UPPER AND LOWER CASE ALPHABET CHARACTERS. SINCE MOST DEVICES DISPLAY LOWER CASE ALPHA CHARACTERS AS UPPER CASE, FOLLOW THE DIRECTIONS CAREFULLY TO AVOID ERRORS.
NOTE THAT DATA ENTRY KEYBOARDS (LIKE A KEYPUNCH WHERE NUMERIC DATA IS UPPER CASE OVER ALPHA CHARACTERS) REQUIRE DIFFERENT ACTION THAN TYPEWRITER KEYBOARDS (NUMERICS ARE THE LOWER SHIFT CHARACTERS IN THE TOP ROW OF KEYS).

CAUTION: NOTE THAT ON SOME KEYBOARDS, PA-1 AND PA-2 (CNCL) ARE ON KEYS WHICH, HAVE UPPER SHIFT CHARACTERS ON THEM (DUP, FIELD MARK). BE SURE YOU ARE SHIFTED TO LOWER CASE BEFORE ATTEMPTING TO USE PA-1 AND PA-2 (CNCL).

THIS ROUTINE IS NOT RUN IF KATAKANA IS INSTALLED.

12 THIS ROUTINE DOES NOTHING MORE THAN PROVIDE A MESSAGE TO SIGNAL END OF TEST FOR A PARTICULAR DEVICE. IT ALSO LINKS BACK TO THE START OF THE PROGRAM TO RESTART FOR THE NEXT DEVICE OR TERMINATE.

13 THIS IS A MANUALLY SELECTED EXERCISER ROUTINE.IT MAY BE SELECTED AND RUN TO HELP PINPOINT INTERMITTENT TYPE PROBLEMS.
THIS ROUTINE PERFORMS AN ENDLESS LOOP CONSISTING OF THE FOLLOWING STEPS:

1. SELECT THE DEVICE.
2. WRITE A RIPPLE PATTERN TO THE DEVICE.
3. RESELECT THE DEVICE.
4. READ THE ENTIRE BUFFER AND CHECK THE RESULTS.
5. UPDATE DATA SO THAT CURSOR AND PATTERN ARE SHIFTED ONE POSITION TO THE RIGHT.
6. RETURN TO STEP 1 .

NOTE: ROUTINES 01-02 MUST BE RUN FOR THE DEVICE BEFORE ATTEMPTING TO SELECT ROUTINE 13.

14-16 ROUTINES 14-16 ARE MANUALLY SELECTABLE ROUTINES PROVIDED TO EXCERCIZE THE 129. SEE SEC. 4.8 FOR DESCRIPTION.

4.4 MICROCODE (ID FC7)

DA MICROCODE DECK (ID = FC7)--NOTE THAT THIS DECK WILL NORMALLY RESIDE ON DISK.
HOWEVER, IF IT IS RECEIVED FOR AN UPDATE, IT WILL BE IN THE FOLLOWING FORMAT:

THE FIRST CARD IN THE DECK IS THE DATA DECK HEADER CARD. THE FUNCTION OF THIS CARD IS TO MAKE THE MICROCODE DECK CONFORM TO THE DIAGNOSTIC PROGRAMMING STANDARDS. THE HEADER CARD DEFINES THE REST OF THE DECK AS DATA. IT CONTAINS THE PART NUMBER, EC NUMBER, PROGRAM NUMBER, AND EC LEVEL.

THE DATA DECK HEADER CARD IS REQUIRED TO BE THE FIRST CARD WHEN THE FC7 DECK IS USED WITH 893 OR FC8. THE 'H' CARD, THE SECOND CARD IN THE DECK, IS IGNORED WHEN THE MICROCODE DECK (FC7) IS USED WITH SECTION 893 OR WITH SECTION FC8.

THE DATA DECK HEADER CARD MUST BE REMOVED WHEN THE FC7 DECK IS USED WITH THE IOCS PROGRAM. THE 'H' CARD CONTAINS INFORMATION REQUIRED BY THE IOCS PROGRAM TO LOAD THE MICROCODE DECK (FC7) TO DISK.

THE 'T' CARDS CONTAIN THE DA MICROCODE.

THE 'E' CARD IS THE 'LAST CARD' OF THE (DA) MICROCODE DECK (FC7).

4.5 PROGRAM TO UPDATE MICROCODE ON SYSTEM PACK (ID = FC8).

THIS PROGRAM WILL BE USED TO UPDATE THE DA MICROCODE ON THE SYSTEM PACK FROM THE DIAGNOSTIC INPUT DEVICE (INPUT DEVICE IS DISK IF RUNNING FROM DISK). FC8 CALLS IN SECTION 893 AND RUNS IT TO CAUSE THE MICRO-CODE (FC7) TO BE BROUGHT INTO CORE AND LOADED. CAUTION: NEVER INSERT SSW RECORDS AT THE END OF 893.

NEXT, THE INFORMATION MUST BE PROVIDED TO LET FC8 KNOW WHETHER THE SYSTEM PACK IS ON R1, F1, OR R3, F3 FOR THE MOD15 D. (THESE ARE SIMULATED AREAS IF 3340/3344 IS USED).

ALSO THE DATA SET NAME MUST BE PROVIDED IF IT IS DIFFERENT FROM $$MCRI. NOTE THAT ON THE PID PACK, THE DATA SET NAME IS $@MCRI. IF ENTERED THRU THE CONSOLE SWITCHES THE HEX CODING FOR $@MCRI IS: 5B 7C D4 C3 D9 C9 .

IF A 3277 OPERATOR CONSOLE IS INSTALLED, THE INFORMATION WILL BE FURNISHED BY ENTERING IT THRU THE OPERATOR CONSOLE KEYBOARD, AND DEPRESSING ENTER.

IN ALL MACHINES WITHOUT A 3277 OPERATOR CONSOLE, THE PRINTER WILL SUPPLY INSTRUCTIONS.
INFORMATION WILL BE SUPPLIED TO THE PROGRAM THRU THE CONSOLE SWITCHES.
AFTER THE INFORMATION HAS BEEN SUPPLIED TO THE PROGRAM, THE MICRO-CODE WILL BE COPIED TO THE SYSTEM PACK AND THE PROGRAM IS TERMINATED.

NOTE 1 : IF BOTH THE 3340 AND 5444 ARE DEFINED IN THE UDT, SSW 2D IS USED TO SELECT 3340 AND SSW 2E IS USED TO SELECT 5444 TO DEFINE WHERE SYSTEM PACK RESIDES.
NOTE 2 : IF RUNNING FROM CARDS, PROGRAMS MUST BE IN THE FOLLOWING ORDER: FC8, 893, FC7.

4.6 TEST PATTERNS

4.6.1 ROUTINE 0A - TEST PATTERN INFORMATION MESSAGE

```
                                   COLUMN
         0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
  ROW    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
   1    |_9         T E S T   P A T T E R N   S E Q U E N C I N G                      |
   2    |                                                                              |
   3    | 1 .   P R E S S   T E S T   R E Q U E S T   T O   C A L L   N E X T          |
   4    |                                                                              |
   5    |    S E Q U E N T I A L   P A T T E R N .   S E C T I O N   W I L L           |
   6    |                                                                              |
   7    |    T E R M I N A T E   O N   L A S T   P A T T E R N .                       |
   8    |                                                                              |
   9    | 2 .   P R E S S   C A N C E L ( O R   P A 2 ) T O   D I S C O N N E C T   C P U|
  10    |                                                                              |
  11    |    A N D   L E A V E   P A T T E R N   F O R   O F F - L I N E   U S A G E . |
  12    |                                                     E8 A D R - 6 0 X X40     |
```

NOTES ON ROUTINE 1

1. WHEN FUNCTIONAL TESTS HAVE BEEN COMPLETED, THIS INFORMATIONAL MESSAGE WILL BE TRANSMITTED. NO OTHER ACTION NEED BE TAKEN WITH THIS DISPLAY OTHER THAN FOLLOWING THE DIRECTIONS GIVEN.

2. WITH THIS DISPLAY AND ALL SUCCEEDING RPT'S THE CONTROL UNIT (ALWAYS 60) AND DISPLAY STATION SELECTION ADDRESSES (XX) WILL APPEAR AFTER 'ADR-'.

3. NOTE THE START FIELD (SF) CONTROL CHARACTERS IN ROW 12 (E8 AND 40). BLANKS WILL APPEAR ON THE SCREEN WHERE THE CONTROL CHARACTERS RESIDE FOR THIS DISPLAY AND ALL SUCCEEDING DISPLAYS. SEE SECTION 5.1.2 FOR AN EXPLANATION OF THESE CODES.

4. IF THE CANCEL KEY (OR PA2) IS PRESSED, THE CURRENT DISPLAY WILL BE KEPT, BUT THE SECTION BEING EXECUTED WILL TERMINATE. THE KEYBOARD WILL BE RESET SO THAT DATA KEY FUNCTIONS MAY BE USED. THIS WILL ALLOW THE OPERATOR TO MAKE ADJUSTMENTS, ETC., USING THE DISPLAY WITHOUT REGARD TO THE PROGRAM TIMEOUT.

5. THE CURSOR SHOULD APPEAR IN THE UPPER LEFT-HAND CORNER OF THE DISPLAY (ROW 1, COLUMN 1). THE CURSOR IS REPRESENTED IN THIS DISPLAY AND ANY SUCCEEDING DISPLAYS BY THE CHARACTER '_'.

6. THE DIGIT NINE (9) WILL APPEAR IN ROW 7, COLUMN 1 WHEN A 3277-2 IS BEING TESTED. THIS NINE WILL APPEAR AS ILLUSTRATED ABOVE IN ROW 1, COLUMN 1 FOR THE 3277-1 DISPLAYS. IF KATAKANA IS INSTALLED, THERE WILL BE A BLANK BEFORE THE NINE.

7. DETAILED INSTRUCTIONS FOR USE OF TEST PATTERNS 1,2 ,3 AND 5 ARE CONTAINED IN THE 3277 DISPLAY STATION MODEL 1 AND 2 TROUBLE SHOOTING GUIDE(SY27-2314 OR SY27-2330 IF KATAKANA).

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 0000000001111111111222222222233333333334
       1234567890123456789012345678901234567890
 ROW
  1        TEST PATTERN SEQUENCING
  2
  3      TO BYPASS 90 SECOND DELAY BETWEEN
  4
  5      PATTERNS DISPLAYED ON PRINTERS
  6
  7
  8
  9      SET SENSE SWITCH 16 ON.
 10
 11
 12                              ADR-60XX
```

NOTES ON THE PRINTER OUTPUT

A. IF A 1920 CHARACTER BUFFER IS BEING TESTED,THE DIGIT NINE (9) WILL BE PRINTED IN THE FIRST POSITION OF THE LAST LINE OF PRINT.OTHERWISE PRINTING WILL TERMINATE WITH THE DATA AS SHOWN ABOVE. IF KATAKANA IS INSTALLED, THERE WILL BE A BLANK BEFORE THE NINE.

B. NOTE THAT THE PROCEDURE TO STEP TO A NEW TEST PATTERN IS DIFFERENT FOR A PRINTER. BE SURE TO WAIT FOR PRINTING TO STOP BEFORE LIFTING THE COVER TO STEP TO THE NEXT PATTERN.

C. IF PRINTER OUTPUT IS DIFFERENT FROM THAT SHOWN IN THIS AND ALL SUCCEEDING PRINTER TEST PATTERNS,REFER TO 3284/86 TROUBLE SHOOTING GUIDE(SY27-2315 OR SY27-2331 IF KATAKANA) OR 3288 TROUBLE SHOOTING GUIDE (SY27-2401) OR 3287 TROUBLE SHOOTING GUIDE(SY18-2002 OR SY27-0171)

NOTE THAT PRINTER OUTPUT FOR THIS PATTERN IS DEFINED AS 40 CHARACTERS PER LINE.

8. DETAILED INSTRUCTIONS FOR THE USE OF TEST PATTERNS 1, 2, 4 AND 6 ARE CONTAINED IN THE 129-3270 ATTACHMENT DESCRIPTIONS GA09-1600 AND SY09-1004. THE 129 WILL PRODUCE 3 CARDS AS FOLLOWS:

```
COLUMN 00000000011111111112222222222333333333344444444445555555555666666666677777777778
       12345678901234567890123456789012345678901234567890123456789012345678901234567890
 CARD
  1    TEST PATTERN SEQUENCING:  TO CALL NEXT PATTERN, RAISE 'RESET/CLEAR' MOMENTARILY
  2    AND THEN FEED 2 CARDS AFTER THE TRANSPORT CLEARS.  IF 2 CARDS ARE NOT FED
  3    WITHIN 5 SECONDS AFTER TRANSPORT CLEARS, PROGRAM WILL TERMINATE.
```

4.6.2 ROUTINE 0B- TEST PATTERN 1

```
                                  COLUMN
      0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
ROW   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
 1   |-------------------------------------------------------------------------------|
 2   |                                                                               |
 3   |60 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  6C N O N   D I S P L A Y|
 4   |                                                                               |
 5   |40_C O P Y   A B O V E   I N   T H I S   L I N E       40 I N S E R T   C K    |
 6   |60                                                                             |
 7   |E8 | @ # $ %4A & * ( ) _ + ! : " < > ? - = ¬5E ' /F8 0 1 2 3 4 5 6 7 8 9 , . - A|
 8   |                                                                               |
 9   |C8 C O P Y   A B O V E   I N   T H I S   L I N E  D8                           |
10   |60                                                                             |
11   |E4 ? S E L   P E N   T E S T     E8 > S E L   P E N   T E S T                  |
12   |                                                          E8 A D R - 6 0 X XE8|
      -------------------------------------------------------------------------------
```

NOTES ON TEST PATTERN 1

1. THE CURSOR WILL BE INSERTED IN ROW NUMBER 5 SUPERIMPOSED WITH THE FIRST CHARACTER.
2. FOR DETAILED INFORMATION ON USING THIS TEST PATTERN,REFER TO THE 3277 DISPLAY STATION MODELS 1 AND 2 TROUBLE SHOOTING GUIDE (SY27-2314 OR SY27-2330 IF KATAKANA).
   NOTE THAT THIS TEST PATTERN IS AN OFF LINE TEST. DO NOT ATTEMPT TO FOLLOW THE SCREEN INSTRUCTIONS WITHOUT READING THE APPORPRIATE MANUALS
3. NOTE THAT INFORMATION IN ROW 3 ENTITLED 'NON-DISPLAY' SHOULD NOT APPEAR ON THE SCREEN.
4. THIS PATTERN IS SKIPPED IF DEVICE IS A PRINTER.
5. IF THE DISPLAY IS A MODEL 2 THERE WILL BE NO SPACES BETWEEN LINES.
6. FOR WORLD TRADE KEYBOARDS, SEE TROUBLE SHOOTING GUIDE FOR TABLES TO HANDLE DIFFERENT CHARACTER ASSIGNMENTS
7. IF THE DEVICE IS A 129 WITH THE 'LINE MODE' SWITCH IN THE 'ON' POSITION, THE FOLLOWING CARDS ARE PRODUCED:

```
COLUMN  00000000011111111112222222222333333333344444444445555555555666666666677777777778
        12345678901234567890123456789012345678901234567890123456789012345678901234567890
 CARD
   1    COPY ABOVE IN THIS LINE     INSERT CK
   2    |@#$%¢&*()_+!:"<>?-=¬X'/ 0123456789,.-A
   3    COPY ABOVE IN THIS LINE
   4    ?SEL PEN TEST    >SEL PEN TEST                                          ADR-60XX
```

IF THE 'LINE MODE' SWITCH IS IN THE 'SPEC' POSITION AND COMPRESSED DATA MODE IS INSTALLED, THE FOLLOWING CARDS ARE PRODUCED:

```
COLUMN  00000000011111111112222222222333333333344444444445555555555666666666677777777778
        12345678901234567890123456789012345678901234567890123456789012345678901234567890
 CARD
   1    COPY ABOVE IN THIS LINE    INSERT CK                                         |@#
   2    $%¢&*()_+!:"<>?-=¬X'/0123456789,.-A                                       COPY
   3    ABOVE IN THIS LINE                                                    ?SEL PEN
   4     TEST   >SEL PEN TEST                                       ADR-60XX
```

NOTE - NOTE - NOTE - THE 'X' IN CARD 2 ABOVE WILL BE PUNCHED AND PRINTED AS A SEMICOLON. THE '5E' IN LINE 7 OF THE DISPLAY WILL BE DISPLAYED AS A SEMICOLON.

4.6.3 ROUTINE 0C- TEST PATTERN 2 FOR MODEL 1 DISPLAYS
TEST PATTERN 3 FOR MODEL 2 DISPLAYS

```
                                  COLUMN
         0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
  ROW    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0

   1    |E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E|

   2    |H                                                                             H|

   3    |H                                                                             H|

   4    |H                                                                             H|

   5    |H                                                                             H|

   6    |H                                     O O                                     H|

   7    |H                                     O O                                     H|

   8    |H                 T E S T   P A T T E R N   F O R   3 2 7 7 - 1               H|

   9    |H                             A L I G N M E N T                               H|

  10    |H                 *40_U N P R O T E C T E D   D A T A        60 *             H|

  11    |H                                                       E8 A D R - 6 0 X X60 H|

  12    |E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E|
```

NOTES ON TEST PATTERN 2

1. TEST PATTERN 3 IS SIMILIAR TO THE ABOVE DISPLAY EXCEPT IT IS FOR THE 3277-2 1920 CHARACTER DISPLAY. THE DISPLAY SCREEN WILL BE OUTLINED AS ABOVE IN THE SAME FORMAT. (SEE BELOW) NOTE: RFT #2 WILL BE USED ONLY ON THE 3277-1 AND RFT #3 ONLY ON THE 3277-2, ACCORDING TO RESULTS OBTAINED IN RTN 02.
2. THE CURSOR WILL BE SUPERIMPOSED WITH THE 'U' IN UNPROTECTED, ROW 10.
3. FOR DETAILED INFORMATION ON USE OF TEST PATTERNS 2 AND 3, REFER TO TROUBLE SHOOTING GUIDE.
4. TEST PATTERNS 2 AND 3 ARE SKIPPED IF THE DEVICE IS A PRINTER.

*** PATTERN FOR A MODEL 2 (1920 CHAR BUFFER) DISPLAY ***

```
COLUMN 00000000011111111112222222222333333333344444444445555555555666666666677777777778
       12345678901234567890123456789012345678901234567890123456789012345678901234567890
 ROW
  1    EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE
  2    H                                                                              H
  3    H                                                                              H
  4    H                                                                              H
  5    H                                                                              H
  6    H                                                                              H
  7    H       TEST PATTERN FOR 3277-2                                                H
  8    H                ALIGNMENT                                                     H
  9    H                                                                              H
 10    H                                                                              H
 11    H          * UNPROTECTED AREA      *                                           H
 12    H                                         OO                                   H
 13    H                                         OO                                   H
 14    H                                                                              H
 15    H                                                                              H
 16    H                                                                              H
 17    H                                                                              H
 18    H                                                                              H
 19    H                                                                              H
 20    H                                                                              H
 21    H                                                                              H
 22    H                                                                              H
 23    H                                                                      ADR-60XX H
 24    EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE
```

5. IF THE DEVICE IS A 129 AND THE 'LINE MODE' SWITCH IS IN THE 'ON' POSITION, THE FOLLOWING CARDS WILL BE PUNCHED:

```
COLUMN   00000000011111111112222222222333333333344444444445555555555666666666677777777778
         12345678901234567890123456789012345678901234567890123456789012345678901234567890
 CARD
   1     UNPROTECTED DATA     *       HH                                   ADR-60XX HEEEEEEEEE
   2     EEEEEEEEEEEEEEEEEEEEEEEEEEEEEE
```

IF THE 'LINE MODE' SWITCH IS IN THE 'SPEC' POSITION AND COMPRESSED DATA MODE IS INSTALLED, THE FOLLOWING CARDS WILL BE PUNCHED:

```
COLUMN   00000000011111111112222222222333333333344444444445555555555666666666677777777778
         12345678901234567890123456789012345678901234567890123456789012345678901234567890
 CARD
   1     UNPROTECTED DATA     *       HH                                 ADR-60XXHEEEEEEEEEEEEE
   2     EEEEEEEEEEEEEEEEEEEEEEEEEEE
```

4.6.4 ROUTINE OD- TEST PATTERN 4

```
                                   COLUMN
       0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
ROW    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
 1    |60 F O R   C L U S T E R E D   P R I N T E R S   D A T A   S H O U L D   S T A R|
 2    | T   N E X T   L I N E   H E R E   - - - - - - - - > C H E C K I N G   P R O G R A|
 3    | M   T A B / E R A S E   U N P R O T .   T O   A D D R / D U P / F I E L D   M A|
 4    | R K   O R D E R S                                                              |
 5    |                                                                                |
 6    |                                                              E8 A D R - _ _ _ _60|
 7    |_F81 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1|
 8    |                                                                                |
 9    |C8 A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A A|
10    |                                                                      *5E 5 9   |
11    |60 B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B|
12    | B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B  |
```

NOTES ON TEST PATTERN 4

1. TEST PATTERN 4 IS SKIPPED IF DEVICE IS A DISPLAY.
   THE ABOVE PATTERN IS GIVEN TO SHOW HOW THE PATTERN RESIDES IN THE PRINTER BUFFER.

2. *** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 0000000001111111111222222222233333333334444444444555555555566666
       1234567890123456789012345678901234567890123456789012345678901234
  ROW
   1    FOR CLUSTERED PRINTERS DATA SHOULD START NEXT LINE HERE ------>
   2   CHECKING PROGRAM TAB/ERASE UNPROT. TO ADDR/DUP/FIELD MARK ORDERS
   3                                           ADR-60XX  11111111111111
   4   11111111111111111111111
   5    AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
   6             *X59   BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
   7   BBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
```

3. IF PRINTER OUTPUT IS DIFFERENT FROM THE ABOVE, REFER TO THE 3284/3286/3287 OR 3288 TROUBLE SHOOTING GUIDES. (SY27-2315 OR SY27-2331 IF KATAKANA FOR 3284/86 OR SY27-2401 FOR 3288). NOTE THAT PRINTER OUTPUT FOR THIS PATTERN IS DEFINED AS 64 CHARACTERS PER LINE.

4. IF KATAKANA IS INSTALLED, THERE WILL BE A BLANK BEFORE THE 5 AND THE 9 IN ROW 6.

5. IF THE DEVICE IS A 129, AND THE 'LINE MODE' SWITCH IS IN THE 'ON' POSITION, THE FOLLOWING CARDS WILL BE PUNCHED:

```
COLUMN   00000000011111111112222222222333333333344444444445555555555666666666677777777778
         12345678901234567890123456789012345678901234567890123456789012345678901234567890
 CARD
   1      1111111111111111111111111111111111111111
   2      AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA                                   *X59
   3       BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
```

IF THE 'LINE MODE' SWITCH IS IN THE 'SPEC' POSITION AND COMPRESSED DATA MODE IS INSTALLED, THE FOLLOWING CARDS WILL BE PUNCHED:

```
COLUMN   00000000011111111112222222222333333333344444444445555555555666666666677777777778
         12345678901234567890123456789012345678901234567890123456789012345678901234567890
 CARD
   1     1111111111111111111111111111111111111111                                       A
   2     AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA                                 *X59  BB
   3     BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
```

NOTE - NOTE - NOTE - THE 'X' IN PRINT LINE 6 OR CARD 2 ABOVE WILL BE PRINTED OR PUNCHED AS A SEMICOLON.

4.6.5 ROUTINE OE- TEST PATTERN 5

```
                                        COLUMN
          0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
   ROW    1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
    1    |8182838485868788898A8C8D8E8F909192939495969798999A9D9E9F                  60|
    2    |A2A3A4A5A6A7A8A9AAACADAEAFBABBBCBDBEBF808B9B9CA0A1ABB0B1B2B3B475B6B7B879    40|
    3    |414243444546474849515253545556575859626364656667686970717273747576777879    60|
    4    |C1C2C3C4C5C6C7C8C9D1D2D3D4D5D6D7D8D9E2E3E4E5E6E7E8E9F0F1F2F3F4F5F6F7F8F9    40|
    5    |40506061C0D0E0E1                                                          60|
    6    |4A4B4C4D4E4F5A5B5C5D5E5F6A6B6C6D6E6F7A7B7C7D7E7F                          40|
    7    |CACBCCCDCECFDADBDCDDDEDFEAEBECEDEEEFFAFBFCFDFE                            60|
    8    | N / L   C H E C K 5 5 5 5 5                                                |
    9    | E O M   C H E C K 9 9                                                      |
   10    |                                                                          40|
   11    |_                                                                           |
   12    |                                                      E8 A D R - 6 0 X X40|
```

NOTES ON TEST PATTERN 5

NOTE: THE CONTENTS OF THIS DISPLAY WILL VARY ACCORDING TO THE FEATURES AVAILABLE TO THE PARTICULAR DISPLAY STATION. THEREFORE ONLY HEX VALUES HAVE BEEN GIVEN AS REFERENCE FOR THIS DISPLAY.

1. THE CURSOR WILL BE PLACED IN THE FIRST POSITION OF ROW 11.
2. IN ROW 1 HEX 81-89 AND 91-99 ARE LOWER CASE A THRU R. (EBCDIC)
3. IN ROW 2 HEX A2-A9 ARE LOWER CASE S THRU Z. (EBCDIC).
4. IN ROW 4 HEX C1-E9 ARE UPPER CASE A-Z (EBCDIC).
5. IN ROW 4 HEX F0-F9 ARE DECIMAL NUMBERS 0-9.
6. THE ABOVE WILL APPEAR AS ILLUSTRATED ONLY FOR THE 480 CHARACTER DISPLAY STATION.

   IF THE DISPLAY STATION IS A 1920 CHARACTER,THE PATTERN WILL BE DIFFERENT IN THAT 2 LINES AS SHOWN IN THE ABOVE PATTERN ARE DISPLAYED AS 1 LINE. SEE ILLUSTRATION IN TROUBLE SHOOTING GUIDE.
7. SEE 3277 TROUBLE SHOOTING GUIDE FOR USE OF THIS PATTERN.
   NOTE THAT CHARACTER ASSIGNMENT MAY BE DIFFERENT FOR WORLD TRADE MACHINES.
8. IF KATAKANA IS INSTALLED, THE '55555' IN LINE 9 WILL BE DISPLAYED AS ' 5 5 5' AND THE '99' IN LINE 10 WILL BE DISPLAYED AS ' 9'.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

1. THIS PATTERN WILL PRINT ALL CHARACTERS AVAILABLE ON THE PRINTER BEING TESTED BEGINNING AT THE LEFT MARGIN AND ENDING AT THE RIGHT MARGIN.
   N/L CHECK WILL BE PRINTED FOLLOWED BY 5 LINE SPACES (ONLY 3 IF KATAKANA). PRINTING WILL TERMINATE AFTER PRINTING 'EOM CHECK'. AN ACCURATE EXAMPLE OF PRINTER OUTPUT CANNOT BE GIVEN SINCE NUMEROUS SPECIAL PRINTER CHARACTERS CANNOT BE DUPLICATED IN THIS GUIDE.

4.6.6 ROUTINE OF- TEST PATTERN 6

```
                                         COLUMN
       0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4
 ROW   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
  1   |_N E W   L I N E   F U N C T I O N   C H E C K 5 N E W   L I N E   F U N C T I O|
  2   | N 5 N E W   L I N E 5 N E W 5 N E W   L I N E 5 N E W   L I N E   F U N C T I O|
  3   | N 5 N E W   L I N E   F U N C T I O N   C H E C K 54C T H I S   D A T A   N O T|
  4   |   V I S I B L E / E O M   A N D   N / L   I G N O R E D 5 940 E N D - O F - M E|
  5   | S S A G E - T E R M I N A T E S   P R I N T 9 5 2 N D   E O M   L I N E   N O T|
  6   | O N   P R I N T E R   O U T P U T 9                                            |
  7   |                                                                                |
  8   |                                                                                |
  9   |                                                                                |
 10   |                                                                                |
 11   |                                                                                |
 12   |                                                         E8 A D R - 6 0 X X40|
       --------------------------------------------------------------------------------
```

NOTES ON TEST PATTERN 6

1. THIS PATTERN IS USED ONLY ON THE PRINTER,HOWEVER, THE ABOVE PATTERN SHOWS HOW IT RESIDES IN THE PRINTER BUFFER. NOTE THAT THE PORTION STARTING IN ROW 3 (THIS DATA NOT VISIBLE /EOM AND N/L IGNORED) SHOULD NOT BE PRINTED ALSO STARTING IN ROW 5 (2ND EOM LINE NOT ON PRINTER OUTPUT) SHOULD NOT BE PRINTED.

2. IF THE PRINTER OUTPUT DOES NOT APPEAR AS SHOWN, REFER TO THE 3284/86/87 OR 3288 TROUBLE SHOOTING GUIDE.

*** PRINTER OUTPUT WILL APPEAR AS FOLLOWS ***

```
COLUMN 000000000111111111122222222223333333333444444444455555555556666666666777777777778
       1234567890123456789012345678901234567890123456789012345678901234567890123456789 0
  ROW
   1   NEW LINE FUNCTION CHECK
   2   NEW LINE FUNCTION
   3   NEW LINE
   4   NEW
   5   NEW LINE
   6   NEW LINE FUNCTION
   7   NEW LINE FUNCTION CHECK
   8                                         END-OF-MESSAGE-TERMINATES PRINT
```

3. IF THE DEVICE IS A 129, 8 CARDS WILL BE PRODUCED WHICH WILL BE AN IMAGE OF THE PRINTER OUTPUT. THE LAST CARD PRODUCED SHOULD BE EXACTLY AS SHOWN ABOVE UNLESS THE 'LINE MODE' SWITCH IS IN THE 'SPEC' POSITION AND COMPRESSED DATA MODE IS INSTALLED. IN THIS CASE, PUNCHING STARTS AT COLUMN 44.

4.7 GENERAL 3270 DISPLAY SYSTEM INFORMATION

4.7.1 TYPICAL CONTROL SEQUENCES

THE FOLLOWING ABBREVIATIONS ARE USED IN ALL EXAMPLES:

DD = DEVICE ADDRESS, SEE 5.1.3 FOR VALID COMBINATIONS, FOR CONTINUOUS POLL SEE NOTE Y
AA = AID CHARACTERS
CCCC = CURSOR ADDRESS
S0S1 = STATUS AND SENSE BYTES 0 AND 1 (DEVICE STATUS)

A) TYPICAL SELECTION SEQUENCE

```
<-----XMIT-------> <-----RECEIVE------>
 E P S S C C D D E     A
 O A Y Y U U S S N   D C
 T D N N A A A A Q   L K
37FF32326060DDDD2D   E 0
                   1070  = ACK0 = NORMAL RESPONSE

                     D R
                     L V
                     E I
                   107C = RVI =STATUS IS PENDING

                       W
                     D A
                     L C
                     E K
                   106B = WACK = DEVICE IS BUSY
```

B) TYPICAL POLL SEQUENCE, FOR CONTINUOUS POLL SEE NOTE Y

```
<-----XMIT-------> <-----RECEIVE------>
 E P S S C C D D E  E P
 O A Y Y U U S S N  O A
 T D N N A A A A Q  T D
37FF32324040DDDD2D 37FF = EOT = NO STATUS OR AID PENDING

                   S     S C D       E
                   O     T U S       T
                   H % R X A A       X
                   016CD90240DDS0S103 = STATUS MESSAGE

                   S     S        E   E
                   O     T        T O T NOTE X
                   H % / X        X R B
                   016C6102 TEXT 03    = TEST REQ. RESPONSE
                                    26

                   S C D              E   E
                   T U S              T O T NOTE X
                   X A A              X R B
                   0240DDAACCCC TEXT 03    = AID RESPONSE FOR ALL EXCEPT
                                        26   PA KEYS AND CLEAR.

                   S C D   E
                   T U S   T   = AID RESPONSE FOR PA KEYS AND CLEAR.
                   X A A   X
                   0240DDAA03
```

NOTE X - ETB IS AT THE END OF EACH TEXT BLOCK IF THERE ARE MORE TO FOLLOW. ETX IS AT THE END OF THE LAST TEXT BLOCK. IF ALL DATA IS CONTAINED WITHIN 1ST TEXT BLOCK IT WILL END WITH ETX. UPON RECEIPT OF THE 1ST TEXT BLOCK WITH ETB, THE CPU WILL TRANSMIT ACK 1 AND THE NEXT BLOCK IS SENT. THE FOLLOWING TEXT BLOCKS ARE ANSWERED WITH ALTERNATING ACK 0/ACK 1 TRANSMISSIONS. WHEN AN ACK IS SENT TO ACKNOWLEDGE THE LAST TEXT BLOCK (ONE THAT ENDS WITH ETX),AN EOT WILL BE SENT AND SELECTION WILL BE DROPPED.

NOTE Y - ON A CONTINUOUS POLL, THE SAME SEQUENCE IS USED AS IN A NORMAL POLL EXCEPT THAT THE DEVICE ADDRESS (DDDD) IS REPLACED BY HEX 8F8F FOLLOWED BY A ONE BYTE COUNT AND A LIST OF THE DEVICE ADDRESSES TO BE POLLED. THE NORMAL ENDING 'ENQ' FOLLOWS THE LAST DEVICE ADDRESS IN THE LIST.

C) TYPICAL WRITE COMMAND SEQUENCE (DEVICE MUST BE SELECTED)

```
<--XMIT--------------------> <-RECEIVE->
 S E C W                   E  D A
 T S M C                   T  L C
 X C D C                   X  E K
                                1
0227F540  TEXT AND ORDERS 03 1061   ACK1 DENOTES A SUCCESSFUL WRITE

                              E P
                              O A
                              T D
                             37FF  EOT INDICATES SOMETHING WENT WRONG. POLL TO GET STATUS.
```

NOTE - ANY SUCCEEDING WRITES ARE ACKNOWLEDGED BY ALTERNATING ACK 0/ACK 1 RESPONSES.
COMMAND SHOWN IS ERASE/WRITE (F5).IT COULD ALSO BE A WRITE (F1).
WCC CHARACTERS ARE DEFINED TO OBTAIN VARIOUS CONTROL FUNCTIONS (START PRINT,UNLOCK KEYBOARD,SOUND ALARM ETC.).

D) TYPICAL READ SEQUENCE (DEVICE MUST BE SELECTED)

```
<--XMIT-->  <----RECEIVE--------->
 S E C E     S C D          E   E
 T S M T     T U S          T O T
 X C D X     X A A          X R B
0227F603    0240DDCCCC TEXT 03    SEE AID RESPONSE TO POLL FOR FURTHER DETAILS.
                              26
```

NOTE-COMMAND SHOWN IS READ MODIFIED (F6), IT COULD BE READ BUFFER(F2). FOR READ BUFFER, TEXT FORMAT IS DIFFERENT. READS ARE NORMALLY NEVER EXECUTED BY A TYPICAL USER PROGRAM. A READ MODIFIED IS GENERALLY EXECUTED BY POLLING A DEVICE THAT HAS HAD AN AID KEY DEPRESSED.

4.8 129 DATA RECORDER TESTS

4.8.1 GENERAL INFORMATION

ROUTINES 14-16 ARE PROVIDED AS MANUALLY SELECTABLE ROUTINES USED TO EXCERCIZE FUNCTIONS OF A 129 WITH RPQ 8T0093 INSTALLED ON IT. IN ORDER TO SELECT ANY OF THESE ROUTINES, AT LEAST ROUTINES 01-02 MUST HAVE BEEN RUN TO GET A 129 SELECTED AS THE CURRENT DEVICE. A SUGGESTED PROCEDURE IS TO USE SSW 10 TO SELECT ONLY THE DEVICE ADDRESS WHICH HAS THE 129 TO BE TESTED ATTACHED TO IT.

THE 129 SWITCHES MUST BE SET UP AS DESCRIBED IN SEC. 4.3 NOTE I. HOLDING 'MULT PCH' DEPRESSED WHILE MOMENTARILY LIFTING 'RESET/CLEAR' WILL CAUSE A D.C. RESET TO THE 129. THIS IS NORMALLY NECESSARY ONLY AFTER SOME UNUSUAL CONDITION.

'COMPRESSED DATA MODE' AND 'FORMATTED READ' ARE FEATURES SELECTED BY JUMPERING WITHIN THE 129. IF COMPRESSED DATA MODE IS NOT JUMPERED, THE 'SPEC' POSITION OF THE 'LINE MODE' SWITCH IS THE SAME AS 'ON' WHEN THE 129 IS PUNCHING. IF FORMATTED READ IS NOT JUMPERED, THE 'SPEC' POSITION OF THE 'LINE MODE' SWITCH THE THE SAME AS 'ON' WHEN THE 129 IS READING.

4.8.2 ROUTINE 14 - PUNCH 129 DATA CARDS

TO RUN ROUTINE 14, MAKE THE 129 READY WITH AT LEAST 18 BLANK CARDS IN THE HOPPER. SELECT AND RUN THE ROUTINE. BE SURE THAT THE 'LINE MODE' SWITCH IS IN THE 'ON' POSITION. THE FOLLOWING DATA CARDS SHOULD THEN BE PUNCHED:

```
COLUMN  00000000011111111112222222222333333333344444444445555555555666666666677777777778
        12345678901234567890123456789012345678901234567890123456789012345678901234567890
 CARD
   1    1 CARD 01 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66661
   2      CARD 02 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66662
   3    2 CARD 03 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66663
   4      CARD 04 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66664
   5    3 CARD 05 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66665
   6      CARD 06 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66666
   7    4 CARD 07 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66667
   8      CARD 08 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66668
   9    1 CARD 09 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66669
  10      CARD 10 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66660
  11    2 CARD 11 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66661
  12      CARD 12 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66662
  13    3 CARD 13 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66663
  14      CARD 14 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66664
  15    4 CARD 15 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66665
  16      CARD 16 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66666
  17    1 CARD 17 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66667
  18      CARD 18 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66668
```

NOTE THAT IF THE 'LINE MODE' SWITCH IS SET TO 'SPEC', AND COMPRESSED DATA MODE IS INSTALLED, COLUMNS 2,7 AND 10 WILL NOT BE BLANK AND ALL DATA IN THE CARDS WILL BE SHIFTED LEFT 3 COLUMNS TO FILL IN THESE BLANKS. DO NOT USE THIS MODE TO PUNCH DATA CARDS FOR ROUTINE 16.

4.8.3 ROUTINE 15 - PUNCH 129 PROGRAM CARDS

ROUTINE 15 IS RUN THE SAME AS ROUTINE 14. THE PURPOSE OF ROUTINE 15 IS TO PUNCH 3 PROGRAM CARDS WHICH ARE NEEDED ONLY IF ROUTINE 16 IS TO BE TESTED WITH FORMATTED READ INSTALLED WITH THE 'LINE MODE' SWITCH IN THE 'SPEC' POSITION. THE THREE CARDS PRODUCED SHOULD BE AS FOLLOWS:

```
COLUMN  00000000011111111112222222222333333333344444444445555555555666666666677777777778
        12345678901234567890123456789012345678901234567890123456789012345678901234567890
 CARD
   1     &&&&&&&&&&&&&&&&&& &&&&&&&&&-&&&&&&&&&-&&&&&&&&& &&&&&&&&&-&&&&&&&&&-&&&&&&&&&&
   2     &&&&&&&&&&&&&&&&&&-&&&&&&&&& &&&&&&&&&-&&&&&&&&&-&&&&&&&&& &&&&&&&&&-&&&&&&&&&&
   3     &&&&&&&&&&&&&&&&&&-&&&&&&&&&-&&&&&&&&& &&&&&&&&&-&&&&&&&&&-&&&&&&&&& &&&&&&&&&&
```

TAKE THE THREE CARDS PRODUCED FROM THIS ROUTINE AND LOAD THEM INTO THE 129 PROGRAMS 1, 2 AND 3 RESPECTIVELY.

4.8.4 ROUTINE 16 - READ AND PRINT CARDS

THIS ROUTINE IS PROVIDED TO EXCERCISE THE READ FUNCTION OF THE 129. IT WILL READ THE DATA CARDS PRODUCED BY ROUTINE 14 AND PRINT THEM ON THE SYSTEM PRINTER. TO RUN THIS ROUTINE PREPARE THE 129 AS FOLLOWS:

1. SET ALL SWITCHES AS DESCRIBED IN SEC. 4.3 NOTE I. EXCEPT, SUBSTITUE THE CARDS PUNCHED BY ROUTINE 14 FOR THE BLANK CARDS AND DO NOT FEED ANY CARDS INTO THE TRANSPORT.
2. SELECT ROUTINE 16 AND DEPRESS 'READ' ON THE 129. CARDS SHOULD THEN BE READ ON THE 129 AND PRINTED ON THE SYSTEM PRINTER AFTER THEY HAVE BEEN READ INTO THE CPU.

WITH THE 'LINE MODE' SWITCH SET TO 'ON' THE PRINTER OUTPUT SHOULD LOOK AS FOLLOWS:

```
RTN 16 - READ AND PRINT CARDS
COLUMN   1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

1 CARD 01 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66661
  CARD 02 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66662
2 CARD 03 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66663
  CARD 04 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66664
3 CARD 05 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66665
  CARD 06 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66666





4 CARD 07 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66667
  CARD 08 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66668
1 CARD 09 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66669
  CARD 10 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66660
2 CARD 11 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66661
  CARD 12 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66662





3 CARD 13 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66663
  CARD 14 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66664
4 CARD 15 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66665
  CARD 16 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66666
1 CARD 17 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66667
  CARD 18 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-66668





INTERVENTION REQUIRED AT 129, CORRECT PROBLEM AND PRESS 'READ' TO CONTINUE
```

IF THE CARDS ARE RE-INSERTED IN THE HOPPER AND 'READ' DEPRESSED AS DIRECTED IN THE MESSAGE, THE CARDS WILL READ AGAIN AND THE ABOVE PRINTOUT MINUS THE HEADING WILL BE REPEATED.

NOTE THAT A SPACE OF 5 BLANK LINES INDICATES THAT THE END OF THE 129 BUFFER LOAD WAS REACHED AND THAT A PF-10 WAS GENERATED BY THE 129 AT THIS TIME

IF THE 'LINE MODE' SWITCH IS IN THE 'SPEC' POSITION AND FORMATTED READ IS INSTALLED, THE FOLLOWING PRINTOUT SHOULD OCCUR:

CAUTION - WHEN RUNNING IN THIS MODE, YOU MUST HAVE PREVIOUSLY LOADED THE PROGRAM CARDS PUNCHED IN ROUTINE 15. SEE 4.8.3 FOR DETAILS.

```
RTN 16 - READ AND PRINT CARDS
COLUMN    1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
 1 CARD 01 ********* FIELD-1111 FIELD-4444
   CARD 02 ********* FIELD-1111 FIELD-4444
 2 CARD 03 ********* FIELD-2222 FIELD-5555
   CARD 04 ********* FIELD-2222 FIELD-5555
 3 CARD 05 ********* FIELD-3333 FIELD-66665
   CARD 06 ********* FIELD-3333 FIELD-66666
 4 CARD 07 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-6666
7
   CARD 08 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-6666
8




 1 CARD 09 ********* FIELD-1111 FIELD-4444
   CARD 10 ********* FIELD-1111 FIELD-4444
 2 CARD 11 ********* FIELD-2222 FIELD-5555
   CARD 12 ********* FIELD-2222 FIELD-5555
 3 CARD 13 ********* FIELD-3333 FIELD-66663
   CARD 14 ********* FIELD-3333 FIELD-66664
 4 CARD 15 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-6666
5
   CARD 16 *********FIELD-1111FIELD-2222FIELD-3333FIELD-4444FIELD-5555FIELD-6666
6




 1 CARD 17 ********* FIELD-1111 FIELD-4444
   CARD 18 ********* FIELD-1111 FIELD-4444



INTERVENTION REQUIRED AT 129, CORRECT PROBLEM AND PRESS 'READ' TO CONTINUE
```

IF THE CARDS ARE RE-INSERTED IN THE HOPPER AND 'READ' DEPRESSED AS DIRECTED IN THE MESSAGE, THE CARDS WILL READ AGAIN AND THE ABOVE PRINTOUT MINUS THE HEADING WILL BE REPEATED.

NOTE THAT A SPACE OF 5 BLANK LINES INDICATES THAT THE END OF THE 129 BUFFER LOAD WAS REACHED AND THAT A PF-10 WAS GENERATED BY THE 129 AT THIS TIME

5. GENERAL 3270 DISPLAY SYSTEM INFORMATION

5.1 CONTROL CHARACTERS

5.1.1 BSCA CONTROL CHARACTERS

NAME OF FUNCTION	FUNCTIONAL MNEMONIC	EBCDIC CODE
START OF HEADING	SOH	01
START OF TEXT	STX	02
END OF TRANSMISSION BLOCK	ETB	26
END OF TEXT	ETX	03
END OF TRANSMISSION	EOT	37 PAD
ENQUIRY	ENQ	2D
NEGATIVE ACKNOWLEDGE	NAK	3D PAD
SYNCHRONOUS IDLE	SYN	32
DATA LINK ESCAPE	DLE	10
END OF INTERMEDIATE TRANSMISSION BLOCK	ITB	1F
EVEN ACKNOWLEDGE	ACK0	1070
ODD ACKNOWLEDGE	ACK1	1061
WAIT BEFORE TRANSMIT POSITIVE ACK.	WACK	106B
MANDATORY DISCONNECT	DISC	1037
REVERSE INTERRUPT	RVI	107C
TEMPORARY TEXT DELAY	TTD	022D

NOTE: ** PAD IS 4 LOW-ORDER BITS OF 1'S (MORE BITS MAY OPTIONALLY BE ON)

5.1.2 3270 CONTROL CHARACTERS AND COMMAND CODES

THE FOLLOWING COMMANDS HAVE BEEN DEFINED FOR THE 3270 DISPLAY SYSTEM:

COMMAND	HEX	GRAPHIC
WRITE	F1	1
ERASE/WRITE	F5	5
READ BUFFER	F2	2
READ MODIFIED	F6	6
COPY	F7	7
ERASE ALL UNPROTECTED	6F	?

THE FOLLOWING CONTROL CHARACTERS ARE USED IN THE VARIOUS RFTS:

HEX	DEFINITION
60	PROTECTED, NORMAL INTENSITY
6C	PROTECTED, NON DISPLAY
E8	PROTECTED, HIGH INTENSITY, SELECTOR PEN
F8	PROTECTED, HIGH INTENSITY, AUTO SKIP
E4	PROTECTED, NORMAL INTENSITY, SELECTOR PEN
40	UNPROTECTED, NORMAL INTENSITY
C8	UNPROTECTED, HIGH INTENSITY
D8	UNPROTECTED, HIGH INTENSITY, NUMERIC
4C	NON DISPLAY, NON PRINT, NON DETECTABLE

5.1.3 VALID 3270 CONTROL UNIT AND DISPLAY STATION ADDRESSES

40 IS ALWAYS CUA FOR POLL.
60 IS ALWAYS CUA FOR SELECT.

DEVICE NUMBER	DEVICE ADDRESS	DEVICE NUMBER	DEVICE ADDRESS
0	40 (BLANK)	16	50 (&)
1	C1 (A)	17	D1 (J)
2	C2 (B)	18	D2 (K)
3	C3 (C)	19	D3 (L)
4	C4 (D)	20	D4 (M)
5	C5 (E)	21	D5 (N)
6	C6 (F)	22	D6 (O)
7	C7 (G)	23	D7 (P)
8	C8 (H)	24	D8 (Q)
9	C9 (I)	25	D9 (R)
10	4A (CENT SIGN)	26	5A (EXCLAMATION)
11	4B (.)	27	5B ($)
12	4C (<)	28	5C (*)
13	4D (()	29	5D ())
14	4E (+)		
15	4F (|)		

NOTE THE FOLLOWING WHEN USING THIS TABLE OF ADDRESSES:

1) THE ABOVE ADDRESS ARE ALL GIVEN IN HEX FOLLOWED BY THE GRAPHIC CHARACTER IN PARENTHESIS.
2) DEVICES ABOVE 4C ARE VALID ONLY ON A MOD-15.

5.2 STATUS BYTES 0 AND 1

5.2.1 DISPLAY STATION STATUS

THE FOLLOWING BITS ARE DEFINED FOR STATUS BYTES 0 AND 1 WHICH ARE RECEIVED FROM A DISPLAY STATION:

STATUS BYTE 0 BIT #		STATUS BYTE 1 BIT #	
0	SEE BELOW	0	SEE BELOW
1	ALWAYS 1	1	ALWAYS 1
2	RESERVED	2	COMMAND REJECT
3	RESERVED	3	INTERVENTION REQUIRED
4	DEVICE BUSY	4	EQUIPMENT CHECK
5	UNIT SPECIFY	5	DATA CHECK
6	DEVICE END	6	CONTROL CHECK
7	NOT USED	7	OPERATION CHECK

BIT 0 IS A 0 OR A 1 AS REQUIRED TO FORM A VALID EBCDIC CHARACTER WITH BITS 1-7.

5.2.2 DA STATUS (SIMULATED BSCA-2 STATUS)

THE FOLLOWING IS THE BIT DEFINITION FOR A DA STATUS SENSE.

STATUS BYTE 0 BIT #		STATUS BYTE 1 BIT #	
0	TIMEOUT	0-5	NOT APPLICABLE = 0
1	NOT APPLICABLE = 0	6	DATA SET READY (ALWAYS = 1)
2	ADAPTER CHECK ON TRANSMIT	7	NOT APPLICABLE = 0
3	ADAPTER CHECK ON RECEIVE		
4-7	NOT APPLICABLE = 0		

6.0 DIAGNOSTIC SECTION 80E - TERMINAL STATISTICS

6.1 SUMMARY

DIAGNOSTIC SECTION 80E DUMPS THE TERMINAL STATISTICS ACCUMULATED ON A CUSTOMER SYSTEM PACK. SINCE IT IS POSSIBLE TO IPL FROM EITHER DRIVE 1 OR DRIVE 3 ON A 5415 MODEL D WITH 3344'S ATTACHED, THERE ARE FOUR POSSIBLE SIMULATION AREAS WHERE TERMINAL HISTORY AND SDR TABLES CAN BE LOCATED.

6.2 OPERATION OF SECTION 80E

6.2.1 CALL IN SECTION 80E.

6.2.2 SENSE SWITCH OPTIONS. (TO BE TURNED ON BEFOFORE SETTING 'HA' HALT)

SSW 29 - PREVENT CLEARING OF TERMINAL STATISTICS AFTER PRINTOUT.

6.2.3 SENSE SWITCH OPTIONS. (TO BE TURNED ON AT THE 'H1' HALT)

SSW 2A - PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-F1.
SSW 2B - PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 2 FOR D1-R1.
SSW 2C - PRINT HISTORY AND SDF TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-F1.
SSW 2D - PRINT HISTORY AND SDR TABLE FROM VOLUME MOUNTED ON DRIVE 3 FOR D3-R1.
SSW 2E - ERAP DATA LOCATED ON 5444 F1.
SSW 2F - ERAP DATA LOCATED ON 3340 SIMULATED F1.

6.2.4 SAMPLE PRINTOUT:

```
*---- TERMINAL STATISTICS ----*

TERMINAL  UNSUCCESSFUL   SUCCESSFUL
ADDRESS  I/O OPERATIONS I/O OPERATIONS

4040C1C1        1               9
4040C2C2      256            4096
4040C3C3     4096           65536
4040C4C4    65535       429467295

TERMINAL STATISTICS DUMP COMPLETE
```

6.2.5 TERMINAL UNSUCCESSFUL I/O OPERATIONS ARE DECIMAL NUMBERS FROM 0 THROUGH 65,535 (HEX 'FFFF').

TERMINAL SUCCESSFUL I/O OPERATIONS ARE DECIMAL NUMBERS FROM 0 THROUGH 4,294,967,295 (HEX 'FFFFFFFF').

6.2.6 IF NO ERRORS ARE ENCOUNTERED, SECTION 80E TERMINATES WITH A HALT 'HE'.

- ******LAST PAGE****** -

1. PROGRAM DESCRIPTION

PROGRAM 'LDS' IS USED FOR LOADING THE 3340 ATTACHMENT CONTROL STORE FROM CARD OR DISKETTE INPUT. FOR CARD READERS, THE MICROCODE TO BE LOADED IS OBTAINED FROM THE 3340 DATA DECK 'FAO'.

2. OPERATING PROCEDURE

2.1 FOR CARD READERS:

A. ASSEMBLE CARD DECKS FOR READER BEING USED AS SHOWN BELOW.

READER	CARD DECKS REQUIRED (ASSEMBLE IN SEQUENCE LISTED)
MFCU	LDS, FAO
1442	FEO, LDS, FAO, ONE BLANK CARD
2560	FDO, LDS, FAO, TWO BLANK CARDS

B. PLACE DECKS IN READER (PRIMARY HOPPER) AND MAKE READY READY.

C. SET PROGRAM LOAD SELECTOR SWITCH TO 'ALTERNATE' POSITION AND DEPRESS THE PROGRAM LOAD KEY.

D. CARD DECKS SHOULD BE READ AND THE PROGRAM SHOULD RUN BRIEFLY. 'EE' HALT IDENTIFER INDICATES THAT CONTROL STORE HAS BEEN SUCCESSFULLY LOADED. SEE SECTION 3 BELOW IF OTHER HALTS OCCUR.

2.2 FOR DISKETTE:

A. INSERT DISKETTE #2 INTO 3741.

B. 'REC ADV' TO LDS HEADER. —

C. PLACE 3741 ON-LINE, OUTPUT MODE (TYPE '41' INTO COL 1 & 2, PRESS UPPER 'FUNCT SEL' AND 'OUTPUT FROM 3741').

D. SET PROGRAM LOAD SELECTOR SWITCH TO 'ALTERNATE' POSITION AND DEPRESS THE PROGRAM LOAD KEY.

E. DISKETTE RECORDS SHOULD BE READ AND THE PROGRAM SHOULD RUN BRIEFLY. 'EE' HALT IDENTIFIER INDICATES THAT CONTROL STORE HAS BEEN SUCCESSFULLY LOADED. SEE SECTION 3 BELOW IF OTHER HALTS OCCUR.

3. HALT IDENTIFIER DESCRIPTIONS

HALT	CONDITION AND RECOVERY ACTION
EE	3340 ATTACHMENT MICROCODE HAS BEEN SUCCESSFULLY LOADED. NO ERRORS WERE DETECTED.
H5	1. IF THIS HALT OCCURS ON 80 COLUMN CARD READER WHEN HOPPER EMPTIES, MAKE READER READY AND RESET HALT. 2. OTHERWISE CLEAR LOADER AND RELOAD PROGRAM.
01	INCORRECT DECK IDENTIFIER FOUND WHILE READING DECK 'FAO'. IDENTIFIER (FAO) IS PUNCHED IN COLUMNS 89-91 OF 96 COLUMN CARDS AND IN COLUMNS 73-75 OF 80 COLUMN CARDS. CORRECT THE DECK AND RESET THE HALT TO RETRY. (NOTE-1)
02	CARDS OUT OF SEQUENCE IN DATA DECK 'FAO'. SEQUENCE NUMBER IS PUNCHED IN COLUMNS 94-96 OF 96 COLUMN CARDS AND IN COLUMNS 78-80 OF 80 COLUMN CARDS. CORRECT THE DECK AND RESET THE HALT TO RETRY. (NOTE-1)
03	3340 ATTACHMENT CONTROL STORE ERROR DETECTED. RESET THE HALT TO RETRY.
04	3340 ATTACHMENT ERROR DETECTED. RESET THE HALT TO RETRY.

NOTE-1: IF THIS HALT OCCURS, WHILE LOADING FROM 3741, TRY RE-LOADING PROGRAM. IF HALT RE-OCCURS, RUN 3741 DIAGNOSTICS, REPLACE DISKETTE.

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1. GENERAL PROGRAM SUMMARY

1.1 PROGRAM DESCRIPTION

1.1.1 UTILITY PROGRAMS DD6, DD9, AND FC2

SECTION	ROUTINE	INTENT	APPLICABLE SENSE SWITCHES
DD6- 3340 CE DISK EDITOR	01	THIS PROGRAM CONSISTS OF JUST ONE ROUTINE WHICH WILL PERFORM VARIOUS EDIT FUNCTIONS AS SPECIFIED VIA CONTROL RECORDS OR VIA THE 3277 KEYBOARD.	17,18 19,1A 22,23 24
DD9- 3340 CE DATA MODULE INITIALIZER	01	THE 3340 INITIALIZER PROGRAM CONSISTS OF ONE ROUTINE WHICH WILL FORMAT EACH CYLINDER AND HEAD ON A 3340 DATA MODULE. THE FORMATTING PROCEDURE CONSISTS OF THE FOLLOWING STEPS: A. READ HA-RO COUNT EVEN AND DETERMINE THAT IT IS NOT DEFECTIVE. B. READ HA-RO COUNT ODD AND DETERMINE THAT IT IS NOT DEFECTIVE. C. IF THERE ARE NO DEFECTS ON EITHER HALF TRACK, THEN THE TRACK IS FORMATTED FOR 48 RECORDS (EACH RECORD IS 256 BYTES OF X'40'). D. IF EITHER HALF TRACK IS DEFECTIVE, THE FOLLOWING STEPS ARE USED: 1. READ HA-RO COUNT EVEN OF THE CURRECT AVAILABLE ALTERNATE AND DETERMINE IF DEFECTIVE. 2. READ HA-RO COUNT ODD OF THE CURRECT AVAILABLE ALTERNATE AND DETERMINE IF DEFECTIVE. 3. IF NO DEFECTS ON EITHER HALF TRACK, THEN IT IS FORMATTED WITH 48 RECORDS AS THE ALTERNATE FOR THE ORIGINAL DEFECTIVE TRACK. 4. IF EITHER IS DEFECTIVE, A SEEK TO THE NEXT ALTERNATE IS PERFORMED--THEN GO TO STEP 1. NOTE THAT CYLINDER 0 HEAD 0 THROUGH CYLINDER 33 (DECIMAL) HEAD 19 ARE INITIALIZED. CYLINDER 34 HEAD 0 THROUGH CYLINDER 0 HEAD 7 ARE USED AS ALTERNATES.	12 14 21 22 23 24
FC2- 3340 IPL FORMAT PROGRAM	01	THIS PROGRAM CONSISTS OF ONE ROUTINE WHICH IS USED TO FORMAT CYLINDER 0 OF A 3340 DATA MODULE (EITHER CE OR CUSTOMER) SO THAT THE DATA MODULE MAY BE IPL'ED. THE THREE PROGRAMS WHICH ARE REQUIRED ON CYLINDER 0 ARE FA0 (3340 FUNCTIONAL MICRO-CODE), FA6 (3340 MINI MICRO LOADER), AND FA7 (3340 IPL LOADER). PROGRAM FC2 MAY BE LOADED EITHER FROM DISK, CARDS, OR DISKETTE. THREE CASES WILL BE COVERED IN SECTIONS 1.1.8 AND 1.1.9. THE 3277 MICRO-CODE MUST BE LOADED BECAUSE THE CRT/KEYBOARD IS USED FOR INPUT. THE DATA MODULE TO BE UPDATED MUST BE INITIALIZED CORRECTLY (AT LEAST CYLINDER 0, HEADS 0, HEADS 0 AND 2) FOR SYSTEM/3.	

1.1.2 OPTIONS

SENSE SWITCH OPTIONS

SENSE SWITCH NUMBER	OPTION PROVIDED WHEN SENSE SWITCH IS ON	SECTIONS WHERE USED
12	PRINT CORRECT RESULTS DURING EACH READ HA-RO COUNT EVEN/ODD PASS.	DD9
14	REPEAT EACH READ HA-RO COUNT EVEN/ODD TEN TIMES WHEN THERE WAS NO ERROR DURING THE FIRST READ.	DD9
17	3741 USED AS INPUT DEVICE.	DD6
18	1442 USED AS INPUT DEVICE.	DD6
19	2560 USED AS INPUT DEVICE.	DD6
1A	MFCU USED AS INPUT DEVICE.	DD6
21	DRIVE 1 USED WHEN RUNNING.	DD9
22	DRIVE 2 USED WHEN RUNNING.	DD6,DD9
23	DRIVE 3 USED WHEN RUNNING.	DD6,DD9
24	DRIVE 4 USED WHEN RUNNING.	DD6,DD9

1.1.3 EDITOR INPUT DEVICES.

THE EDITOR (DD6) IS PROGRAMED TO ACCEPT INPUT RECORDS FROM MANY INPUT DEVICES. EACH INPUT RECORD IS BASED ON 96 BYTES.

INPUT DEVICE	MODEL USED ON	HOW TO USE
MFCU	5415 SEE 1.1.4 FOR MORE DETAILS	1. TURN ON SENSE SWITCH 1A. 2. PLACE ALL INPUT RECORDS IN THE PRIMARY HOPPER AND MAKE READY.
3741 DISKETTE	5415 SEE 1.1.4 FOR MORE DETAILS	1. TURN ON SENSE SWITCH 17. 2. INSERT DISKETTE INTO 3741. 3. 'REC ADV' TO INPUT DATA SET. 4. PLACE 3741 ON-LINE, OUTPUT MODE. (TYPE 41 IN COL 1 & 2, PRESS UPPER 'FUNCT SEL' AND 'OUTPUT FROM 3741')
1442	5415 SEE 1.1.4 FOR MORE DETAILS	1. TURN ON SENSE SWITCH 18. 2. INPUT RECORDS CAN BE 80 OR 96 BYTES IN LENGTH. IF THE INPUT RECORD IS IN COMPRESSED FORMAT, THEN USE ONE 80-COLUMN CARD PER RECORD. IF NOT, THEN YOU MUST USE TWO 80-COLUMN CARDS PER RECORD. THE FORMAT FOR EACH RECORD IS GIVEN BELOW. 80-BYTE RECORD: IN COLUMN 1 THRU 80, PLACE THE COMPRESSED FORMAT INPUT DATA. 96-BYTE RECORD: IN COLUMN 1 THRU 76 OF CARD 1 PLACE THE FIRST 76 BYTES OF DATA. PUNCH A CHARACTER X IN COL 77. IN COLUMN 1 THRU 20 OF CARD 2 PLACE THE LAST 20 BYTES(BYTES 77 THRU 96) OF DATA. 3. PLACE ALL INPUT RECORDS IN THE 1442 FOLLOWED BY TWO BLANK CARDS AND MAKE READY.
2560 80 COLUMN CARD RDR.	5415 SEE 1.1.4 FOR MORE DETAILS	1. TURN ON SENSE SWITCH 19. 2. INPUT RECORDS CAN BE 80 OR 96 BYTES IN LENGTH. IF THE INPUT RECORD IS IN COMPRESSED FORMAT THEN USE ONE 80-COLUMN CARD PER RECORD. IF NOT, THEN YOU MUST USE TWO 80-COLUMN CARDS PER RECORD. THE FORMAT FOR EACH RECORD IS GIVEN BELOW. 80-BYTE RECORD: IN COLUMN 1 THRU 80 PLACE THE COMPRESSED FORMAT INPUT DATA. 96-BYTE RECORD: IN COLUMN 1 THRU 76 OF CARD 1 PLACE THE FIRST 76 BYTES OF DATA. PUNCH A CHARACTER X IN COL 77. IN COLUMN 1 THRU 20 OF CARD 2 PLACE THE LAST 20 BYTES(BYTES 77 THRU 96) OF DATA. 3. PLACE ALL INPUT RECORDS IN THE 2560 FOLLOWED BY TWO BLANK CARDS AND MAKE READY.
3277 KEYBOARD/CRT	5415 SEE 1.1.5 FOR MORE DETAILS	1. IF SSW 17, 18, 19, OR 1A IS NOT ON, THE 3277 WILL BE USED FOR INPUT. 2. YOU CAN SWITCH BACK TO THE ALTERNATE LOADER BY TURNING SSW 17, 18, 19, OR 1A ON. 3. WHEN YOU HAVE FINISHED ENTERING THE INPUT RECORD, DEPRESS - ENTER - ON THE 3277. 4. IF A TYPING ERROR OCCURS WHILE INPUTTING A RECORD, USE THE - BKSP - KEY AND RE-ENTER THE OPTION.

1.1.4 CONTROL RECORD INPUT VIA CARDS ON THE 1442, 2560, OR MFCU OR VIA DISKETTE ON 3741.

SINCE PROGRAM DD6 HAS THE CAPABILITY TO PERFORM SEVERAL DIFFERENT FUNCTIONS, THESE FUNCTIONS MUST BE SELECTED BY THE CE AS THEY ARE NEEDED, BY THE USE OF CONTROL CARD INPUT RECORDS.

```
----------
  $ADD     1.1.4.1  ADD CONTROL RECORD
----------          COLUMN  1 2 3 4 5 THRU END OF RECORD
                            $ A D D  (BLANK)
                A.  ALL PROGRAM DECKS AND TAP DECKS FOLLOWING THE $ADD CARD WILL BE WRITTEN ON THE CE DISK IMMEDIATELY
                    FOLLOWING THE LAST EXISTING PROGRAM ON DISK.
                B.  THE $ADD FUNCTION WILL ADD THE NEW PROGRAM AND DELETE THE OLD PROGRAM FROM THE CE DISK.
                C.  MULTIPLE PROGRAMS CAN BE ADDED WITH ONE $ADD CONTROL CARD.

***********************************************************************************************
*                                                                                             *
*   SAMPLE PROCEDURE FOR ADDING OR RE-ADDING PROGRAMS TO THE CE DISK PACK BY ALTERNATE LOADER. *
*                                                                                             *
*                                                                                             *
* 1. PLACE CE DISK PACK ON DRIVE 1 AND MAKE DRIVE READY.                                      *
* 2. IPL AND LOAD THE DISK EDITOR ( DD6)  FROM DISK. RESET THE -HA- HALT.                     *
* 3. AT THE -F0- HALT, SELECT THE INPUT DEVICE BY TURNING ON A SSW:                           *
*       NO SWITCH = USE 3277 KEYBOARD/CRT   (CAN'T BE USED FOR $ADD).                         *
*       SSW 17 = USE 3741                                                                     *
*       SSW 18 = USE 1442                                                                     *
*       SSW 19 = USE 2560                                                                     *
*       SSW 1A = USE MFCU                                                                     *
* 4. WHEN LOADING FROM CARD READER:                                                           *
*    PLACE THE FOLLOWING CONTROL CARD AND YOUR PROGRAM DECKS IN THE PRIMARY HOPPER            *
*    AND MAKE IT READY.                                                                       *
*                                                                                             *
*      $ADD              (CONTROL CARD, MUST BE FIRST)                                        *
*       PROG 1 DECK                                                                           *
*       PROG 2 DECK                                                                           *
*        .                                                                                    *
*        .                                                                                    *
*        .                                                                                    *
*       PROG N DECK                                                                           *
*      $CMP     (OPTIONAL)  COMPRESS DISK SPACE                                               *
*      $LST     (OPTIONAL)  LIST PROGRAMS ON DISK                                             *
*      /*                   CAUSE -E1- HALT.                                                  *
*      /&                   CAUSE SECTION TERMINATED                                          *
*    WHEN LOADING FROM 3741:                                                                  *
*    'REC ADV' TO DESIRED PROGRAM HEADER. PLACE 3741 ON-LINE, OUPUT MODE. (TYPE '41' IN COL 1 & *
*    2, PRESS UPPER 'FUNCT SEL' AND 'OUTPUT FROM 3741')                                       *
*                                                                                             *
* 5. RESET THE HALT AND THE FOLLOWING WILL HAPPEN:                                            *
*    A. CARDS OR DISKETTE WILL BE READ AND PROGRAM(S) WILL BE PLACED ON THE PACK.             *
*    B. YOU WILL GET A LISTING OF THE PROGRAMS ON THE PACK FOLLOWED BY A -E1- HALT.           *
*    C. AFTER RESETTING THIS HALT, THE /& CARD WILL BE READ CAUSING THE PROGRAM TO TERMINATE. *
***********************************************************************************************

----------
  $CMP     1.1.4.2  CMP CONTROL RECORD
----------          COLUMN  1 2 3 4 5 THRU END OF RECORD
                            $ C M P  (BLANK)
                    IT IS RECOMMENDED THAT A $CMP BE PERFORMED ANYTIME PROGRAMS ARE BEING ADDED TO THE PACK SO THAT ALL
                    THE DEAD SPACE ON THE PACK MAY BE ELIMINATED.

                    THE $CMP FUNCTION SHOULD BE RUN WHEN EITHER THE NUMBER OF PROGRAM ENTRIES LEFT, OR THE SPACE AVAILABLE
                    FOR PROGRAMS APPROACHES ZERO.  THE $LST FUNCTION WILL GIVE YOU THESE VALUES.

                    AT MOST THERE ARE 768 PROGRAM ENTRIES, AND EACH PROGRAM ADDED WILL USE UP ONE OF THESE ENTRIES.

----------
  $DEL     1.1.4.3  DEL CONTROL RECORD
----------          COLUMN  1 2 3 4 5 6 7 8 9 10 11 12 THRU END OF RECORD
                            $ D E L X X X , X X X  AS MANY GROUPS OF ,XXX AS NEEDED
                    EACH PROGRAM THAT IS DEFINED  BY AN ID XXX WILL BE DELETED FROM THE CE DISK.
                    IF A PROGRAM IS NOT ON THE CE DISK, A MESSAGE IS PRINTED TELLING THE CE THAT
                    THE PROGRAM IS NOT ON DISK.

***********************************************************************************************
*                                                                                             *
*              SAMPLE PROCEDURE FOR DELETING PROGRAM(S) FROM THE CE PACK.                     *
*                                                                                             *
*   BY USE OF THE $DEL CONTROL CARD, UNWANTED PROGRAMS MAY BE DELETED FROM THE DISK.          *
*   SEE PARAGRAPH 1.1.4.3 FOR THE FORMAT OF THE $DEL CONTROL CARD.  AS MANY PROGRAM ID'S AS   *
*   DESIRED, (UP TO THE LIMIT OF THE CAPACITY OF THE CARD), MAY BE ENTERED ON ONE CARD PROVIDED *
*   THAT EACH ENTRY IS SEPARATED BY A COMMA (,).  ANOTHER METHOD OF MAKING MULTIPLE DELETIONS *
*   IS TO USE MULTIPLE $DEL CONTROL CARDS WITH A NEW CARD USED FOR EACH PROGRAM TO BE DELETED. *
*   IF A NEW PROGRAM ID LIST IS DESIRED AFTER ANY OF THE DELETIONS HAVE BEEN MADE, IT MAY BE  *
*   OBTAINED BY USE OF THE $LST CONTROL CARD.  USE A /* CONTROL CARD AFTER ALL OTHER $DEL AND *
*   $LST CONTROL CARDS HAVE BEEN ENTERED. THIS WILL CAUSE PROGRAM DD6 TO COME TO THE 'E1'     *
*   HALT SO THAT YOU CAN PREPARE FOR THE NEXT FUNCTION YOU WISH TO PERFORM.                   *
*                                                                                             *
*   SAMPLE INPUT TO DELETE PROGRAMS C81,D82,206, AND 205                                      *
*                                                                                             *
*     $DELC81,D82,206,205                                                                     *
*     $LST      (LIST PROGRAMS)                                                               *
*     /*        (CAUSES -E1- HALT)                                                            *
*     /&        (CAUSES SECTION TERMINATED)                                                   *
*                                                                                             *
*     'NOTE' $DEL IS NOT NEEDED WHEN USING $ADD, SINCE THE $ADD WILL AUTOMATICALLY            *
*            DELETE THE OLD PROGRAM(S).                                                       *
***********************************************************************************************

----------
  $LST     1.1.4.4  LST CONTROL RECORD
----------          COLUMN  1 2 3 4  5 THRU END OF RECORD
                            $ L S T   (BLANK)
                     THE ID OF EACH DIAGNOSTIC OR UTILITY PROGRAM RESIDING ON THE CE DISK WILL BE PRINTED ON THE SELECTED
                     OUTPUT DEVICE, ALONG WITH ITS PART NUMBER, EC AND DESCRIPTION. THE LAST STATMENT WILL TELL YOU HOW MANY
                     MORE ENTRIES AND PROGRAM SPACE ARE AVALIABLE.
              NOTE: CPU AND MEMORY TEST, FFA, FFB, AND FFF WILL BE LISTED IMMEDIATELY PRECEEDING THE LAST STATEMENT.

----------
  $DUP     1.1.4.5  DUP CONTROL RECORD
----------          COLUMN  1 2 3 4 5 6 7 8 9 10 THRU END OF RECORD
                            $ D U P   F F T T (BLANK)
                    THIS OPTION WILL ALLOW DUPLICATION OF THE CE PACK.
                     FF - FROM PACK
                     TT - TO PACK

                 DRIVE #       VALUE FOR FF OR TT
              ****************************************
              *     1      *          D1             *
              *     2      *          D2             *
              *     3      *          D3             *
              *     4      *          D4             *
              ****************************************
```

```
$REP      1.1.4.6  REP CONTROL RECORD
                   COLUMN  1 2 3 4 5 6 7 8 9 THRU END OF RECORD
                           $ R E P X X X (BLANK)      XXX = PROGRAM ID
                    THIS CONTROL RECORD IS THE FIRST ONE OF A SERIES THAT WILL ALLOW ENTRY OF 'REP' RECORDS FOLLOWING
                    IT. COLUMNS 5, 6, AND 7 MUST CONTAIN THE PROGRAM ID OF THE PROGRAM WHICH THE 'REP' RECORD WILL BE
                    ADDED.  THE TYPE OF RECORDS THAT CAN BE INPUTED ARE:
                      1. R        (REPLACE RECORD)
                      2. SSW      (SSW RECORD)
                      3. *        (COMMENT RECORD)
                     FOR THE FORMAT OF THE ABOVE RECORDS SEE BLOCK 10 OF THE USER GUIDE.
                    THE FINAL RECORD MUST CONSIST OF AN 'E' IN COLUMN 1, WHICH TERMINATE THIS OPTION.

                    ' CAUTION ' ONCE A REP RECORD IS WRITTEN ON DISK, IT CAN NOT BE DELETED.
```

```
             SAMPLE PROCEDURE TO ADD REPLACE CARDS TO A PROGRAM RESIDING ON THE CE DISK

   ANY PROGRAM RESIDING  ON THE CE DISK MAY HAVE REPLACE CARDS ADDED TO IT BY USING THE
   REQUIRED CONTROL CARDS IN ADDITION TO AS MANY STANDARD REPLACE CARDS AS ARE DESIRED.  THE
   FIRST CONTROL CARD REQUIRED IS A $REPXXX CARD, WHERE XXX IS THE ID OF THE PROGRAM ON THE
   DISK THAT YOU WISH TO ADD THE REPLACE CARDS TO.  THE SECOND CARD ENTERED IS A REPLACE CARD
   OF THE STANDARD FORMAT.  (SEE THE DCP USER'S GUIDE BLOCK 10 ENTITLED 'REPLACE CARDS' FOR THE
   FORMAT OF THESE CARDS.)  FOLLOW CARD 2 WITH OTHER REPLACE CARDS IF DESIRED. AFTER
   THE LAST REPLACE CARD, ENTER A CARD WITH A 'E' IN COLUMN 1.  FOLLOW THIS CARD WITH A /*
   CONTROL CARD.

  TO REP DCP, USE AN ID OF FFF.

  NOTE:  ALL SSW ENTRIES CAN BE REMOVED FROM A PROGRAM BY ENTERING A SSW RECORD
         WITH COLUMNS 4-80 BLANK AS SHOW IN THE EXAMPLE BELOW.

  SAMPLE INPUT FOR REP-ING DCP

    $REPFFF
    R ADDR XXXX...
    SSW                  (CAUSES ALL SSW ENTRIES TO BE REMOVED)
    * COMMENTS IF WANTED
    E
    /*

  SAMPLE INPUT FOR REP-ING OTHER PROGRAMS

    $REPC81              REPS C81
    R 0CD2 F31000        REPLACES THE INSTRUCTION STARTING AT CORE LOCATION 0CD2 WITH F31000
    * COMMENT IF WANTED
    SSW 1C,1D            TURNS SSW 1C AND 1D ON IN PROGRAM C81
    E                    (CAUSES REPS TO BE WRITTEN ON DISK)
    /*                   (CAUSES -E1- HALT)
    /&                   (CAUSES SECTION TERMINATED)
```

```
$CONFIG   1.1.4.7  CONFIG CONTROL RECORD
                   COLUMN   1 2 3 4 5 6 7 8 THRU END OF RECORD
                            $ C O N F I G  (BLANK)
                    THIS CONTROL RECORD IS THE FIRST ONE OF A SERIES THAT WILL ALLOW ENTRY OF 'CPU' , 'UDT' OR '// CHAIN'
                    RECORDS FOLLOWING IT. AS MANY 'CPU' , 'UDT' , OR  '// CHAIN' RECORDS MAY BE ENTERED AS NEEDED.
                    WHEN ALL ENTRIES HAVE BEEN MADE, A FINAL RECORD WITH AN 'E' IN COLUMN 1 WILL TERMINATE THIS OPTION.
```

```
               SAMPLE PROCEDURE TO CONFIGURE THE DCP RESIDING ON THE DISK

      THE SYSTEM CONFIGURATION AS DEFINED IN YOUR DCP BY THE CPU , UDT AND //CHAIN CARDS MAY BE
      CHANGED BY $CONFIG CONTROL CARD.  FOLLOWING THIS FIRST CONTROL CARD, ENTER AS MANY CARDS
      AS ARE REQUIRED TO PROPERLY CONFIGURE YOUR DCP.  THESE CARDS MAY BE 'CPU' , 'UDT' OR
      '// CHAIN' RECORDS (SEE DCP USERS GUIDE, BLOCK 10, FOR THE FORMAT).  AFTER THE LAST
      CONFIGURATION CARD, ENTER A CARD WITH AN -E- IN COLUMN 1, AND FOLLOW THIS WITH A /* CARD.

   SAMPLE INPUT TO CONFIGURE DCP

     $CONFIG
     UDT C1-4,E1,14,...
     CPU E,C000,0
     // CHAIN 048
     F1F2F3F4F5F6F7F8F9F07B7C61E2E3E4E5E6E7E8E9506B6C      1ST CHAIN IMAGE CARD COL 1-48
     D1D2D3D4D5D6D7D8D9605B5CC1C2C3C4C5C6C7C8C94E4B7D      2ND CHAIN IMAGE CARD COL 1-48
     E                         (THROUGH WITH CONFIGURATION)
     /*                        (CAUSES -E1- HALT)
     /&                        (SECTION TERMINATED)


      NOTE: AN  OPTION EXISTS TO CONFIGURE DCP WITH A CHAIN IMAGE OF 48 WITHOUT ENTERING
            CHAIN IMAGE CARDS. IT IS CALLED IN THE $CONFIG OPTION BY A '// CHAIN STD' RECORD.
            AN OPTION ALSO EXISTS WHICH ADDS DEVICES TO THE UDT TABLE WITHOUT RE-ENTERING
            PREVIOUS DEVICES.  IF A DEVICE ADDED BY THIS METHOD ALREADY IS CONTAINED IN THE
            UDT TABLE, ONLY THE LAST DEVICE ADDED WILL HAVE EFFECT.

   SAMPLE INPUT TO CONFIGURE DCP (USING '// CHAIN STD' AND UDTX)

     $CONFIG
     UDTXF0,20-289,...         (THESE OPTIONS ADDED TO EXISTING UDT)
     CPU E,C000,0
     // CHAIN STD              (NO CHAIN IMAGE CARDS NEEDED)
     E                         (THROUGH WITH CONFIGURATION)
     /*                        (CAUSES -E1- HALT)
     /&                        (SECTION TERMINATED)
```

```
 /*       1.1.4.8   /*  CONTROL RECORD
                   COLUMN 1 2 3 4 THRU END OF RECORD
                          / *   (BLANK)
                    THIS CONTROL RECORD WILL CAUSE THIS PROGRAM TO COME TO AN 'E1' HALT. WHEN THIS HALT IS RESET, THE
                    NEXT RECORD WILL BE READ FROM THE INPUT DEVICE.


 /&       1.1.4.9   /& CONTROL RECORD
                   COLUMN   1 2 3 4 THRU END OF RECORD
                            / &   (BLANK)
                    THIS CONTROL RECORD WILL CAUSE THIS PROGRAM TO TERMINATE OPERATION.
```

1.1.5. CONTROL RECORD INPUT VIA THE 3277 KEYBOARD/CRT

1.1.5.1 $CMP EXAMPLE

CE ENTERS $CMP ON INPUT LINE (LINE 10)

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE     *
* $CMP                                      *
*                                           *
*                  READY-DISK I/O ON D1     *
*                                           *
*********************************************
```

$CMP FUNCTION BEING PROCESSED
KEYBOARD IS LOCKED

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATEO OPERATION-        *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* YOUR SELECTION IS BEING PROCESSED         *
* $CMP                                      *
*                                           *
*                  KEYBOARD LOCKED          *
*                                           *
*********************************************
```

AFTER COMPRESS IS COMPLETED,
KEYBOARD IS READY FOR NEXT OPTION

1.1.5.2 $LST EXAMPLE

CE ENTERS $LST ON INPUT LINE (LINE 10)

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE     *
* $LST                                      *
*                                           *
*                  READY-DISK I/O ON D1     *
*                                           *
*********************************************
```

$LST FUNCTION BEING PROCESSED
KEYBOARD IS LOCKED

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* YOUR SELECTION IS BEING PROCESSED         *
* $LST                                      *
*                                           *
*                  KEYBOARD LOCKED          *
*                                           *
*********************************************
```

AFTER LIST FUNCTION IS COMPLETE,
KEYBOARD IS READY FOR NEXT OPTION

1.1.5.3 /& EXAMPLE

CE ENTERS /& ON INPUT LINE (LINE 10)

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE     *
* /&                                        *
*                                           *
*                  READY-DISK I/O ON D1     *
*                                           *
*********************************************
```

OPERATION TERMINATED

```
*********************************************
*                                           *
*                                           *
*                                           *
*                                           *
*                                           *
*                                           *
*                                           *
*                                           *
* SECTION TERMINATED                        *
*                                           *
*                                           *
*                                           *
*********************************************
```

1.1.5.4 $DEL EXAMPLE

CE ENTERS $DEL ON INPUT LINE (LINE 10)
TO DELETE PROGRAMS C81 AND D82

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE     *
* $DELC81,D82                               *
*                                           *
*                  READY-DISK I/O ON D1     *
*                                           *
*********************************************
```

$DEL FUNCTION BEING PROCESSED
KEYBOARD IS LOCKED

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* YOUR SELECTION IS BEING PROCESSED         *
* $DELC81,D82                               *
*                                           *
*                  KEYBOARD LOCKED          *
*                                           *
*********************************************
```

AFTER DELETE FUNCTION IS COMPLETE,
KEYBOARD IS READY FOR NEXT OPTION

1.1.5.5 $DUP EXAMPLE

CE ENTERS $DUP D3D2 ON INPUT LINE
(LINE 10) TO COPY D3 TO D2

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE     *
* $DUP D3D2                                 *
*                                           *
*                  READY DISK I/O ON D1     *
*                                           *
*********************************************
```

$DUP FUNCTION BEING PROCESSED
KEYBOARD IS LOCKED

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* YOUR SELECTION IS BEING PROCESSED         *
* $DUP D3D2                                 *
*                                           *
*                  KEYBOARD LOCKED          *
*                                           *
*********************************************
```

AFTER DUP FUNCTION IS COMPLETE,
KEYBOARD IS READY FOR NEXT OPTION

1.1.5.6 $REP EXAMPLE

CE ENTERS $REP ON INPUT LINE (LINE 10)
TO ADD A COMMENT CARD TO PROGRAM C81

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE     *
* $REPC81                                   *
*                                           *
*              READY-DISK I/O ON D1         *
*                                           *
*********************************************
```

CE ADDS A COMMENT RECORD TO PGM C81

```
*********************************************
*                                           *
* ENTER ONE REPLACE RECORD        $REPC81   *
* THE FOLLOWING ARE EXAMPLES:               *
* * ...      (ADD THE DESIRED COMMENT)      *
* R XXXX XXXXXX                             *
* SSW 1C,1D      (TURNS ON SSW 1C AND 1D)   *
* E    (CAUSES REPS TO BE WRITTEN ON DISK)  *
* X        (RETURN TO THE MAIN OPTION MENU) *
*                                           *
*                                           *
* * SET SENSE SWITCH 16 ON TO USE THE CONS* *
* OLE SWITCHES FOR INPUT RATHER THAN THE 3* *
* 277 FOR INPUT. READY-DISK I/O ON D1       *
*                                           *
*********************************************
```

CE ENTERS E TO WRITE COMMENT ON DISK

```
*********************************************
*                                           *
* ENTER ONE REPLACE RECORD        $REPC81   *
* THE FOLLOWING ARE EXAMPLES:               *
* *          (ADD THE DESIRED COMMENT)      *
* R XXXX XXXXXX                             *
* SSW 1C,1D      (TURNS ON SSW 1C AND 1D)   *
* E    (CAUSES REPS TO BE WRITTEN ON DISK)  *
* X        (RETURN TO THE MAIN OPTION MENU) *
*                                           *
*                                           *
* E                                         *
*              READY-DISK I/O ON D1         *
*                                           *
*********************************************
```

AFTER COMMENT IS WRITTEN ON DISK,
KEYBOARD IS READY FOR NEXT OPTION

1.1.5.7 $REP EXAMPLE

CE ENTERS $REP ON INPUT LINE (LINE 10)
TO TURN SSW 1C AND 1D ON IN PGM C81

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE     *
* $REPC81                                   *
*                                           *
*              READY-DISK I/O ON D1         *
*                                           *
*********************************************
```

CE TURNS SSW 1C AND 1D ON IN PGM C81

```
*********************************************
*                                           *
* ENTER ONE REPLACE RECORD        $REPC81   *
* THE FOLLOWING ARE EXAMPLES:               *
* * ...      (ADD THE DESIRED COMMENT)      *
* R XXXX XXXXXX                             *
* SSW 1C,1D      (TURNS ON SSW 1C AND 1D)   *
* E    (CAUSES REPS TO BE WRITTEN ON DISK)  *
* X        (RETURN TO THE MAIN OPTION MENU) *
*                                           *
*                                           *
* SSW 1C,1D                                 *
*              READY-DISK I/O ON D1         *
*                                           *
*********************************************
```

CE ENTERS E TO WRITE RECORD ON DISK

```
*********************************************
*                                           *
* ENTER ONE REPLACE RECORD        $REPC81   *
* THE FOLLOWING ARE EXAMPLES:               *
* *          (ADD THE DESIRED COMMENT)      *
* R XXXX XXXXXX                             *
* SSW 1C,1D      (TURNS ON SSW 1C AND 1D)   *
* E    (CAUSES REPS TO BE WRITTEN ON DISK)  *
* X        (RETURN TO THE MAIN OPTION MENU) *
*                                           *
*                                           *
* E                                         *
*              READY-DISK I/O ON D1         *
*                                           *
*********************************************
```

AFTER RECORD IS WRITTEN ON DISK,
KEYBOARD IS READY FOR NEXT OPTION

NOTE: ALL SSW ENTRIES TO ANY PROGRAM
CAN BE REMOVED BY ENTERING A $REPXXX
RECORD IN THE MAIN OPTION MENU, AND A
SSW RECORD WITH COLUMNS 4-80 BLANK IN
THE FOLLOWING MENU.

1.1.5.8 $REP EXAMPLE

CE ENTERS $REP ON INPUT LINE (LINE 10)
TO CHANGE CORE IN PROGRAM C81

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE     *
* $REPC81                                   *
*                                           *
*              READY-DISK I/O ON D1         *
*                                           *
*********************************************
```

CE ALTERS CORE IN PROGRAM C81

```
*********************************************
*                                           *
* ENTER ONE REPLACE RECORD        $REPC81   *
* THE FOLLOWING ARE EXAMPLES:               *
* *          (ADD THE DESIRED COMMENT)      *
* R XXXX XXXXXX                             *
* SSW 1C,1D      (TURNS ON SSW 1C AND 1D)   *
* E    (CAUSES REPS TO BE WRITTEN ON DISK)  *
* X        (RETURN TO THE MAIN OPTION MENU) *
*                                           *
*                                           *
* R 0AF2 F31091                             *
*                                           *
*              READY-DISK I/O ON D1         *
*                                           *
*********************************************
```

CE ENTERS E TO WRITE REP RECORD ON DISK

```
*********************************************
*                                           *
* ENTER ONE REPLACE RECORD        $REPC81   *
* THE FOLLOWING ARE EXAMPLES:               *
* *          (ADD THE DESIRED COMMENT)      *
* R XXXX XXXXXX                             *
* SSW 1C,1D      (TURNS ON SSW 1C AND 1D)   *
* E    (CAUSES REPS TO BE WRITTEN ON DISK)  *
* X        (RETURN TO THE MAIN OPTION MENU) *
*                                           *
*                                           *
* E                                         *
*              READY DISK I/O ON D1         *
*                                           *
*********************************************
```

AFTER REP RECORD IS WRITTEN ON DISK,
KEYBOARD IS READY FOR NEXT OPTION.

1.1.5.9 $CONFIG EXAMPLE

EXAMPLE OF CE ENTERING $CONFIG TO
CONFIGURE THE CPU RECORD IN DCP

```
*********************************************
*                                           *
* ENTER ONE OF THE FOLLOWING OPTIONS:       *
* /&          -TERMINATE OPERATION-         *
* $CMP        -COMPRESS-                    *
* $CONFIG     -CONFIGURE-                   *
* $LST        -LIST-                        *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE   *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK   *
* $REPXXX     XXX= ID OF PROGRAM TO REP     *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE     *
* $CONFIG                                   *
*                                           *
*              READY-DISK I/O ON D1         *
*                                           *
*********************************************
```

CE CONFIGURES THE CPU RECORD IN DCP

```
*********************************************
*                                           *
* ENTER CONFIGURE RECORD, OPTIONS ARE:      *
* CPU ...       (EXAMPLE - CPU E,C000,0)    *
* UDT ...       (EXAMPLE - UDT C1-4,E1,..)  *
* UDTX...       (EXAMPLE - UDTX14,F0,...)   *
* // CHAIN 048 OR // CHAIN 120   OR         *
*           // CHAIN STD                    *
* X          (RETURN TO MAIN OPTION MENU)   *
*                                           *
*                                           *
* CPU E,C000,0                              *
*                                           *
*              READY-DISK I/O ON D1         *
*                                           *
*********************************************
```

CE RECEIVES MESSAGE REMINDING HIM THAT
AFTER CONFIGURING DCP, HE MUST RELOAD
DCP TO GET HIS CHANGES INTO STORAGE.
HE TYPES IN X TO RETURN TO MAIN MENU.

```
*********************************************
*                                           *
*  CONFIGURE CHANGES COMPLETE ON DISK.      *
*                                           *
*  YOU MUST IPL DCP TO PUT THEM IN EFFECT.  *
*                                           *
*   TYPE X AND DEPRESS ENTER TO RETURN      *
*      TO MAIN OPTION MENU.                 *
*                                           *
*                                           *
* X                                         *
*              READY-DISK I/O ON D1         *
*                                           *
*********************************************
```

AFTER CONFIGURE FUNCTION IS COMPLETE,
KEYBOARD IS READY FOR NEXT OPTION

1.1.6.1 $CONFIG EXAMPLE

EXAMPLE OF CE ENTERING $CONFIG TO
CONFIGURE THE UDT RECORD IN DCP

```
********************************************
*                                          *
* ENTER ONE OF THE FOLLOWING OPTIONS:      *
* /&          -TERMINATE OPERATION-        *
* $CMP        -COMPRESS-                   *
* $CONFIG     -CONFIGURE-                  *
* $LST        -LIST-                       *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE  *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK  *
* $REPXXX     XXX= ID OF PROGRAM TO REP    *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE    *
* $CONFIG                                  *
*                                          *
*              READY-DISK I/O ON D1        *
*                                          *
********************************************
```

CE CONFIGURES THE UDT RECORD IN DCP

```
********************************************
*                                          *
* ENTER CONFIGURE RECORD, OPTIONS ARE:     *
* CPU ...     (EXAMPLE - CPU E,C000,0)     *
* UDT ...     (EXAMPLE - UDT C1-4,E1,..)   *
* UDTX...     (EXAMPLE - UDTX14,F0,...)    *
* // CHAIN 048 OR // CHAIN 120    OR       *
*        // CHAIN STD                      *
* X        (RETURN TO MAIN OPTION MENU)    *
*                                          *
*                                          *
* UDT C1-4,E1,14,51                        *
*                                          *
*              READY-DISK I/O ON D1        *
*                                          *
********************************************
```

CE RECEIVES MESSAGE REMINDING HIM THAT
AFTER CONFIGURING DCP, HE MUST RELOAD
DCP TO GET HIS CHANGES INTO STORAGE.
HE TYPES IN X TO RETURN TO MAIN MENU.

```
********************************************
*                                          *
*  CONFIGURE CHANGES COMPLETE ON DISK.     *
*                                          *
*  YOU MUST IPL DCP TO PUT THEM IN EFFECT. *
*                                          *
*   TYPE X AND DEPRESS ENTER TO RETURN     *
*     TO MAIN OPTION MENU.                 *
*                                          *
*                                          *
* X                                        *
*              READY-DISK I/O ON D1        *
*                                          *
********************************************
```

AFTER CONFIGURE FUNCTION IS COMPLETE,
KEYBOARD IS READY FOR NEXT OPTION

1.1.6.2 $CONFIG EXAMPLE

EXAMPLE OF CE ENTERING $CONFIG TO
CONFIGURE THE UDT RECORD IN DCP

```
********************************************
*                                          *
* ENTER ONE OF THE FOLLOWING OPTIONS:      *
* /&          -TERMINATE OPERATION-        *
* $CMP        -COMPRESS-                   *
* $CONFIG     -CONFIGURE-                  *
* $LST        -LIST-                       *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE  *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK  *
* $REPXXX     XXX= ID OF PROGRAM TO REP    *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE    *
* $CONFIG                                  *
*                                          *
*              READY-DISK I/O ON D1        *
*                                          *
********************************************
```

CE CONFIGURES THE CHAIN IMAGE IN DCP

```
********************************************
*                                          *
* ENTER CONFIGURE RECORD, OPTIONS ARE:     *
* CPU ...     (EXAMPLE - CPU E,C000,0)     *
* UDT ...     (EXAMPLE - UDT C1-4,E1,..)   *
* UDTX...     (EXAMPLE - UDTX14,F0,...)    *
* // CHAIN 048 OR // CHAIN 120    OR       *
*        // CHAIN STD                      *
* X        (RETURN TO MAIN OPTION MENU)    *
*                                          *
*                                          *
* UDTXF0,20-289                            *
*                                          *
*              READY-DISK I/O ON D1        *
*                                          *
********************************************
```

CE RECEIVES MESSAGE REMINDING HIM THAT
AFTER CONFIGURING DCP, HE MUST RELOAD
DCP TO GET HIS CHANGES INTO STORAGE.
HE TYPES IN X TO RETURN TO MAIN MENU.

```
********************************************
*                                          *
*  CONFIGURE CHANGES COMPLETE ON DISK.     *
*                                          *
*  YOU MUST IPL DCP TO PUT THEM IN EFFECT. *
*                                          *
*   TYPE X AND DEPRESS ENTER TO RETURN     *
*     TO MAIN OPTION MENU.                 *
*                                          *
*                                          *
* X                                        *
*              READY-DISK I/O ON D1        *
*                                          *
********************************************
```

AFTER CONFIGURE FUNCTION IS COMPLETE,
KEYBOARD IS READY FOR NEXT OPTION

1.1.6.3 $CONFIG EXAMPLE

EXAMPLE OF CE ENTERING $CONFIG TO
CONFIGURE THE CHAIN IMAGE IN DCP.

```
*******************************************
*                                         *
* ENTER ONE OF THE FOLLOWING OPTIONS:     *
* /&          -TERMINATE OPERATION-       *
* $CMP        -COMPRESS-                  *
* $CONFIG     -CONFIGURE-                 *
* $LST        -LIST-                      *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK *
* $REPXXX     XXX= ID OF PROGRAM TO REP   *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE   *
* $CONFIG                                 *
*                                         *
*               READY-DISK I/O ON D1      *
*******************************************
```

CE CONFIGURES THE CHAIN IMAGE IN DCP

```
*******************************************
*                                         *
* ENTER CONFIGURE RECORD, OPTIONS ARE:    *
* CPU ...     (EXAMPLE - CPU E,C000,0)    *
* UDT ...     (EXAMPLE - UDT C1-4,E1,..)  *
* UDTX...     (EXAMPLE - UDTX14,F0,...)   *
* // CHAIN 048 OR // CHAIN 120   OR       *
*          // CHAIN STD                   *
* X        (RETURN TO MAIN OPTION MENU)   *
*                                         *
*                                         *
* // CHAIN STD                            *
*                                         *
*               READY-DISK I/O ON D1      *
*******************************************
```

CE RECEIVES MESSAGE REMINDING HIM THAT
AFTER CONFIGURING DCP, HE MUST RELOAD
DCP TO GET HIS CHANGES INTO STORAGE.
HE TYPES IN X TO RETURN TO MAIN MENU.

```
*******************************************
*                                         *
*  CONFIGURE CHANGES COMPLETE ON DISK.    *
*                                         *
*  YOU MUST IPL DCP TO PUT THEM IN EFFECT.*
*                                         *
*   TYPE X AND DEPRESS ENTER TO RETURN    *
*      TO MAIN OPTION MENU.               *
*                                         *
*                                         *
* X                                       *
*               READY-DISK I/O ON D1      *
*                                         *
*******************************************
```

AFTER CONFIGURE FUNCTION IS COMPLETE,
KEYBOARD IS READY FOR NEXT OPTION

1.1.6.4 $CONFIG EXAMPLE

EXAMPLE OF CE ENTERING $CONFIG TO
CONFIGURE THE CHAIN IMAGE IN DCP

```
*******************************************
*                                         *
* ENTER ONE OF THE FOLLOWING OPTIONS:     *
* /&          -TERMINATE OPERATION-       *
* $CMP        -COMPRESS-                  *
* $CONFIG     -CONFIGURE-                 *
* $LST        -LIST-                      *
* $DELXXX,XXX XXX= ID OF PGM(S) TO DELETE *
* $DUP FFTT   FF= FROM PACK , TT= TO PACK *
* $REPXXX     XXX= ID OF PROGRAM TO REP   *
* DEPRESS -ENTER- KEY TO INPUT RESPONSE   *
* $CONFIG                                 *
*                                         *
*               READY-DISK I/O ON D1      *
*                                         *
*******************************************
```

CE CONFIGURES THE CHAIN IMAGE IN DCP

```
*******************************************
*                                         *
* ENTER CONFIGURE RECORD, OPTIONS ARE:    *
* CPU ...     (EXAMPLE - CPU E,C000,0)    *
* UDT ...     (EXAMPLE - UDT C1-4,E1,..)  *
* UDTX...     (EXAMPLE - UDTX14,F0,...)   *
* // CHAIN 048 OR // CHAIN 120   OR       *
*          // CHAIN STD                   *
* X        (RETURN TO MAIN OPTION MENU)   *
*                                         *
*                                         *
* // CHAIN 048                            *
*                                         *
*               READY-DISK I/O ON D1      *
*                                         *
*******************************************
```

CE CONFIGURES THE 1ST CHAIN IMAGE
RECORD IN DCP

```
*******************************************
*                                         *
* ENTER CHAIN IMAGE CARD (48 HEX DIGITS)  *
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
* F1F2F3F4F5F6F7F8F9F07B7C61E2E3E4E5E6E7E8*
* E9506B6C                                *
*               READY-DISK I/O ON D1      *
*                                         *
*******************************************
```

CE CONFIGURES THE 2ND CHAIN IMAGE
RECORD IN DCP

```
*******************************************
*                                         *
* ENTER CHAIN IMAGE CARD (48 HEX DIGITS)  *
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
* D1D2D3D4D5D6D7D8D9605B5CC1C2C3C4C5C6C7C8*
* C94E4B7D                                *
*               READY-DISK I/O ON D1      *
*                                         *
*******************************************
```

CE RECEIVES MESSAGE REMINDING HIM THAT
AFTER CONFIGURING DCP, HE MUST RELOAD
DCP TO GET HIS CHANGES INTO STORAGE.
HE TYPES IN X TO RETURN TO MAIN MENU.

```
*******************************************
*                                         *
*  CONFIGURE CHANGES COMPLETE ON DISK.    *
*                                         *
*  YOU MUST IPL DCP TO PUT THEM IN EFFECT.*
*                                         *
*   TYPE X AND DEPRESS ENTER TO RETURN    *
*      TO MAIN OPTION MENU.               *
*                                         *
*                                         *
* X                                       *
*               READY-DISK I/O ON D1      *
*                                         *
*******************************************
```

AFTER CONFIGURE FUNCTION IS COMPLETE,
KEYBOARD IS READY FOR NEXT OPTION

1.1.7 CLEARING SSW RECORDS VIA $REP

A SSW RECORD WITH COLUMNS 4-80
BLANK, ENTERED VIA $REP, WILL
CLEAR ALL SSW ENTRIES TO THAT
PROGRAM. THIS OPTION APPLIES
TO DCP (PROGRAM FFF) AS WELL
AS ALL OTHER DIAGNOSTIC PROGRAMS.
AN EXAMPLE IS GIVEN IN 1.1.4.6

1.1.8 FORMATTING CYLINDER 0 FROM ALTERNATE LOADER

THE STEPS BELOW SHOULD BE FOLLOWED WHEN FORMATTING CYLINDER 0 FROM CARDS.

1. LOAD DCP AND 143/FC0 FROM ALTERNATE LOADER
2. LOAD FC2 FROM ALTERNATE LOADER
3. RESET THE 'HA' HALT
4. THE FOLLOWING DISPLAY WILL BE GIVEN

```
*******************************************
*                                         *
* THIS PROGRAM IS USED TO UPDATE CYL 0    *
* WITH 3340 MICRO-CODE(ID FA0), 3340 MINI *
* MICRO LOADER(ID FA6), AND THE 3340 IPL  *
* LOADER(ID FA7). THESE PROGRAMS RESIDE ON*
* THE CE DATA MODULE IN 2 LOCATIONS.      *
*     1-CYLINDER 0 (USED FOR IPL)         *
*     2-NORMAL PROGRAM AREA (USED BY THIS *
*       PROGRAM TO UPDATE CYLINDER 0 UNLESS*
*       RUNNING FROM ALTERNATE LOADER)    *
*                                         *
* PRESS ENTER TO CONTINUE                 *
*                                         *
*                                         *
*******************************************
```

5. PRESS -ENTER- KEY TO OBTAIN NEXT DISPLAY

```
*******************************************
*                                         *
* CE DATA MODULE MUST RESIDE ON D1. THE   *
* DATA MODULE TO BE UPDATED MAY RESIDE ON *
* D1,D2,D3 OR D4. CYL 0 IS UPDATED BY     *
* FA0, FA6, OR FA7 WHICH RESIDES IN THE   *
* NORMAL PROG AREA (OR CARDS OR DISKETTE),*
* NOT CYL 0 FROM THE CE DATA MODULE.      *
* ENTER D1,D2,D3, OR D4 FOR THE DRIVE WITH*
* THE DATA MODULE TO BE UPDATED. NOTE THAT*
* IF D1 IS SPECIFIED, CYL 0 ON THE CE DATA*
* MODULE WILL BE UPDATED.                 *
* D1<SELECT DRIVE AND PRESS ENTER         *
*                                         *
*                                         *
*******************************************
```

6. ENTER D1 AS INDICATED ABOVE AND RECEIVE NEXT DISPLAY

```
*******************************************
*                                         *
*  ENTER THE IDS(FA0, FA6, FA7) OF THE    *
*  PROGRAMS TO BE UPDATED. IF MORE THAN   *
*  ONE IS TO BE UPDATED, SEPARATE EACH    *
*  ENTRY BY A COMMA.                      *
*                                         *
* NOTE THAT IF FA0 IS SELECTED, PROGRAM   *
*  C17 IS USED IN THE UPDATE PROCESS.     *
*  THIS ALLOWS CONTROL STORE TO BE LOADED *
*  (ONLY WHEN RUNNING FROM ALT LOADER) IN *
*  ADDITION TO THE UPDATING OF FA0.       *
* FA0,FA7    <SELECT ID(S) & PRESS ENTER  *
*                                         *
*******************************************
```

7. ENTER FA0,FA7 AS INDICATED ABOVE AND FOLLOW DIRECTIONS AS THEY ARE OUTPUT ON THE PRINTER.

   WHEN THE PROGRAM TERMINATES, FA0 AND FA7 WILL HAVE BEEN ADDED TO CYLINDER 0.

NOTE 1: ANYTIME FA0, FA6, OR FA7 IS ADDED TO CYLINDER 0 (WHETHER FROM CARDS, DISKETTE OR DISK), CYLINDER 0, HEAD 0, RECORD 47 IS UPDATED WITH THE NEW EC NUMBER.

NOTE 2: IF FA0 REQUIRES PATCH (REP) CARDS THEY ARE PLACED IN PROGRAM C17. SEE BLOCK 28 FOR THIS PROCEDURE. FA6 CAN NOT BE PATCHED VIA REP CARDS. FA7 MAY BE PATCHED VIA REP CARDS USING DD6.

1.1.9 FORMATTING CYLINDER 0 FROM DISK

THE STEPS BELOW SHOULD BE FOLLOWED WHEN FORMATTING CYLINDER 0 FROM DISK.

1. LOAD DCP FROM DISK
2. LOAD FC2 FROM DISK
3. RESET THE 'HA' HALT
4. THE FOLLOWING DISPLAY WILL BE GIVEN

```
*******************************************
*                                         *
* THIS PROGRAM IS USED TO UPDATE CYL 0    *
* WITH 3340 MICRO-CODE(ID FA0), 3340 MINI *
* MICRO LOADER(ID FA6), AND THE 3340 IPL  *
* LOADER(ID FA7). THESE PROGRAMS RESIDE ON*
* THE CE DATA MODULE IN 2 LOCATIONS.      *
*     1-CYLINDER 0 (USED FOR IPL)         *
*     2-NORMAL PROGRAM AREA (USED BY THIS *
*       PROGRAM TO UPDATE CYLINDER 0 UNLESS*
*       RUNNING FROM ALTERNATE LOADER)    *
*                                         *
* PRESS ENTER TO CONTINUE                 *
*                                         *
*                                         *
*******************************************
```

5. PRESS -ENTER- KEY TO OBTAIN NEXT DISPLAY

```
*******************************************
*                                         *
* CE DATA MODULE MUST RESIDE ON D1. THE   *
* DATA MODULE TO BE UPDATED MAY RESIDE ON *
* D1,D2,D3 OR D4. CYL 0 IS UPDATED BY     *
* FA0, FA6 OR FA7 WHICH RESIDES IN THE    *
* NORMAL PROG AREA (OR CARDS OR DISKETTE),*
* NOT CYL 0 FROM THE CE DATA MODULE.      *
* ENTER D1,D2,D3, OR D4 FOR THE DRIVE WITH*
* THE DATA MODULE TO BE UPDATED. NOTE THAT*
* IF D1 IS SPECIFIED, CYL 0 ON THE CE DATA*
* MODULE WILL BE UPDATED.                 *
* D1<SELECT DRIVE AND PRESS ENTER         *
*                                         *
*                                         *
*******************************************
```

6. ENTER D1 AS INDICATED ABOVE AND RECEIVE NEXT DISPLAY

```
*******************************************
*                                         *
*  ENTER THE IDS(FA0, FA6, FA7) OF THE    *
*  PROGRAMS TO BE UPDATED. IF MORE THAN   *
*  ONE IS TO BE UPDATED, SEPARATE EACH    *
*  ENTRY BY A COMMA.                      *
*                                         *
* NOTE THAT IF FA0 IS SELECTED, PROGRAM   *
*  C17 IS USED IN THE UPDATE PROCESS.     *
*  THIS ALLOWS CONTROL STORE TO BE LOADED *
*  (ONLY WHEN RUNNING FROM ALT LOADER) IN *
*  ADDITION TO THE UPDATING OF FA0.       *
* FA0,FA7    <SELECT ID(S) & PRESS ENTER  *
*                                         *
*******************************************
```

7. ENTER FA0,FA7 AS INDICATED ABOVE AND PRESS ENTER TO OBTAIN THE NEXT DISPLAY.

```
*******************************************
*                                         *
* THE FOLLOWING PROGRAM(S) WILL BE UPDATED*
* VERIFY PROG ID AND LEVEL, AND EC LEVEL  *
* ** PRESS ENTER KEY TO INITIATE UPDATE * *
*  IPL TRACK      CE PACK DATA AREA       *
*  ID   OLD EC    ID    NEW EC            *
*  FA02 111111    FA03  222222            *
*  FA71 333333    FA72  444444            *
*                                         *
*                                         *
*                                         *
*                                         *
*******************************************
```

8. AFTER VERIFYING THE EC(S) ARE CORRECT PRESS -ENTER- TO OBTAIN NEXT DISPLAY.

```
*******************************************
*                                         *
* THE FOLLOWING PROGRAM(S) WILL BE UPDATED*
* VERIFY PROG ID AND LEVEL, AND EC LEVEL  *
* ** PRESS ENTER KEY TO INITIATE UPDATE * *
*  IPL TRACK      CE PACK DATA AREA       *
*  ID   OLD EC    ID    NEW EC            *
*  FA02 111111    FA03  222222            *
*  FA71 333333    FA72  444444            *
*                                         *
*                                         *
*                                         *
* DRIVE 1 IPL TRACK IS NOW BEING UPDATED  *
*                                         *
*******************************************
```

9. THE KEYBOARD WILL BE LOCKED DURING THE UPDATING--BEFORE THE PROGRAM TERMINATES, THE NEXT DISPLAY IS GIVEN

```
*******************************************
*                                         *
* THE FOLLOWING PROGRAM(S) WILL BE UPDATED*
* VERIFY PROG ID AND LEVEL, AND EC LEVEL  *
* ** PRESS ENTER KEY TO INITIATE UPDATE * *
*  IPL TRACK      CE PACK DATA AREA       *
*  ID   OLD EC    ID    NEW EC            *
*  FA02 111111    FA03  222222            *
*  FA71 333333    FA72  444444            *
*                                         *
*                                         *
*                                         *
*      SECTION TERMINATED                 *
*                                         *
*******************************************
```

FA0 AND FA7 HAVE NOW BEEN ADDED TO CYLINDER 0.

NOTE: WHEN UPDATING THE IPL TRACK, FC2 WILL COMPARE THE PROG ID'S DISPLAYED. IF THE PID TO BE WRITTEN ONTO THE IPL TRACK IS A LOWER LEVEL THAN THE PID ALREADY ON THE IPL TRACK, A WARNING WILL BE DISPLAYED. IF YOU PRESS THE ENTER KEY AT THIS POINT, YOU WILL IN FACT 'DOWN LEVEL' THE IPL TRACK. ARROWS WILL POINT TO THE PROGRAM(S) WHICH WILL BE DOWN LEVELED.

3. INDEX TABLE FOR HALTS AND PRINTOUTS

3.1 ERROR HALTS

3.1.1 ERROR HALTS FOR DD6

INDEX NUMBER 'XX'	MEANING OF HALT	SECTION WHERE USED
10	3277 MICROCODE NOT LOADED OR AN ERROR WAS DETECTED DURING A 3277 FUNCTION. IF THE ERROR CAN NOT BE CORRECTED, USE THE ALTERNATE LOADER) FOR THE INPUT DEVICE.	DD6
E0	A CONTROL CARD RECORD IS MISSING. (SEE PARAGRAPH 1.1.4.) CORRECT ERROR AND RESET HALT. (NOTE-1)	DD6
E1	THE EDITOR HAS REACHED A /* RECORD. RESET THE HALT AND THE EDITOR WILL CONTINUE OPERATING.	DD6
E2	THE PREVIOUS CONTROL CARD RECORD ENTERED IS INVALID. ENTER ANY OF THE CONTROL CARDS DESCRIBED IN SECTION 1.1.4 AND RESET HALT (NOTE-1)	DD6
E3	THE INPUT DECK HAS AN INVALID HEADER CARD. CORRECT HEADER CARD AND PUT CONTROL CARD AND REMAINING DECKS IN READER AND RESET HALT. (NOTE-1)	DD6
E4	THE INPUT DECK HAS AN INVALID SYSTEM TEST HEADER CARD. THE HEADER CARD IS INVALID IF: (1) EITHER COL'S 75 OR 82 ARE NON-BLANK, OR (2) COL'S 76 THROUGH 81 CONTAIN A BLANK. CORRECT HEADER CARD AND PUT CONTROL CARD AND REMAINING DECKS IN READER AND RESET HALT. (NOTE-1)	DD6
E5	AN INVALID INPUT RECORD HAS BEEN READ, THE CARD RECORD IS PRINTED ON THE PRINTER. CORRECT THE CARD AND CONTINUE READING BEGINNING WITH THAT CARD, OR REENTER RECORD IF USING DISPLAY. (NOTE-1)	DD6
E6	THE INPUT DECK IS OUT OF SEQUENCE. CLEAR CARD INPUT DEVICE AND BEGIN WITH THE CARD NUMBER SPECIFIED IN THE PRINTOUT AND RESET HALT. (NOTE-1)	DD6
E7	THE PROGRAM ID IN COLUMNS 89-92 OF THE INPUT DECK DOES NOT AGREE WITH THE ID FOUND IN PREVIOUS CARDS OF THIS INPUT DECK. CORRECT AND BEGIN WITH THE CARD NUMBER THAT WAS PREVIOUSLY IN ERROR AND RESET HALT. (NOTE-1)	DD6
E8	MORE THAN 256 BYTES HAVE BEEN ATTEMPTED TO BE ADDED TO PROGRAM FFA OR A CPU-MEMORY MODULE. CORRECT DECK AND TRY TO ADD THE PROGRAM AGAIN.	DD6
E9	A REP RECORD IS NOT FORMATTED CORRECTLY (SEE BLOCK 10 FOR CORRECT FORMAT). REPLACE RECORD AND CONTINUE BEGINNING WITH THAT RECORD.	DD6
EA	MISSING UDT AND/OR CPU RECORD IN FFF DECK. PROGRAM FFF HAS NOT BEEN ADDED. ADD CPU AND/OR UDT RECORD TO CARD DECK AND ADD PROGRAM AGAIN.	DD6
EB	INVALID CHAIN IMAGE CARD, CORRECT CARD AND RETRY OPERATION.	DD6
EC	THE ALTERNATE LOADER IS NOT READY OR HAD AN ERROR. CORRECT ERROR AND RESET. HALT.	DD6
ED	ERROR OCCURRED WHILE SCANNING VTOC. PRESS SYSTEM RESET, AND START, RETRY OPERATION.	DD6
EE	NOT ENOUGH SPACE LEFT TO ADD OR REP PROGRAM. DO A $CMP AND RETRY OPERATION.	DD6
EF	THE DATA MODULE ON THE SPECIFIED DRIVE IS NOT A 12 MBYTE ONE. VERIFY THAT THAT IS DESIRED AND PRESS START TO CONTINUE.	DD6
FC	3340 NOT READY OR UNIT CHECK. THE 24 BYTE DIAGNOSTIC READ IS PRINTED ON PRINTER. MAKE DEVICE READY OR CORRECT CHECK AND RETRY.	DD6
FE	A 3340 SIO INSTRUCTION HAS FAILED TEN TIMES. 24 BYTE DIAGNOSTIC READ IS PRINTED ON PRINTER.	DD6
FF	3340 ADAPTER CHECK. RELOAD ADAPTER MICROCODE AND RETRY OPERATION. IF ERROR PERSISTS RUN 3340 DIAGNOSTICS.	DD6

3.1.2 ERROR HALTS FOR DD9 AND FC2

01	NO SENSE SWITCH WAS SET FOR DRIVE SELECTION. RESET THE HALT AND FOLLOW DIRECTIONS.	DD9
01	FA7 NOT ON PACK--ADD IT TO THE PACK AND THEN RELOAD FC2.	FC2
02	BUSY TOO LONG AFTER A RECALIBRATE.	DD9
03	CYLINDER 0 HEAD 0 IS DEFECTIVE--DATA MODULE MUST BE REPAIRED.	DD9
04	NO MORE ALTERNATES ARE AVAILABLE--DATA MODULE MUST BE REPAIRED.	DD9
05	BUSY TOO LONG AFTER A SEEK.	DD9,FC2
06	ATTACHMENT BUSY TOO LONG.	DD9,FC2
07	MORE THAN ONE SENSE SWITCH WAS SET FOR DRIVE SELECTION. CORRECT THE ENTRY AND RESET THE HALT.	DD9
08	ADAPTER CHECK.	DD9,FC2
09	UNIT CHECK.	DD9,FC2
0A	NON UNIT CHECK 3340 STATUS ERROR.	DD9,FC2

NOTE-1: IF THIS HALT OCCURS WHILE LOADING FROM 3741, TRY RELOADING PROGRAM. IF HALT RE-OCCURS, RUN 3741 DIAGNOSTICS, REPLACE DISKETTE.

3.2 NON ERROR HALTS

3.2.1 NON ERROR HALTS FOR DD6

INDEX NUMBER 'XX'	MEANING OF HALT	SECTION WHERE USED
F0	DRIVE 1 WILL BE USED. TO USE DRIVES 2,3, OR 4, TURN ON SSW'S 22,23, OR 24, RESPECTIVELY.	DD6

3.2.2 NON ERROR HALTS FOR DD9

E1	SET SENSE SWITCHES 21, 22, 23, OR 24 TO SELECT DRIVES 1, 2, 3, OR 4. SET ONE SWITCH AND RESET THE HALT TO CONTINUE.	DD9
E2	DATA MODULE ON 3340 DRIVE X (1-4) WILL NOW BE INITIALIZED. RESET THIS HALT TO BEGIN INITIALIZATION.	DD9

3.2.3 NON ERROR HALTS FOR FC2

F1	PLACE C17 FOLLOWED BY FA0 IN ALTERNATE LOADER-RESET THE HALT PROGRAM C17 WILL DO THE LOADING OF FA0.	FC2
F2	PLACE FA6 IN ALTERNATE LOADER-RESET THE HALT.	FC2
F3	PLACE FA7 IN ALTERNATE LOADER-RESET THE HALT.	FC2
F4	NOTE: YOU ARE RUNNING FROM ALTERNATE LOADER. IF 3340 MICRO-CODE NOT LOADED, FA0 MUST BE UPDATED (WHICH CAUSES CONTROL STORE TO BE LOADED) BEFORE FA6 OR FA7 CAN BE UPDATED. IF 3340 MICRO-CODE IS LOADED, MUST RESET THIS HALT TO CONTINUE.	FC2

4.0 WORLD TRADE KEYBOARD NOTES FOR DD6

THERE WERE NO PROGRAM CHANGES REQUIRED IN PROGRAM DD6 FOR WORLD TRADE KEYBOARDS. HOWEVER, SINCE THE DOLLAR SIGN ($) IS NOT A UNIVERSAL CHARACTER ON ALL KEYBOARDS, CERTAIN CHANGES WILL BE REQUIRED WHEN ENTERING ITS REPLACEMENT CHARACTER FOR SUCH OPTIONS AS $CMP. OBSERVE THE FOLLOWING RULES:

A. WHEN USING THE UNITED STATES, FRENCH QWERTY, BELGIAN AZERTY, ITALY, OR GERMAN QWERTY, NO CHANGE IS REQUIRED--USE THE DOLLAR SIGN ($).

B. FOR THE UNITED KINGDOM KEYBOARD, USE THE ENGLISH POUND SIGN INSTEAD OF THE DOLLAR SIGN.

C. FOR THE AUSTRIA/GERMAN QWERTZ KEYBOARD, USE THE UPPER CASE OF THE 'U'-DIAERESIS ('U' WITH 2 PERIODS ABOVE IT) INSTEAD OF THE DOLLAR SIGN.

D. FOR THE BRAZIL/PORTUGAL KEYBOARD, USE THE UPPER CASE OF CRUZEIRO ('C'-SLASH) INSTEAD OF THE DOLLAR SIGN.

E. FOR THE DENMARK, NORWAY, OR SWEDISH-FINNISH KEYBOARDS, USE THE UPPER CASE KEY 'A' WITH ONE PERIOD ABOVE IT INSTEAD OF THE DOLLAR SIGN.

F. FOR THE SPANISH KEYBOARD, ENTER A PESETA (PT) INSTEAD OF THE DOLLAR SIGN.

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1. GENERAL DESCRIPTION

THE CPU AND MEMORY DIAGNOSTIC CONTAINS PROGRAMS NUMBERED HEXIDECIMALLY FROM D0 TO F5. THE CPU TESTS (D0-F1), DCP AND I/O LSR TESTS (FD6) CAN BE RUN EITHER FROM CARDS, DISK OR DISKETTE. THE MEMORY TESTS (F2-F5) CAN BE RUN ONLY FROM THE DISK.
THE PROGRAMS ARE CLASSIFIED AS FOLLOWS:

D0 THRU E7	BASIC CPU TESTS
E8 THRU F1	EXTENDED CPU TESTS
F2 AND F3	MEMORY TEST LOADER
F4 AND F5	FET MEMORY TESTS
FD6	I/O LSR FEATURE TESTS
FD7	FET MEMORY TEST PRINT PROGRAM

FOR DESCRIPTIONS OF INDIVIDUAL PROGRAMS SEE SECTION 4.

1.1 PROGRAM IDENTIFICATION (96 COLUMN CARDS)

THE PROGRAM NUMBER (ID) IS LOCATED (PUNCHED) IN COLUMNS 61 THRU 64 OF THE 96 COLUMN CARD. ALL DATA ON THE CARD, INCLUDING THE ID, IS IN THE IPL FORMAT. THE ID IS READ AS FOLLOWS:

COLUMN	CONTENTS	MEANING
61	0-F	SEQUENCING FOR MULTIPLE CARD PROGRAMS
62	0-F	REVISION LEVEL
63	0-F	TENS DIGIT OF PROGRAM NUMBER
64	0-F	UNITS DIGIT OF PROGRAM NUMBER

NOTE: THE REVISION LEVEL IS THE SECOND CHARACTER OF THE FOUR CHARACTER PROGRAM ID. THIS DIFFERS FROM THE STANDARD ID IN WHICH THE REVISION LEVEL IS THE FOURTH CHARACTER.

EXAMPLE: 0394 PUNCHED IN COLUMNS 61-64 IS READ AS THE FIRST CARD OF THE PROGRAM (0 IN 61), REVISION LEVEL 3 (3 IN 62), AND PROGRAM NUMBER 94 (94 IN 63-64). 1394 IN COLUMNS 61-64 INDICATES THAT THIS IS THE SECOND CARD OF PROGRAM 94.

THE PRINTING ON THE CARD COULD BE EITHER THE STRAIGHT INTERPRET OF THE PUNCHED DATA OR THE FORMATTED HEADINGS OBTAINED WITH THE 'DUP' PROGRAM (P/N 5558037). ASSUME THE SAME EXAMPLE AS ABOVE. ONLY THE TOP THIRD OF THE 96 COLUMN CARD IS REPRESENTED.

```
 ---------------DATA---------------   <-- COLUMN -->   094 LEVEL 3             IPL CARD
           11111111112222222222333    <-- NUMBER -->             11111111112222222222333
 12345678901234567890123456789012                      12345678901234567890123456789012

 ---------------DATA-----------0394                        CPU DIAGNOSTICS
 33333334444444444455555555556666     <-- COLUMN -->   33333334444444444455555555556666
 34567890123456789012345678901234     <-- NUMBER -->   34567890123456789012345678901234

 ------------C-D BITS-------------                     PN 5558790 EC 824829        0001
 66666777777777788888888889999999     <-- COLUMN -->   66666777777777788888888889999999
 56789012345678901234567890123456     <-- NUMBER -->   56789012345678901234567890123456

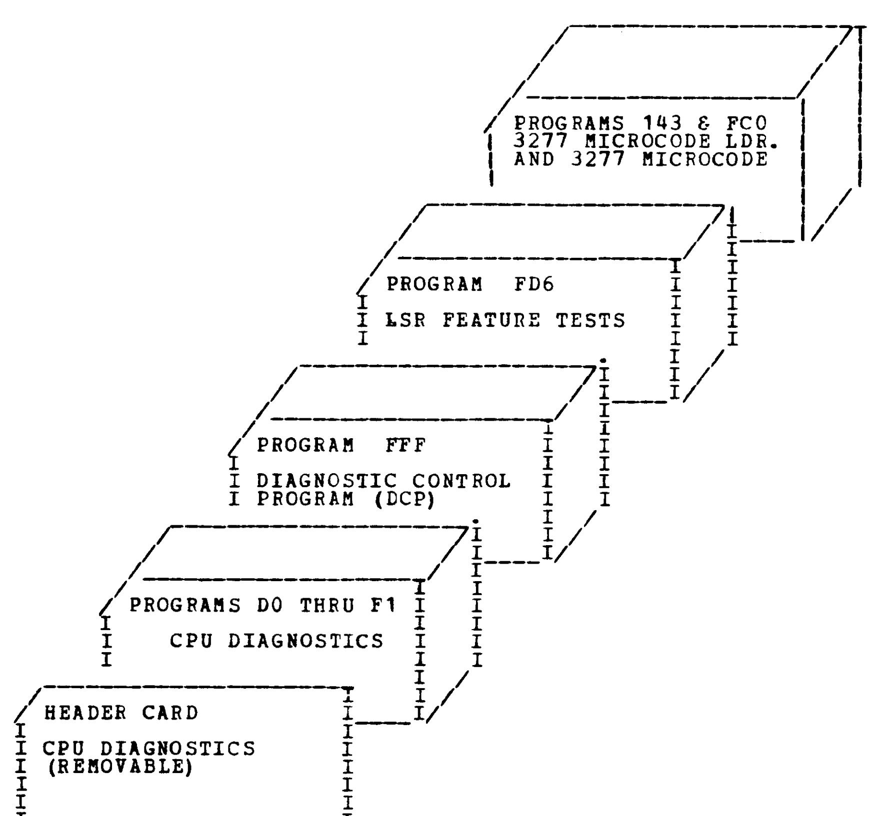
        STRAIGHT INTERPRETED PRINT                             FORMATTED PRINT
```

1.2 PROGRAM IDENTIFICATION (80 COLUMN CARDS)

COLUMN	MEANING
77	SEQUENCE NUMBER
78	REVISION LEVEL
79	TENS DIGIT OF PROGRAM NUMBER
80	UNITS DIGIT OF PROGRAM NUMBER

1.3 DECK CONFIGURATION

THE CPU DIAGNOSTIC DECK IS A STANDARD DECK SENT WITH ALL SYSTEMS AND IS DESIGNED TO TEST ALL AVAILABLE FEATURES.THE CONFIGURATION OF THE CPU DIAGNOSTIC DECK AS USED WITH THE OTHER DIAGNOSTIC PROGRAMS IS AS FOLLCWS:



2. GENERAL PROGRAM OPERATION

2.1 CPU DIAGNOSTICS FROM THE DISK

2.1.1 SETUP

FILL LOWEST 64K OF MAIN STORAGE WITH 'FE'.

SET CONSOLE SWITCHES TO 00FE (FAILURE TO LEAVE SWITCHES AT -00FE- WILL CAUSE -E5- HALTS)

2.1.2 LOADING

SET PROGRAM LOAD SELECTOR TO R1 (DISK 1 R1 ON MODEL D'S WITH 3344 FEATURE).
DEPRESS PROGRAM LOAD KEY

2.1.3 RUNNING

2.1.3.1 OPERATOR INTERVENTION

THE CPU TESTS REQUIRE OPERATOR INTERVENTION IN THE FOLLOWING ORDER:

1) SMALL -CC- HALT - OPERATOR SHOULD RESET HALT

2) 'LL' HALT - RESET HALT UNLESS HALTING BEFORE EXECUTION IS DESIRED.
FOR HALT PRIOR TO EXECUTION OF EACH PROGRAM, ENTER '00' AT HEX LOC '018E'
AND RESTART AT HEX LOC '0145'. SWITCHES SHOULD BE RESET TO 00FE.

3) CPU TEST COMPLETION
'8P' HALT - END OF CPU TEST/END OF MEMORY TESTS.
CAUTION: THE MEMORY PROGRAMS MAY BE SELECTED ONLY AT THE '8P' HALT.
IF THEY ARE NOT SELECTED HERE, DCP WILL BE LOADED.
REFER TO SECTION 2.3 TO RUN MEMORY DIAGNOSTICS.

2.1.3.2 FAILURES

ADDITIONAL INTERVENTION, HALTS, CHECKS, OR LOOPS, SHOULD BE INTERPRETED AS CPU OR I/O MALFUNCTIONS.

CPU TESTS HALT WITH THE PROGRAM NUMBER DISPLAYED IN THE HALT ID LIGHTS. REFER TO HALT INDEX, SEC. 3.1.

IF THE FAILURE IS A PROCESSOR CHECK, THE HALT ID MAY BE OBTAINED
BY THE FOLLOWING OPERATIONS:

DEPRESS SYSTEM RESET
DEPRESS START

THE HALT ID OF THE FAILING PROGRAM SHOULD BE DISPLAYED. ON CERTAIN FAILURES
ANOTHER PROC CHECK COULD OCCUR.

NOTE: PROCESSOR CHECK/INVALID Q AFTER RESET OF 8P HALT WHILE RUNNING FD6, SUSPECT INCORRECT DCP CONFIGURATION. (SEE SECTION 4.3.1)

2.1.3.3 LOOPING ON PROGRAM

IT IS POSSIBLE TO LOOP ON ANY CPU PROGRAM EXCEPT PROGRAMS E8-F5 USING THE FOLLOWING PROCEDURE:

1) IPL FROM THE CE PACK.
2) RESET THE SMALL 'CC' HALT.
3) WHEN 'LL' HALT APPEARS, PRESS SYSTEM RESET, ENTER '00' AT HEX LOCATION '018E'.
4) RESTART AT HEX LOCATION '0145'.
5) SET 00FE IN SWITCHES.
6) EACH PROGRAM WILL HALT WITH IT'S ID IN THE HALT LIGHTS PRIOR TO EXECUTION.
7) STEP THROUGH THE PROGRAMS BY RESETTING THE HALT UNTIL THE DESIRED ID APPEARS.
8) ENTER '87' AT HEX LOCATION '0179'.
9) PERFORM A SYSTEM RESET, START.
10) RESET THE HALT TO ALLOW PROGRAM EXECUTION LOOPING (INITIAL HALTS WILL NOT OCCUR).
11) TO TERMINATE LOOPING AND GO TO THE NEXT TEST:
    A) PRESS STOP.
    B) ENTER '80' AT HEX LOCATION '0179'.
    C) DO A SYSTEM RESET, START.
    D) GO TO STEP 5.
12) IT IS POSSIBLE AT ANY TIME TO START OVER BY GOING BACK TO STEP 1.

2.2 CPU DIAGNOSTICS FROM CARDS

2.2.1 SETUP

FILL LOWEST 64K OF MAIN STORAGE WITH 'FE'.

SET CONSOLE SWITCHES TO 00FE (FAILURE TO LEAVE SWITCHES AT -00FE- WILL CAUSE -E5- HALTS)
PLACE CPU DECK IN MFCU PRIMARY HOPPER
MAKE ALL DEVICES READY

2.2.2 LOADING

SET PROGRAM LOAD SELECTOR TO ALTERNATE.
DEPRESS PROGRAM LOAD KEY

2.2.3 RUNNING

2.2.3.1 OPERATOR INTERVENTION

THE CPU TESTS REQUIRE OPERATOR INTERVENTION IN THE FOLLOWING ORDER:
1) SMALL 'CC' HALT ON IPL - OPERATOR SHOULD RESET HALT
2) 'LL' HALT - OPERATOR SHOULD RESET HALT UNLESS HALT BEFORE EXECUTION IS DESIRED. FOR HALT BEFORE EXECUTION OF EACH PROGRAM, ENTER '00' AT HEX LOCATION '0072' AND RESTART AT HEX LOC '0073'. SWITCHES SHOULD BE RESET TO 00FE.
3) CPU TEST COMPLETION
'8P' HALT - END OF CPU TESTS. WITH DCP, FD6 AND 3277 MICROCODE IN HOPPER RESET HALT

2.2.3.2 FAILURES

ADDITIONAL INTERVENTION, HALTS, CHECKS, OR LOOPS, SHOULD BE INTERPRETED AS CPU OR I/O MALFUNCTIONS.

CPU TESTS HALT WITH THE PROGRAM NUMBER DISPLAYED IN THE HALT ID LIGHTS. REFER TO HALT INDEX, SEC. 3.1.

IF THE FAILURE IS A PROCESSOR CHECK, THE HALT ID MAY BE OBTAINED
BY THE FOLLOWING OPERATIONS:

DEPRESS SYSTEM RESET
DEPRESS START

THE HALT ID OF THE FAILING PROGRAM SHOULD BE DISPLAYED. ON CERTAIN FAILURES
ANOTHER PROC CHECK COULD OCCUR.

NOTE: PROCESSOR CHECK/INVALID Q AFTER RESET OF 8P HALT WHILE RUNNING FD6, SUSPECT INCORRECT DCP CONFIGURATION. (SEE SECTION 4.3.1)

2.2.3.3 LOOPING ON PROGRAM

IT IS POSSIBLE TO LOOP ON ANY CPU PROGRAM EXCEPT PROGRAMS E8 THRU F1 USING THE FOLLOWING PROCEDURE:

1) IPL FIRST CARD

2) RESET THE SMALL 'CC' HALT.
3) WHEN THE 'LL' HALT APPEARS, ENTER '00' AT HEX LOCATION '0072'.
4) RESTART AT LOCATION '0073'.
5) SET 00FE IN THE CONSOLE SWITCHES.
6) DEPRESS CPU START. EACH PROGRAM WILL HALT WITH IT'S ID IN THE HALT LIGHTS PRIOR TO EXECUTION.
7) STEP THROUGH THE PROGRAM BY RESETTING THE HALT UNTIL THE DESIRED ID APPEARS.
8) FOR PROGRAMS D0 THRU D9:
   ENTER 'C0 00 0003' AT HEX LOCATION '0060'.
   FOR PROGRAMS DA THRU F1:
   ENTER '0003' AT HEX LOCATION '0302'.
9) PERFORM A SYSTEM RESET, START.
10) RESET THE HALT TO ALLOW PROGRAM EXECUTION LOOPING (INITIAL HALTS WILL NOT OCCUR).
11) TO TERMINATE LOOPING AND GO TO THE NEXT TEST:
   A) PRESS CPU STOP.
   B) IF LOOPING ON A PROGRAM D0 THRU D9:
      ENTER '31 F5 0082' AT LOCATION '0060' IF THIS IS A 5424 SYSTEM.
      ENTER '31 F0 0054' AT LOCATION '0060' IF THIS IS A 2560 SYSTEM.
      ENTER '31 54 0054' AT LOCATION '0060' IF THIS IS A 1442 SYSTEM.
      IF LOOPING ON A PROGRAM DA THRU F1:
      ENTER '0307' AT LOCATION '0302'.
   C) DO A SYSTEM RESET, START.
   D) GO TO STEP 5.
12) IT IS POSSIBLE AT ANY TIME TO START OVER BY GOING BACK TO STEP 1.

2.3 CPU DIAGNOSTICS FROM DISKETTE

2.3.1 SETUP

FILL LOWEST 64K OF MAIN STORAGE WITH 'FE'.

SET CONSOLE SWITCHES TO 00FE (FAILURE TO LEAVE SWITCHES AT -00FE- WILL CAUSE -E5- HALTS)
INSERT DISKETTE #1 INTO 3741. PLACE 3741 ON-LINE, OUTPUT MODE (TYPE '41' IN COL 1 & 2, PRESS UPPER 'FUNCT SEL', AND 'OUTPUT FROM 3741').

2.3.2 LOADING

SET PROGRAM LOAD SELECTOR TO ALTERNATE.
DEPRESS PROGRAM LOAD KEY

2.3.3 RUNNING

2.3.3.1 OPERATOR INTERVENTION

THE CPU TESTS REQUIRE OPERATOR INTERVENTION IN THE FOLLOWING ORDER:
1) SMALL 'CC' HALT ON IPL - OPERATOR SHOULD RESET HALT
2) 'LL' HALT - OPERATOR SHOULD RESET HALT UNLESS HALT BEFORE EXECUTION IS DESIRED. FOR HALT BEFORE EXECUTION OF EACH PROGRAM, ENTER '00' AT HEX LOCATION '00C3' AND RESTART AT HEX LOC '00C4'. SWITCHES SHOULD BE RESET TO 00FE.
3) CPU TEST COMPLETION
   '8P' HALT - END OF CPU TESTS. RESET HALT.

2.3.3.2 FAILURES

ADDITIONAL INTERVENTION, HALTS, CHECKS, OR LOOPS, SHOULD BE INTERPRETED AS CPU OR I/O MALFUNCTIONS.

CPU TESTS HALT WITH THE PROGRAM NUMBER DISPLAYED IN THE HALT ID LIGHTS. REFER TO HALT INDEX, SEC. 3.1.

IF THE FAILURE IS A PROCESSOR CHECK, THE HALT ID MAY BE OBTAINED BY THE FOLLOWING OPERATIONS:

DEPRESS SYSTEM RESET
DEPRESS START

THE HALT ID OF THE FAILING PROGRAM SHOULD BE DISPLAYED. ON CERTAIN FAILURES ANOTHER PROC CHECK COULD OCCUR.

NOTE: PROCESSOR CHECK/INVALID Q AFTER RESET OF 8P HALT WHILE RUNNING FD6, SUSPECT INCORRECT DCP CONFIGURATION. (SEE SECTION 4.3.1)

2.3.3.3 LOOPING ON PROGRAM

IT IS POSSIBLE TO LOOP ON ANY CPU PROGRAM EXCEPT PROGRAMS E8 THRU F1 USING THE FOLLOWING PROCEDURE:

1) IPL FIRST RECORD

2) RESET THE SMALL 'CC' HALT.
3) WHEN THE 'LL' HALT APPEARS, PRESS SYSTEM RESET, ENTER '00' AT HEX LOCATION '00C3'.
4) RESTART AT LOCATION '00C4'.
5) SET 00FE IN THE CONSOLE SWITCHES.
6) DEPRESS CPU START. EACH PROGRAM WILL HALT WITH IT'S ID IN THE HALT LIGHTS PRIOR TO EXECUTION.
7) STEP THROUGH THE PROGRAM BY RESETTING THE HALT UNTIL THE DESIRED ID APPEARS.
8) FOR PROGRAMS D0 THRU D9:
   ENTER 'C0 00 0003' AT HEX LOCATION '0087'.
   FOR PROGRAMS DA THRU F1:
   ENTER 'C0 00 0003' AT HEX LOCATION '034F'.
9) PERFORM A SYSTEM RESET, START.
10) RESET THE HALT TO ALLOW PROGRAM EXECUTION LOOPING (INITIAL HALTS WILL NOT OCCUR).
11) TO TERMINATE LOOPING AND GO TO THE NEXT TEST:
   A) PRESS CPU STOP.
   B) IF LOOPING ON A PROGRAM D0 THRU D9:
      ENTER '30 43 00CC' AT LOCATION '0087'.
      IF LOOPING ON A PROGRAM DA THRU F1:
      ENTER '30 43 0391' AT LOCATION '034F'.
   C) DO A SYSTEM RESET, START.
   D) GO TO STEP 5.
12) IT IS POSSIBLE AT ANY TIME TO START OVER BY GOING BACK TO STEP 1.

2.4 FET MEMORY DIAGNOSTICS

THE MEMORY DIAGNOSTICS CONSIST OF PROGRAMS F2 - F5 WHOSE FUNCTIONS ARE DESCRIBED BELOW.

PROGRAM ID	FUNCTION TESTED
F2	8P HALT
F3	MEMORY TEST LOADER FOR PROGRAMS 'F4' AND 'F5'
F4	MEMORY TEST 24K-32K
F5	MEMORY TEST 0K-24K, 32K-48K OR 64K, 64K UP TO 256K, 256K UP TO 384K, 384K UP TO 512K, ATT FUNCTION TEST

2.4.1 SELECTION OF MEMORY DIAGNOSTICS

MEMORY DIAGNOSTICS CAN BE SELECTED BY SETTING THE DATA SWITCHES TO 'F3' BEFORE RESETTING THE '8P' HALT AT THE COMPLETION OF THE CPU TESTS. ALL TESTS WILL BE RUN CONSECUTIVELY. AN '8P' HALT WILL ALSO OCCUR AT THE COMPLETION OF THE MEMORY TESTS. AT THIS SECOND '8P' HALT REMOVE THE 'F3' FROM THE DATA SWITCHES SO THAT DCP MAY BE LOADED.

2.4.1.1 THE FUNCTIONS OF THE CONSOLE ADDRESS SWITCHES ARE:

SWITCH 1	SWITCH 2	SWITCH 3+4
1 TESTS TO 48K	0 SAVE STATISTICS	F3 TEST MEMORY
2 TESTS TO 64K	4 WAIT LOOP	XX LOAD DCP IF ANY OTHER ENTRY
4 TESTS TO 96K	(NOTE: SEE SECT	
8 TESTS TO 128K	4.2.3.1.B)	
9 TESTS TO 160K		
A TESTS TO 192K		
B TESTS TO 224K		
C TESTS TO 256K		
D TESTS TO 384K		
E TESTS TO 512K		

SWITCH #1 (THIS SWITCH DESIGNATES THE AMOUNT OF MEMORY TO BE TESTED.)

WHEN THE MEMORY DIAGNOSTICS ARE SELECTED TO BE RUN, THE AMOUNT OF MEMORY TO BE TESTED SHOULD BE ENTERED ON THE LEFTMOST ADDRESS SWITCH BEFORE RESETTING THE '8P' HALT.

SWITCHES #2, 3 AND 4.

THESE SWITCHES ARE USED TO CONTROL PROGRAMS F3 THRU F5 AND ARE RECOGNIZED BY THE PROGRAMS WHEN THE '8P' HALT IS RESET.

1) SET ADDRESS SWITCHES AS DESCRIBED BELOW TO THE DESIRED OPTIONS.
2) RESET THE HALT TO BEGIN EXECUTION OF THE PROGRAMS.

2.4.2 RUNNING

2.4.2.1 OPERATOR INTERVENTION

2.4.2.1.1 NORMAL RUNNING

THE MEMORY DIAGNOSTICS DO NOT REQUIRE OPERATOR INTERVENTION OTHER THAN SETTING UP OF THE SWITCHES.

2.4.2.1.2 MEMORY TEST COMPLETION

WHEN THE LAST MEMORY DIAGNOSTIC HAS BEEN COMPLETED '8P' WILL AGAIN APPEAR IN THE HALT INDICATOR LIGHTS. REMOVE THE 'F3' FROM THE RIGHT HAND TWO SWITCHES AND RESET THE HALT SO THAT DCP MAY BE LOADED.

2.4.2.1.3 RUNNING TIMES OF MEMORY DIAGNOSTICS

THE RUN TIME OF THE MEMORY DIAGNOSTIC F4 AND F5 IS VARIABLE. THE TIME WILL DEPEND ON THE NUMBER OF CORRECTABLE ERRORS BUT SHOULD NOT EXCEED 6 MINUTES.

2.4.2.2 FAILURES

MEMORY PROGRAMS HALT WITH A HALT ID THAT IDENTIFIES WHICH PROGRAM FAILED. THE IAR IDENTIFIES WHICH HALT OCCURED. EXCEPTION -- 'FA' CAN OCCUR IN PROGRAM 'F5'. (SEE HALT LIST 3.2)

THE FET MEMORY MAP-DIAGNOSTIC WILL ATTEMPT TO RUN THE MEMORY PROGRAM TO COMPLETION. THE MAP WILL GUIDE YOUR EFFORT TO BYPASS THE ERROR AND REACH THE 8P HALT AT THE END OF THE MEMORY PROGRAMS. THE RESULTS OF THE TESTS CAN BE PRINTED BY RUNNING PROGRAM FD7 (SEE FET MEMORY TEST PRINT PROGRAM FD7, SECTION 4.4)

3. HALT IDENTIFICATIONS

3.1 HALTS FOR BASIC CPU TESTS FROM DISK, CARDS, OR DISKETTE, SEE MAPS.

3.2 LSR (FD6) HALTS

NOTE THAT THE FOLLOWING TWO PROGRAMS (FD6 & FD7) RUN UNDER CONTROL OF DCP RATHER THAN STANDALONE.

FD6	HALT A0	LSR TEST BYPASSED (ONLY WHEN SSW04 ON AT IPL TIME)
FD6	HALT A1	LSR TEST LOADED (ONLY WHEN SSW04 ON AT IPL TIME)
FD6	HALT A2	LSR TEST COMPLETED (ONLY WHEN SSW04 ON AT IPL TIME)
FD6	HALT 01-9F	NOT ALL HALTS 01-9F CAN OCCUR FROM FD6. THOSE HALTS WHICH CAN OCCUR DEPEND ON WHICH DEVICES CAN BE TESTED BY FD6. ALL SUCH ERROR HALTS SHOULD BE ANALYZED USING THE MAPS.

3.3 MEMORY PRINT PROGRAM (FD7) HALTS

FD7	HALT D1	IF SSW10 IS ON, ENTER MEMORY SIZE--OTHERWISE JUST RESET HALT
FD7	HALT DF	DISK ERROR-RESET HALT TO RETRY

4. DESCRIPTION OF TESTS

4.1 CPU PROGRAMS

PROGRAM ID	DESCRIPTION OR TEST PERFORMED
D0	HPL, UNCONDITIONAL JUMP, LIO, SIO AND SNS INSTRUCTIONS TO THE LOAD DEVICE. A SMALL CC HALT WILL OCCUR AT ADDRESS 0000 IF THE IPL LOADED THE PROGRAM. RESETTING THE CC HALT WILL RESULT IN AN LL HALT WHICH INDICATES THAT THIS PROGRAM RAN PROPERLY AND THAT THE LOADER HAS BEEN LOADED. NOTE: IF A HALT IS DESIRED BEFORE EACH TEST IS EXECUTED REFER TO SEC 2.1.3.1 (DISK), OR SEC 2.2.3.1 (CARD) OR SEC 2.3.3.1 (DISKETTE). RESETTING THE LL HALT WITH 00FE IN THE ADDRESS SWITCHES WILL CAUSE EXECUTION OF ALL STANDARD CPU TESTS AND CONCLUDE WITH AN 8P HALT. AT THAT TIME, MEMORY TESTS OR DCP MAY BE SELECTED.
D1	LOADER FOR DISK THIS SECTOR IS READ INTO MEMORY LOCATION 00FD-01FD BY SECTOR 48. THIS SECTOR CONTAINS LOADERS FOR SECTORS 2,3,4,5,6,7 (CYL 1 HEAD 0) AND THE MASTER LOADER FOR SUCCEEDING SECTORS.
D1	LOADER FOR CARDS OR DISKETTE THIS LOADER IS FOR PROGRAMS D4 THRU D9 WHEN RUNNING FROM CARDS OR DISKETTE.
D2	NOT USED
D3	NOT USED
D4	BRANCH AND JUMP ON CONDITION
D5	LOAD REGISTER AND JUMP ON CONDITION
D6	LOAD REGISTER AND JUMP ON CONDITION
D7	COMPARE LOGICAL IMMEDIATE
D8	COMPARE LOGICAL IMMEDIATE
D9	MOVE LOGICAL IMMEDIATE
L1	LOADER FOR CARDS OR DISKETTE } L1 AND L2 ARE USED TO LOAD PROGRAMS DA THRU F1.
L2	LOADER FOR CARDS OR DISKETTE
DA	SET BITS ON TEST BITS ON SET AND TEST BITS OFF
DB	NOT USED
DC	LOAD AND STORE REGISTER LOAD, STORE, AND ADD REGISTER LOAD ADDRESS
DD	MOVE NUMERIC TO NUMERIC MOVE ZONE TO ZONE
DE	MOVE ZONE TO NUMERIC MOVE NUMERIC TO ZONE MOVE AND COMPARE LOGICAL CHARACTERS MOVE, ADD, SUBTRACT, AND COMPARE LOGICAL CHARACTERS
DF	ZERO AND ADD DECIMAL
E0	ADD DECIMAL ADD DECIMAL AND ZERO AND ADD DECIMAL SUBTRACT DECIMAL
E1	EDIT
E2	INSERT AND TEST CHARACTERS
E3	INDEXING
E4	INDEXING
E5	LOAD AND STORE REGISTER CHECK IF Q BIT STUCK DOWN SENSE CONSOLE DATA SWITCHES FIRST AND/OR SECOND INDEXED OP
E6	COMPARE LOGICAL IMMEDIATE COMPARE LOGICAL CHARACTERS ADD DECIMAL ADVANCE PROGRAM LEVEL
E7	LOAD AND SENSE I/O LSR'S, PRINTER
E8	LOAD AND STORE REGISTER CPU LSR DATA INTEGRITY TEST
E9	LOAD AND STORE REGISTER CPU ADDRESS DECODE TEST LOAD AND STORE CPU ATT DATA INTEGRITY TEST ATT ADDRESS DECODE TEST
EA	INITIALIZE INTERRUPT IARS AND PROGRAM LEVEL PMR SPECIAL LOADER FOR PROG EE
EB	LOAD CPU AND STORE CPU PMR DATA INTEGRITY TEST PMR ADDRESS DECODE TEST
EC	COMMAND CPU TEST INTERRUPT LEVEL 0 FUNCTION TEST PROGRAM LEVEL PMR DATA INTEGRITY
ED	LOAD CPU AND STORE CPU LOAD CURRENT PMR PROGRAM CHECK ADDRESS REGISTER AND PROGRAM CHECK STATUS REGISTER DATA INTEGRITY AND ADDRESS DECODE TEST
EE	PROGRAM CHECK INTERRUPT TEST STORAGE AND FETCH PROTECT
EF	INTERVAL TIMER DATA INTEGRITY (MOD D ALSO CHECKS CCP DIAGNOSTIC INSTRUCTION.) INTERVAL TIMER INTERRUPT TIMING TEST
F0	ATT FUNCTION TEST
F1	INTERRUPT PRIORITY AND QUEUING TEST INTERRUPT MASKING TEST

4.2 FET MEMORY PROGRAMS

4.2.1 PROGRAM 'F2'

UPON RESETTING THE '8P' HALT, THIS PROGRAM DECIDES WHETHER TO RUN MEMORY TESTS OR TO LOAD DCP AS SPECIFIED BY THE CONSOLE SWITCHES.

```
'XYF3'      RUN MEMORY TESTS  (LOAD PROGRAM 'F3')
'ZZZZ'      LOAD DCP

WHERE, X = MEMORY SIZE     (SEE SECTION 2.4.1.1)
       Y = MEMORY OPTIONS  (SEE SECTION 2.4.1.1)
       Z = ANY OTHER VALUES
```

4.2.2 PROGRAM 'F3'

PROGRAM 'F3' IS LOADED SINCE THE RIGHT-HAND TWO SWITCHES WERE SET TO 'F3'.

THE MEMORY SIZE AND MEMORY OPTIONS MUST BE SET IN THE LEFT-HAND TWO SWITCHES. THESE FUNCTIONS ARE NOW PERFORMED:

1) LOAD PROGRAM F4 INTO LOCATIONS 0000-02FF AND ALLOW IT TO EXECUTE AUTOMATICALLY. THEN, IT AUTOMATICALLY
2) LOADS PROGRAM F5 INTO LOCATIONS 6000-7D00 AND ALLOWS IT TO EXECUTE AUTOMATICALLY.

4.2.3 PROGRAM 'F4'

4.2.3.1 TESTS PERFORMED IN PROGRAM 'F4'

PROGRAM 'F4' TESTS ONLY THE 8K BLOCK OF MEMORY BETWEEN 24K AND 32K. THE STATISTICAL RESULTS OF THIS TEST (AND PROGRAM 'F5') ARE SAVED ON DISK (CYLINDER 01, HEAD 09, SECTORS 01,02 AND 03) SO THAT THEY MAY BE PRINTED BY FD7 (MEMORY PRINT PROGRAM). PROGRAM 'FD7' MAY BE RUN AFTER DCP HAS LOADED.

FOLLOWING TESTS ARE PERFORMED IN PROGRAM 'F4':

A. WRITE ONES
THIS ROUTINE WRITES ALL ONES (HEX 'FF') AND TESTS FOR MEMORY DATA CHECKS.

B. WAIT 1 MINUTE
THIS OPTIONAL ROUTINE TESTS FOR DATA RETENTION. (ONLY IF SWITCH 2 WAS SET TO 4-SEE 2.4.1.1)

C. READ AND WRITE COMPLIMENT
THIS ROUTINE TESTS THE ABILITY TO WRITE AND READ ONES AND ZEROS IN EACH CELL AND DETECT SINGLE BIT ADDRESS DECODE FAILURES. THIS ROUTINE ALSO INSURES THAT LOWER OR UPPER BYTE WILL BE REGENERATED.

D. ERRORS
THE FAILURES ARE COUNTED AND RECORDED SO THAT THEY MAY BE PRINTED BY 'FD7' AFTER DCP HAS LOADED. THE ERROR INFORMATION IS ORGANIZED BY 8K BLOCKS OF MEMORY AND BY BIT POSITION THUS ALLOWING CARD CALLOUTS BY THE MAP CHARTS.

E. WRITE AND READ ADDRESS DECODE TEST
THIS ROUTINE INSURES ADDRESSABILITY.

4.2.3.2 EXPLANATION OF LOADING & EXECUTION

```
*                    F4 FET MEMORY MAP                            *

MEMORY
LOCATION             FUNCTION
0000-----------------------------------------------------------------
                     F4 PROGRAM
02FF-----------------------------------------------------------------
0300-----------------------------------------------------------------
                     F3 PROGRAM (LOADER FOR PROGRAMS 'F4' & 'F5')
04D5-----------------------------------------------------------------
                     SAVE AREA FOR TABLE CREATED BY PROGRAM 'F4'
04FF-----------------------------------------------------------------
 * PROGRAM 'F4'
  * DOES NOTHING WITH
   * THIS SECTION OF MEMORY
6000-----------------------------------------------------------------
                     THIS 8K BLOCK IS TESTED BY PROGRAM 'F4'
7FFF-----------------------------------------------------------------
```

EXPLANATION OF PROGRAM 'F4' LOADING & EXECUTION

1 PROGRAM IS LOADED INTO 0000-02FF
2 LOCATIONS 6000-7FFF ARE TESTED
3 RESULTS ARE STORED IN A TABLE (04D5-04FF)
4 PROGRAM TERMINATES AND RETURNS TO THE LOADER (PROGRAM 'F3' RESIDING AT 0300-04D5) SO THAT PROGRAM 'F5' MAY BE LOADED

4.2.4 PROGRAM 'F5'

4.2.4.1 TESTS PERFORMED IN PROGRAM 'F5'

A. WRITE ONES
(SEE 4.2.3)

B. WAIT 1 MINUTE OPTION
(SEE 4.2.3)

C. READ AND WRITE COMPLIMENT
(SEE 4.2.3)

D. ERRORS
(SEE 4.2.3)

E. WRITE AND READ ADDRESS DECODE TEST
(SEE 4.2.3)

F. WRITE AND READ SHIFT ZERO
ENSURES THAT NO SHORTS EXIST BETWEEN DATA OR CHECK BIT LINES.

G. CORRECTABLE ERROR DETECTION TEST, UNCORRECTABLE ERROR DETECTION TEST
THE ERROR CORRECTION DETECTION ROUTINES ENSURE THAT SINGLE BIT ERRORS ARE DETECTED AND CORRECTED AND ALL DOUBLE BIT ERRORS ARE DETECTED.

H. ATT (ADDRESS TRANSLATE TABLE) TESTS
WRITE AND READ ADDRESS DECODE TEST PERFOMED IN ATT MODE PROVIDES AN ATT FUNCTION TEST.

4.2.4.2 EXPLANATION OF LOADING & EXECUTION

A. PROGRAM IS LOADED INTO 6000-7D00

B. TABLE CREATED BY PROGRAM 'F4' IS MOVED TO 7DC4-7DEF

C. LOCATIONS 0000-5FFF ARE TESTED

D. LOCATIONS 8000-BFFF ARE TESTED,
OR IF LARGER THAN 48K SYSTEM,
LOCATIONS 8000-FFFF ARE TESTED

E. ATT FUNCTION TEST IS PERFORMED

F. GO TO STEP 'G' IF ONLY 48K OR 64K SYSTEM,
OTHERWISE,
LOCATIONS 10000 - 17FFF ARE TESTED (96K SYSTEM)
OR
LOCATIONS 10000 - 1FFFF ARE TESTED (128K SYSTEM)

G. RESULTS FROM ABOVE TESTS ARE STORED IN A TABLE IN MEMORY (7520-77FF)

H. CONTENTS OF TABLE ARE WRITTEN ON CYLINDER 01, HEAD 09, SECTORS 01, 02 AND 03.

I. GO TO STEP T IF 48K, 64K, 96K, OR 128K SYSTEM.

J. CPU INSTRUCTIONS LCP AND SCP WITH Q-CODES 50-6F ARE CHECKED
FOR PROPER EXECUTION.

K. PMR BIT 0 (>128K) IS CHECKED FOR ALL PMR'S.

L. PROPER OPERATION OF PMR BIT 0 IS CHECKED WITH AN LIO.

M. LOCATIONS 20000-3FFFF (128K-256K) ARE TESTED (DEPENDING ON
STORAGE SIZE OF SYSTEM).

N. RESULTS FROM ABOVE TESTS ARE STORED IN A TABLE IN
MEMORY (7D20-7FFF) AND WRITTEN ON CYLINDER 01, HEAD 09,
SECTORS 04, 05, AND 06.

O. GO TO STEP T IF 160K, 192K, 224K, OR 256K SYSTEM.

P. PMR BIT 7, SECOND BYTE, (> 256K) IS CHECKED FOR ALL PMR'S.

Q. PROPER OPERATION OF PMR BIT 7, SECOND BYTE, IS CHECKED WITH AN LIO.

R. LOCATIONS 40000-7FFFF (256K-512K) ARE TESTED (DEPENDING ON
STORAGE SIZE OF SYSTEM).

S. RESULTS FROM ABOVE TESTS ARE STORED IN A TABLE IN
MEMORY (7D20-7FFF) AND WRITTEN ON CYLINDER 01, HEAD 09,
SECTORS 07, 08, 09, 0A, 0B, AND 0C

T. PROGRAM 'F2' IS RELOADED AND THE '8P' HALT IS GIVEN.

4.3 PROGRAM 'FD6' - I/O LSR TESTS

4.3.1 GENERAL PROGRAM DESCRIPTION

THIS PROGRAM IS RUN PRIOR TO LOADING THE 3270 MICRO CODE WHEN LOADING DCP. THE UDT TABLE IS USED TO DETERMINE THE LSRS TO BE TESTED. IF THE UDT IS PRESENT FOR AN UNINSTALLED DEVICE A PROCESS CHECK WILL OCCUR DUE TO THE DEVICE CONFIGURATION. SYSTEM RESET-START TO BYPASS THE TEST AND ALLOW CONFIGURATION CORRECTION.

OF COURSE THE PROGRAM CAN BE RUN AT ANY OTHER TIME JUST LIKE ANY OTHER DIAGNOSTIC BY SELECTING 'DFD6' IN THE SWITCHES AND EXECUTING THE PROGRAM.

FOLLOWING TESTS ARE PERFORMED ON EACH LSR:

A. DATA INTEGRITY TESTS

EACH I/O LSR IS TESTED WITH A LIST OF DATA PATTERNS AND LOADED WITH A UNIQUE CODE TO BE TESTED IN THE I/O LSR ADDRESS DECODE ROUTINE.

THE FOLLOWING DEVICE LSRS ARE TESTED BY PROGRAM 'FD6' (IF THEY ARE DEFINED AS BEING ATTACHED TO THE SYSTEM VIA UDTS.)

3277 CRT AND KEYBOARD
MLTA GENERAL ADAPTER
SIOC
2501 CARD READER
1442 CARD READ PUNCH
3410/3411 TAPE
BSCA 1
BSCA 2
5444 DISK
5445 DISK
1403 PRINTER
5424 MFCU
2560 MFCM
3340 DISK
BSCC
3741 WORK STATION

B. I/O LSR ADDRESS DECODE TEST

THE UNIQUE CODE THAT WAS LEFT IN EACH I/O LSR BY THE DATA INTEGRITY TEST IS CHECKED. THE MAP WILL GUIDE YOUR ANALYSIS OF THE DETECTED FAILURE.

4.3.2 PROGRAM HALTS

4.3.2.1 NON-ERROR HALTS

AN 'AX' HALT WILL OCCUR IF SSW04 (BYPASS NON-ERROR PRINTING) WAS ON WHILE DCP WAS BEING IPLED FROM THE 5444 OR 3340. THE HALTS HAVE THE FOLLOWING MEANINGS:

'A0' HALT--LSR TEST BYPASSED(INDICATES SYSTEM-RESET START WAS PERFORMED WHEN FD6 WAS RUN UNDER DCP AT IPL TIME.

'A1' HALT--FD6 LOADED

'A2' HALT--FD6 COMPLETED

4.3.2.2 ERROR HALTS

ALL ERROR HALTS WHICH OCCUR FROM THIS PROGRAM SHOULD BE ANALYZED BY THE CPU MAP CHARTS.

4.3.3 SENSE SWITCHES

THERE ARE NO PROGRAM SENSE SWITCHES APPLICABLE FOR THIS PROGRAM.

4.4 PROGRAM 'FD7' - MEMORY TEST PRINT PROGRAM

4.4.1 GENERAL PROGRAM DESCRIPTION

THIS PROGRAM RUNS UNDER CONTROL OF DCP. THE PROGRAM CONSISTS OF ONE ROUTINE WHICH IS USED TO PRINT OUT THE STATISTICS SAVED BY MEMORY PROGRAMS 'F4' AND 'F5'. THE STATISTICS ARE PRINTED IN TABULAR FORMAT AS DESCRIBED IN 4.4.4 AND 4.4.5.

THE MEMORY SIZE MUST BE CORRECTLY DEFINED VIA THE DCP CPU RECORD (SEE THE DCP USERS GUIDE, BLOCK 10, IF THERE ARE QUESTIONS) FOR THE PROGRAM TO RUN CORRECTLY. IF IT IS NOT CORRECT, THE TABULAR PRINTOUT DESCRIBED BELOW MAY CALL OUT THE WRONG CARDS.

THE PROGRAM ALWAYS GIVES THE TABULAR PRINTOUT FOR THE STAGE 2 MEMORY(NO CARD IN A-B4B2). IF THE PROGRAM IS USED ON SYSTEMS WITH THE STAGE 1 MEMORY(CARD IN LOCATION A-B4B2) SENSE SWITCH 11 MUST BE SET ON BEFORE THE PRINTOUT IS STARTED. IF THE MEMORY SIZE IS GREATER THAN 256K, PROGRAM FD7 AUTOMATICALLY GIVES THE CORRECT PRINTOUT.

4.4.2 PROGRAM HALTS

4.4.2.1 NON-ERROR HALTS

D1 - (LOWER CASE 'D')
EVERY TIME THE PROGRAM IS RESTARTED THIS HALT IS GIVEN. IT GIVES THE WARNING ABOUT THE MEMORY CONFIGURATION BEING CORRECT IN ORDER TO OBTAIN A VALID PRINTOUT. AT THIS TIME ANY SENSE SWITCHES MUST BE SET-OTHERWISE JUST RESET THE HALT.

4.4.2.2 ERROR HALTS

DF - (LOWER CASE 'D')
DISK ERROR - WHILE READING CYLINDER 01, HEAD 09, SECTORS 01,02 AND 03, A DISK ERROR HAS OCCURRED. RESET THE HALT TO RETRY THE OPERATION.

4.4.3 SENSE SWITCHES

THE FOLLOWING SENSE SWITCHES ARE USED BY PROGRAM FD7:

SSW # MEANING WHEN ON

SSW10 USE CONSOLE SWITCHES TO DEFINE MEMORY SIZE.

```
01XX  -  48K
02XX  -  64K
04XX  -  96K
08XX  - 128K
09XX  - 160K
0AXX  - 192K
0BXX  - 224K
0CXX  - 256K
0DXX  - 384K
0EXX  - 512K
```

THIS SWITCH SHOULD BE SET AT THE -D1- HALT. IT OVERRIDES THE DCP DEFINED MEMORY SIZE.

SSW11 FORCE THE STAGE 1 MEMORY PRINTOUT.
(PROGRAM NORMALLY PRINTS OUT FOR THE STAGE 2 MEMORY)
FOR A SYSTEM WITH STAGE 1 MEMORY, IT IS ADVISABLE TO INSERT A 'SSW 11' CARD INTO FD7. THIS WILL CAUSE SSW 11 TO ALWAYS BE SET ON WHEN FD7 IS LOADED. THIS CARD IS DESCRIBED IN DCP USER GUIDE. THE DISK EDITOR IS USED TO INSERT THE CARD ON DISK.

4.4.4 SAMPLE PRINTOUT--ORIGINAL CONFIGURATION (STAGE 1)

SAMPLE PRINTOUT

```
           ******  WARNING  ******  (1)
IF MEMORY CONFIGURATION IS INCORRECT, RESULTS WILL BE INVALID

PROGRAM DEFAULTS TO MEMORY SIZE AS CONFIGURED IN DCP
IF DEFAULT IS CORRECT, PRESS START TO CONTINUE   (2)
IF NOT CORRECT, SET SSW10 AND ENTER SIZE VIA CONSOLE SWITCHES 1 AND  2 AS FOLLOWS.        (3)
 01-48K  02-64K  04-96K  08-128K  09-160K  0A-192K  0B-224K  0C-256K
 0D-384K  0E-512K
                         SINGLE BIT ERROR ANALYSIS OF FET MEMORY TEST

                          ************************************
                          *   STAGE 1 MEMORY-CARD IN A-B4B2  *
                          ************************************

MEMORY SIZE  48K  (4)
ADDR BITS 7,0,1,2 (5)        SDBO  BITS 15-8   (6)         SDBO BITS 7-0             CHECK BITS C6-C1
 (9)  15  14  13  12  11  10   9   8   7   6   5   4   3   2   1   0  C6  C5  C4  C3  C2  C1
BOARD B4 (7)
0000  M4  N4  M4  N4  Q4  P4  Q4  P4  N2  M2  N2  M2  P2  Q2  P2  Q2  K2  K4  J4  K4  K2  J4
 (8)             (9)

0001  N4  M4  N4  M4  P4  Q4  P4  Q4  M2  N2  M2  N2  Q2  P2  Q2  P2  K4  K2  J4  K2  K4  J4

0010  F4  H4  F4  H4  Q4  P4  Q4  P4  H2  F2  H2  F2  P2  Q2  P2  Q2  L4  K4  J4  K4  L2  J4

0011  H4  F4  H4  F4  P4  Q4  P4  Q4  F2  H2  F2  H2  Q2  P2  Q2  P2  K4  L4  J4  L4  K4  J4

0100  M4  N4  M4  N4  F4  H4  F4  H4  N2  M2  N2  M2  H2  F2  H2  F2  K2  L4  J2  L4  K2  J2
                                     (10) 0200

0101  N4  M4  N4  M4  H4  F4  H4  F4  M2  N2  M2  N2  F2  H2  F2  H2  L4  K2  J2  K2  L4  J2
                                  0020
                             (11)  *

-----------------------------------------------------------------------------------------------

   (13)
THE FOLLOWING PRINTOUT IS SAME AS ABOVE EXCEPT ONLY THE ERRORS ARE INDICATED


MEMORY SIZE  48K  (4)
ADDR BITS 7,0,1,2 (5)        SDBO  BITS 15-8   (6)         SDBO BITS 7-0             CHECK BITS C6-C1
 (9)  15  14  13  12  11  10   9   8   7   6   5   4   3   2   1   0  C6  C5  C4  C3  C2  C1
BOARD B4 (7)
0000
 (8)

0001

0010

0011

0100                                         M2
                                     (10) 0200

0101                              H4
                                  0020
                             (11)  *

 NOTE: * INDICATES POSSIBLE SHORTED SENSE LINE,CELL ERROR OR SINGLE BIT ADDRESS DECODE ERROR.
      ALL ERROR COUNTS ARE IN HEX.
      THE MAP WILL GUIDE YOUR ANALYSIS OF THIS PRINTOUT


 ID FF00. PROG FD70-01.   (12)
 SECTION TERMINATED
```

NOTES:

(1) THE CONFIGURATION MUST BE CORRECT WHEN FD7 IS RUN OR THE PRINTOUT WILL BE INVALID BECAUSE EACH MEMORY SIZE HAS A DIFFERENT CHART.
(2) THE DCP MEMORY CONFIGURATION IS USED AS A DEFAULT.
(3) SSW10 CAN BE SET AT THE HA HALT OR D1 HALT.
(4) THE MEMORY SIZE SELECTED IS PRINTED.
(5) THE ADDRESS BITS REFER TO THE >64K BIT AND BITS 0,1 & 2 OF MEMORY ADDRESS
(6) BITS 15-8 ARE EVEN ADDRESSED BYTES AND BITS 7-0 ARE ODD ADDRESSED BYTES.
(7) B4 BOARD IS THE LOCATION OF BASIC MEMORY.
(8) THE ADDRESS BITS ARE GROUPED IN 8K BLOCKS. (SEE ITEM 5).
(9) THE CARD LOCATIONS ARE PRINTED UNDER EACH BIT POSITION.
(10) THE NUMBER PRINTED UNDER THE CARD LOCATION IS THE TOTAL NUMBER OF ERRORS IN HEX. THE FAILURE CAN BE A CELL ERROR, DATA RETENTION ERROR OR A SINGLE BIT ADDRESS DECODE FAILURE.
(11) THE ASTERISK INDICATES THAT THE BIT WAS NOT THE EXPECTED RESULT ON READ SHIFT ZERO TEST. (THE MAP PROVIDES ERROR ANALYSIS)
(12) NORMAL PROGRAM TERMINATION.
(13) A SECOND PRINTOUT IS GIVEN WHICH IS THE SAME AS THE FIRST EXCEPT ONLY THE ERRORS ARE GIVEN.

4.4.5 SAMPLE PRINTOUT--CONFIGURATION USING 8KX11 CARDS (STAGE II)

SAMPLE PRINTOUT

```
           ******  WARNING  ******  (1)
IF MEMORY CONFIGURATION IS INCORRECT, RESULTS WILL BE INVALID

PROGRAM DEFAULTS TO MEMORY SIZE AS CONFIGURED IN DCP
IF DEFAULT IS CORRECT, PRESS START TO CONTINUE   (2)
IF NOT CORRECT, SET SSW10 AND ENTER SIZE VIA CONSOLE SWITCHES 1 AND  2 AS FOLLOWS.          (3)
 01-48K  02-64K  04-96K  08-128K  09-160K  0A-192K  0B-224K  0C-256K
 0D-384K  0E-512K

 TO FORCE STAGE 1 MEMORY PRINTOUT, SET SSW 11.
                              SINGLE BIT ERROR ANALYSIS OF FET MEMORY TEST

                                ************************************
                                * STAGE 2 MEMORY-NO CARD IN A-B4B2  *
                                ************************************

MEMORY SIZE  64K--BOARD B4     (4), (7)

LEFTMOST                                                     (6)
SAR (5)
BITS  15    14    13    12    11    10     9     8     7     6     5     4     3     2     1     0     C6    C5    C4    C3    C2    C1
6701  I--------- SDBO BITS 15-8 -----------I     I--------- SDBO BITS 7-0 -----------I     I--- CHECK BITS C6-C1 ----I

0000  L4    L4    L4    L4    L4    L4     L4    L4    L2    L2    L2    L2    L2    L2    L2    L2    L4    L4    L4    L2    L2    L2
 (8)                   (9)                                       0080

0001  G4    G4    G4    G4    G4    G4     G4    G4    G2    G2    G2    G2    G2    G2    G2    G2    G4    G4    G4    G2    G2    G2
                                                                       0100  (10)

0010  K4    K4    K4    K4    K4    K4     K4    K4    K2    K2    K2    K2    K2    K2    K2    K2    K4    K4    K4    K2    K2    K2
                                                                  * (11)

0011  F4    F4    F4    F4    F4    F4     F4    F4    F2    F2    F2    F2    F2    F2    F2    F2    F4    F4    F4    F2    F2    F2

-------------------------------------------------------------------------------------------------------------------------------------

    (13)
THE FOLLOWING PRINTOUT IS SAME AS ABOVE EXCEPT ONLY THE ERRORS ARE INDICATED


MEMORY SIZE  64K--BOARD B4     (4), (7)

LEFTMOST                                                     (6)
SAR (5)
BITS  15    14    13    12    11    10     9     8     7     6     5     4     3     2     1     0     C6    C5    C4    C3    C2    C1
6701  I--------- SDBO BITS 15-8 -----------I     I--------- SDBO BITS 7-0 -----------I     I--- CHECK BITS C6-C1 ----I

0000                                                              L2
 (8)                                                             0080

0001                                                                    G2
                                                                       0100  (10)

0010                                                              K2
                                                                  * (11)

0011

 NOTE: * INDICATES POSSIBLE SHORTED SENSE LINE,CELL ERROR OR SINGLE BIT ADDRESS DECODE ERROR.
       ALL ERROR COUNTS ARE IN HEX.
       THE MAP WILL GUIDE YOUR ANALYSIS OF THIS PRINTOUT


 ID FF00. PROG FD70-01.  (12)
 SECTION TERMINATED
```

NOTES:

(1) THE CONFIGURATION MUST BE CORRECT WHEN FD7 IS RUN OR THE PRINTOUT WILL BE INVALID BECAUSE EACH MEMORY SIZE HAS A DIFFERENT CHART. ALSO THE STAGE 1 MEMORY PRINTOUT DIFFERS FROM THAT FOR THE STAGE 2. STAGE 1 MEMORY CONTAINS A CARD IN A-B4B2. STAGE 2 HAS NO CARD IN THAT LOCATION.

(2) THE DCP MEMORY CONFIGURATION IS USED AS A DEFAULT.

(3) SSW10 CAN BE SET AT THE HA HALT OR D1 HALT.

(4) THE MEMORY SIZE SELECTED IS PRINTED.

(5) THE LEFTMOST SAR BITS REFER TO THE >128K BIT, >64K BIT, BIT 0 AND BIT 1 OF A STORAGE ADDRESS. THUS, SAR MAY BE THOUGHT OF AS AN 18 BIT REGISTER WHOSE BITS ARE NUMBERED:
6 7 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

(6) BITS 15-8 ARE EVEN ADDRESSED BYTES AND BITS 7-0 ARE ODD ADDRESSED BYTES.

(7) B4 BOARD IS THE LOCATION OF MEMORY (0-128K)
A4 BOARD IS THE LOCATION OF MEMORY (128K-256K)

(8) THE ADDRESS BITS ARE GROUPED IN 16K BLOCKS. (SEE ITEM 5).

(9) THE CARD LOCATIONS ARE PRINTED UNDER EACH BIT POSITION.

(10) THE NUMBER PRINTED UNDER THE CARD LOCATION IS THE TOTAL NUMBER OF ERRORS IN HEX. THE FAILURE CAN BE A CELL ERROR, DATA RETENTION ERROR OR A SINGLE BIT ADDRESS DECODE FAILURE.

(11) THE ASTERISK INDICATES THAT THE BIT WAS NOT THE EXPECTED RESULT ON READ SHIFT ZERO TEST. NOTE THAT AN ASTERISK MAY APPEAR BY ITSELF WITH NO COUNT ASSOCIATED WITH IT. THE MAP PROVIDES ERROR ANALYSIS.

(12) NORMAL PROGRAM TERMINATION.

(13) A SECOND PRINTOUT IS GIVEN WHICH IS THE SAME AS THE FIRST EXCEPT ONLY THE ERRORS ARE GIVEN.

4.4.6 SAMPLE PRINTOUT--CONFIGURATION USING 16KX11 CARDS (384K AND 512K SYSTEMS ONLY)

```
 SAMPLE PRINTOUT

            ******  WARNING  ******  (1)
IF MEMORY CONFIGURATION IS INCORRECT, RESULTS WILL BE INVALID

PROGRAM DEFAULTS TO MEMORY SIZE AS CONFIGURED IN DCP
IF DEFAULT IS CORRECT, PRESS START TO CONTINUE   (2)
IF NCT CORRECT, SET SSW10 AND ENTER SIZE VIA CONSOLE SWITCHES 1 AND  2 AS FOLLOWS.          (3)
 01-48K  02-64K  04-96K  08-128K  09-160K  0A-192K  0B-224K  0C-256K
 0D-384K  0E-512K

 TO FORCE STAGE 1 MEMORY PRINTOUT, SET SSW 11.
                                  SINGLE BIT ERROR ANALYSIS OF FET MEMORY TEST

MEMORY SIZE  384K-- BOARD B4     (4), (7)

LEFTMOST                                                  (6)
SAR (5)
BITS  15  14  13  12  11  10   9   8   7   6   5   4   3   2   1   0   C6  C5  C4  C3  C2  C1
5670  I---------- SDBO BITS 15-8 -----I   I---------- SDBO BITS 7-0 -----I   I--- CHECK BITS C6-C1 ---I

0000  L4  L4  L4  L4  L4  L4   L4  L4  L2  L2  L2  L2  L2  L2  L2  L2  L4  L4  L4  L2  L2  L2
 (8)             (9)                        0080

0001  G4  G4  G4  G4  G4  G4   G4  G4  G2  G2  G2  G2  G2  G2  G2  G2  G4  G4  G4  G2  G2  G2
                                                 0100 (10)

0010  K4  K4  K4  K4  K4  K4   K4  K4  K2  K2  K2  K2  K2  K2  K2  K2  K4  K4  K4  K2  K2  K2
                                                * (11)
0011  F4  F4  F4  F4  F4  F4   F4  F4  F2  F2  F2  F2  F2  F2  F2  F2  F4  F4  F4  F2  F2  F2

0100  J4  J4  J4  J4  J4  J4   J4  J4  J2  J2  J2  J2  J2  J2  J2  J2  J4  J4  J4  J2  J2  J2

0101  E4  E4  E4  E4  E4  E4   E4  E4  E2  E2  E2  E2  E2  E2  E2  E2  E4  E4  E4  E2  E2  E2

0110  H4  H4  H4  H4  H4  H4   H4  H4  H2  H2  H2  H2  H2  H2  H2  H2  H4  H4  H4  H2  H2  H2

0111  D4  D4  D4  D4  D4  D4   D4  D4  D2  D2  D2  D2  D2  D2  D2  D2  D4  D4  D4  D2  D2  D2


              BOARD A4     (7)

LEFTMOST                                                  (6)
SAR (5)
BITS  15  14  13  12  11  10   9   8   7   6   5   4   3   2   1   0   C6  C5  C4  C3  C2  C1
5670  I---------- SDBO BITS 15-8 -----I   I---------- SDBO BITS 7-0 -----I   I--- CHECK BITS C6-C1 ---I

1000  L4  L4  L4  L4  L4  L4   L4  L4  L2  L2  L2  L2  L2  L2  L2  L2  L4  L4  L4  L2  L2  L2
 (8)             (9)

1001  G4  G4  G4  G4  G4  G4   G4  G4  G2  G2  G2  G2  G2  G2  G2  G2  G4  G4  G4  G2  G2  G2

1010  K4  K4  K4  K4  K4  K4   K4  K4  K2  K2  K2  K2  K2  K2  K2  K2  K4  K4  K4  K2  K2  K2

1011  F4  F4  F4  F4  F4  F4   F4  F4  F2  F2  F2  F2  F2  F2  F2  F2  F4  F4  F4  F2  F2  F2

---------------------------------------------------------------------------------------------------
```

```
     (13)
THE FOLLOWING PRINTOUT IS SAME AS ABOVE EXCEPT ONLY THE ERRORS ARE INDICATED


MEMORY SIZE  384K-- BOARD B4     (4), (7)
LEFTMOST                                                                        (6)
SAR (5)
BITS  15    14    13    12    11    10     9     8     7     6     5     4     3     2     1     0     C6    C5    C4    C3    C2    C1
5670   I--------- SDBO BITS 15-8 -----------I   I--------- SDBO BITS 7-0 -----------I    I--- CHECK BITS C6-C1 ----I

0000                                                              L2
 (8)                                                            0080

0001                                                                          G2
                                                                            0100 (10)

0010                                                                    K2
                                                                        * (11)

0011

0100

0101

0110

0111


                         BOARD A4      (7)
LEFTMOST                                                                        (6)
SAR (5)
BITS  15    14    13    12    11    10     9     8     7     6     5     4     3     2     1     0     C6    C5    C4    C3    C2    C1
5670   I--------- SDBO BITS 15-8 -----------I   I--------- SDBO BITS 7-0 -----------I    I--- CHECK BITS C6-C1 ----I
1000
 (8)

1001

1010

1011

NOTE: * INDICATES POSSIBLE SHORTED SENSE LINE,CELL ERROR OR SINGLE BIT ADDRESS DECODE ERROR.
      ALL ERROR COUNTS ARE IN HEX.
      THE MAP WILL GUIDE YOUR ANALYSIS OF THIS PRINTOUT


 ID FF00. PROG FD70-01.   (12)
 SECTION TERMINATED
```

NOTES:

(1) THE CONFIGURATION MUST BE CORRECT WHEN FD7 IS RUN OR THE PRINTOUT WILL BE INVALID BECAUSE EACH MEMORY SIZE HAS A DIFFERENT CHART. FOR MEMORY SIZES 384K AND 512K, THE MEMORY PRINTOUT DIFFERS FROM BOTH THE STAGE 1 AND STAGE 2 PRINTOUTS.

(2) THE DCP MEMORY CONFIGURATION IS USED AS A DEFAULT.

(3) SSW10 CAN BE SET AT THE HA HALT OR D1 HALT.

(4) THE MEMORY SIZE SELECTED IS PRINTED.

(5) THE LEFTMOST SAR BITS REFER TO THE >256K BIT, >128K BIT, >64K BIT AND BIT 0 OF A STORAGE ADDRESS. THUS, SAR MAY BE THOUGHT OF AS AN 19 BIT REGISTER WHOSE BITS ARE NUMBERED:
5 6 7 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

(6) BITS 15-8 ARE EVEN ADDRESSED BYTES AND BITS 7-0 ARE ODD ADDRESSED BYTES.

(7) B4 BOARD IS THE LOCATION OF MEMORY (0-256K)
A4 BOARD IS THE LOCATION OF MEMORY (256K-512K)

(8) THE ADDRESS BITS ARE GROUPED IN 32K BLOCKS. (SEE ITEM 5).

(9) THE CARD LOCATIONS ARE PRINTED UNDER EACH BIT POSITION.

(10) THE NUMBER PRINTED UNDER THE CARD LOCATION IS THE TOTAL NUMBER OF ERRORS IN HEX. THE FAILURE CAN BE A CELL ERROR, DATA RETENTION ERROR OR A SINGLE BIT ADDRESS DECODE FAILURE.

(11) THE ASTERISK INDICATES THAT THE BIT WAS NOT THE EXPECTED RESULT ON READ SHIFT ZERO TEST. NOTE THAT AN ASTERISK MAY APPEAR BY ITSELF WITH NO COUNT ASSOCIATED WITH IT. THE MAP PROVIDES ERROR ANALYSIS.

(12) NORMAL PROGRAM TERMINATION.

(13) A SECOND PRINTOUT IS GIVEN WHICH IS THE SAME AS THE FIRST EXCEPT ONLY THE ERRORS ARE GIVEN.

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1. GENERAL PROGRAM SUMMARY

1.1 PROGRAM DESCRIPTION

1.1.1 GENERAL PROGRAM SUMMARY

PROGRAM -D44- MAY BE USED AS A FREE LANCE AID AS W LL AS A UTILITY.
THIS PROGRAM IS DESIGNED TO RESIDE ON DISK AND RUN UNDER THE DIAGNOSTIC CONTROL PROGRAM (DCP).
AFTER THE CE HAS LOADED THE PROGRAM, THE 'HA' HALT SHOULD BE RESET SO THAT THE OPTION MENU
WILL BE DISPLAYED ON THE 3277 SCREEN. FROM THE OPTION MENU, ANY OPTION MAY BE SELECTED
ACCORDING TO THE SPECIFIC NEEDS. EACH OPTION IS DESCRIBED IN DETAIL LATER.
FOR OPTIONS REQUIRING CARD I/O, READING IS DONE FROM THE PRIMARY, PUNCHING FROM THE SECONDARY HOPPERS.
3741 OPERATIONS ARE ALWAYS DONE TO THE 3741 DRIVE 1.

IF NO SENSE SWITCHES ARE SET,
DISK I/O ON DRIVE 1
CARD I/O ON CARD DEVICE DEFINED IN UDT RECORD.

SENSE SWITCHES MAY BE SET AS DESCRIBED IN SECTION 1.1.4 WHICH WILL OVERRIDE
THE DISK DRIVE AND THE CARD DEVICE SELECTIONS.

1.1.2 ROUTINES

THE PROGRAM CONSISTS OF ONE ROUTINE WHICH PROVIDES THE FOLLOWING CAPABILITIES:

A. KEYPUNCH	ALLOWS CRT/KEYBOARD TO BE USED SIMILIARLY TO A 5496 DATA RECORDER OR 029 KEYPUNCH.
B. DUPLICATE 80 COLUMN CARDS	ALLOWS 80 COLUMN CARDS TO BE DUPLICATED ON EITHER THE 2560 OR THE 1442.
C. VTOC DUMP	PROVIDES A SUMMARY OF THE INFORMATION INCLUDED IN THE VTOC (VOLUME TABLE OF CONTENTS). THE VTOC CONTAINS INFORMATION ABOUT WHERE EACH PROGRAM RESIDES ON DISK AND THE TYPE OF PROGRAM IT IS (BEGINNING ADDRESS, NUMBER OF RECORDS, WHETHER IT IS A SYSTEM TEST, AND HEADER CARD INFORMATION).
D. DISK DUMP	ALLOWS ANY RECORD OF THE DISK TO BE PRINTED ON THE 1403 PRINTER.
E. PUNCH OUT A PROGRAM RESIDING ON DISK	ALLOWS ALL PROGRAMS RESIDING ON DISK (EXCEPT CPU AND MEMORY, FFA, FFB, AND DCP) TO BE PUNCHED OUT IN 80 OR 96 COLUMN CARDS OR WRITTEN ON DISKETTE. (IF WRITING A DISKETTE YOU MUST CREATE A DATASET).
F. DISK PATCH/DISPLAY	ALLOWS ANY DISK RECORD TO BE DISPLAYED ON THE CRT. ONCE IT HAS BEEN DISPLAYED, IT MAY BE ALTERED ON THE CRT AND THEN REWRITTEN BACK ONTO THE DISK.

1.1.3 SYSTEM REQUIREMENTS

A. SYSTEM/3 MODEL 15B
B. 48K OF MEMORY
C. 3277 CRT/KEYBOARD
D. 3340 DISK DRIVE
E. 1403 LINE PRINTER

1.1.4 OPTIONS

SENSE SWITCH OPTIONS

SENSE SWITCH NUMBER	OPTION PROVIDED WHEN SENSE SWITCH IS ON	OPTION WHERE USED
17	3741 USED AS THE OUTPUT DEVICE.	PUNCH ONLY
18	1442 USED AS CARD DEVICE.	KEYPUNCH DUP PUNCH
19	2560 USED AS CARD DEVICE.	SAME AS 18
1A	5424 USED AS CARD DEVICE.	KEYPUNCH PUNCH
20	INCLUDE DELETED ENTRIES IN VTOC DUMP.	VTOC DUMP
22	DRIVE 2 USED FOR DISK I/O.	VTOC DUMP DISK DUMP PUNCH DISK PATCH
23	DRIVE 3 USED FOR DISK I/O.	SAME AS 22
24	DRIVE 4 USED FOR DISK I/O	SAME AS 22

1.2 MAIN OPTION MENU

OPTION MENU

```
*******************************************
*                                         *
*  ENTER THE NUMBER OF OPTION DESIRED:    *
* 1    KEYPUNCH                           *
* 2    DUPLICATE 80 COLUMN DECKS          *
* 3    VTOC DUMP                          *
* 4    DISK DUMP                          *
* 5    PUNCH PROGRAMS RESIDING ON DISK    *
* 6    PATCH/DISPLAY DISK RECORDS         *
* /&   TERMINATES SECTION--DISK I/O       *
*      ON D1-SET SSW22,23,24 FOR D2,D3,D4 *
* _  <-ENTER OPTION NUMBER & PRESS -ENTER-*
*                                         *
*              READY-DISK I/O ON D1       *
*                                         *
*******************************************
```

NOTE THAT THE DISK DRIVE FOR I/O IS DEFINED IN LINE 12 OF THIS AND EVERY DISPLAY. 'READY' INDICATES KEYBOARD IS UNLOCKED.

1.3 KEYPUNCH EXAMPLE

CE ENTERS '1' ON INPUT LINE (LINE 10) AND PRESSES 'ENTER' KEY.

```
*******************************************
*                                         *
*  ENTER THE NUMBER OF OPTION DESIRED:    *
* 1    KEYPUNCH                           *
* 2    DUPLICATE 80 COLUMN DECKS          *
* 3    VTOC DUMP                          *
* 4    DISK DUMP                          *
* 5    PUNCH PROGRAMS RESIDING ON DISK    *
* 6    PATCH/DISPLAY DISK RECORDS         *
* /&   TERMINATES SECTION--DISK I/O       *
*      ON D1-SET SSW22,23,24 FOR D2,D3,D4 *
* 1_ <-ENTER OPTION NUMBER & PRESS -ENTER-*
*                                         *
*              READY-DISK I/O ON D1       *
*                                         *
*******************************************
```

A SECOND DISPLAY IS NOW GIVEN.

```
*******************************************
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
*                                         *
* ENTER RECORD TO BE PUNCHED:             *
* _                                       *
*                                         *
*              READY-DISK I/O ON D1       *
*                                         *
*******************************************
```

THE RECORD TO BE PUNCHED WILL ALSO BE PRINTED ON THE 1403. '/&' WILL RETURN TO THE MAIN MENU.

1.4 DUP DECKS

```
*******************************************
*                                         *
*  ENTER THE NUMBER OF OPTION DESIRED:    *
* 1    KEYPUNCH                           *
* 2    DUPLICATE 80 COLUMN DECKS          *
* 3    VTOC DUMP                          *
* 4    DISK DUMP                          *
* 5    PUNCH PROGRAMS RESIDING ON DISK    *
* 6    PATCH/DISPLAY DISK RECORDS         *
* /&   TERMINATES SECTION--DISK I/O       *
*      ON D1-SET SSW22,23,24 FOR D2,D3,D4 *
* 2_ <-ENTER OPTION NUMBER & PRESS -ENTER-*
*                                         *
*              READY-DISK I/O ON D1       *
*                                         *
*******************************************
```

NOTE THE FOLLOWING WHEN DUPING DECKS:

1. DUP ONLY 80 COLUMN DECKS--USE PROGRAM 'DUP' FOR 96 COLUMN DECKS.
2. PUT A $PUNCH (COLUMNS 1-6) AT BEGINNING OF CARDS TO BE PUNCHED.
3. PUT A $END (COLUMNS 1-4) AT END OF CARDS TO BE PUNCHED.
4. MAXIMUM OF 300 CARDS MAY BE BETWEEN THE $PUNCH AND THE $END.
5. PLACE DECKS IN PRIMARY, BLANKS IN SECONDARY (2560).
6. FOR THE 1442, PLACE BLANK CARDS AFTER THE $END RECORD.

1.5 VTOC DUMP

CE ENTERS '3' ON INPUT LINE (LINE 10)

```
*******************************************
*                                         *
*  ENTER THE NUMBER OF OPTION DESIRED:    *
* 1    KEYPUNCH                           *
* 2    DUPLICATE 80 COLUMN DECKS          *
* 3    VTOC DUMP                          *
* 4    DISK DUMP                          *
* 5    PUNCH PROGRAMS RESIDING ON DISK    *
* 6    PATCH/DISPLAY DISK RECORDS         *
* /&   TERMINATES SECTION--DISK I/O       *
*      ON D1-SET SSW22,23,24 FOR D1,D2,D3 *
* 3_ <-ENTER OPTION NUMBER & PRESS -ENTER-*
*                                         *
*              READY-DISK I/O ON D1       *
*                                         *
*******************************************
```

LINE 9 CONTAINS 'SELECTION IN PROCESS' WHILE THE VTOC CONTENTS ARE BEING DUMPED ON THE 1403 LINE PRINTER. KEYBOARD IS LOCKED.

```
*******************************************
*                                         *
*  ENTER THE NUMBER OF OPTION DESIRED:    *
* 1    KEYPUNCH                           *
* 2    DUPLICATE 80 COLUMN DECKS          *
* 3    VTOC DUMP                          *
* 4    DISK DUMP                          *
* 5    PUNCH PROGRAMS RESIDING ON DISK    *
* 6    PATCH/DISPLAY DISK RECORDS         *
* /&   TERMINATES SECTION--DISK I/O       *
* SELECTION IN PROCESS                    *
* 3_ <-ENTER OPTION NUMBER & PRESS -ENTER-*
*                                         *
*              KEYBOARD LOCKED            *
*                                         *
*******************************************
```

AFTER THE VTOC DUMP IS COMPLETE, THE MAIN OPTION MENU WILL BE REDISPLAYED.

1.6 DISK DUMP

CE ENTERS '4' ON THE INPUT LINE

```
*******************************************
*                                         *
*  ENTER THE NUMBER OF OPTION DESIRED:    *
* 1    KEYPUNCH                           *
* 2    DUPLICATE 80 COLUMN DECKS          *
* 3    VTOC DUMP                          *
* 4    DISK DUMP                          *
* 5    PUNCH PROGRAMS RESIDING ON DISK    *
* 6    PATCH/DISPLAY DISK RECORDS         *
* /&   TERMINATES SECTION--DISK I/O       *
*      ON D1-SET SSW22,23,24 FOR D2,D3,D4 *
* 4_ <-ENTER OPTION NUMBER & PRESS -ENTER-*
*                                         *
*              READY-DISK I/O ON D1       *
*                                         *
*******************************************
```

THE NEXT DISPLAY IS GIVEN SO THAT INFORMATION ABOUT THE DUMP MAY BE ENTERED.

```
*******************************************
*                                         *
*              DISK DUMP                  *
*                                         *
* ENTER CC - CYLINDER IN HEX (0 TO 21)    *
*       HH - HEAD IN HEX   (0 TO 13)      *
*       RR - RECORD IN HEX (1 TO 30)      *
*       N  - # TO DUMP(DEFAULT 1,MAX 999) *
*       /& - RETURNS TO MAIN MENU         *
*       CONTIN N - CONTINUES DUMP         *
*                                         *
* CCHHRR N  <--ENTER CCHHRR, PRESS ENTER  *
*                                         *
*              READY-DISK I/O ON D1       *
*                                         *
*******************************************
```

AFTER ENTER HAS BEEN PRESSED, THE DUMP WILL BEGIN WITH 'SELECTION IN PROCESS' APPEARING IN LINE 9. WHEN THE DUMP IS COMPLETE, THE ABOVE DISPLAY WILL BE REPEATED UNTIL '/&' IS ENTERED, WHICH RETURNS TO THE MAIN OPTION MENU. THE DISK CONTENTS ARE PRINTED ON THE 1403.

1.7 PUNCH PROGRAM

CE ENTERS '5' ON INPUT LINE (LINE 10)

```
*********************************************
*                                           *
*  ENTER THE NUMBER OF OPTION DESIRED:      *
* 1    KEYPUNCH                             *
* 2    DUPLICATE 80 COLUMN DECKS            *
* 3    VTOC DUMP                            *
* 4    DISK DUMP                            *
* 5    PUNCH PROGRAMS RESIDING ON DISK      *
* 6    PATCH/DISPLAY DISK RECORDS           *
* /&   TERMINATES SECTION--DISK I/O         *
*       ON D1-SET SSW22,23,24 FOR D1,D2,D3  *
* 5_ <-ENTER OPTION NUMBER & PRESS -ENTER-  *
*                                           *
*               READY-DISK I/O ON D1        *
*                                           *
*********************************************
```

THE NEXT DISPLAY ALLOWS THE PROGRAM ID TO BE ENTERED. ANY PROGRAM MAY BE PUNCHED EXCEPT DCP, CPU AND MEMORY PROGRAMS, FFA, AND FFB. THE DATA PUNCHED ON THE CARDS OR WRITTEN ON DISKETTE WILL BE EXACTLY AS IT WAS IN THE ORIGINAL.

```
*********************************************
*                                           *
*                                           *
*                                           *
*                                           *
*                                           *
*                                           *
*                                           *
*                                           *
*  THIS OPTION ALLOWS A PROGRAM TO BE       *
*  PUNCHED FROM THE DISK                    *
*                                           *
* PID      <ENTER PROGRAM ID                *
*                                           *
*               READY-DISK I/O ON D1        *
*                                           *
*********************************************
```

AFTER ENTER HAS BEEN PRESSED, PUNCHING (OR DISKETTE WRITTING ON THE 3741) WILL BEGIN WITH 'SELECTION IN PROCESS' APPEARING IN LINE 9. AFTER THE DECK HAS BEEN PUNCHED, THE ABOVE DISPLAY WILL BE REPEATED UNTIL '/&' IS ENTERED, WHICH WILL RETURN TO THE MAIN OPTION MENU.

NOTE THAT THE END CARD PUNCHED FOR THE DECKS WILL HAVE AN 'E' IN COLUMN 1 AND 'THIS DECK PUNCHED USING PROGRAM D44' IN COLUMNS 34-68. TAP DECKS OR DATA DECKS WILL NOT HAVE THIS SPECIAL END CARD.

1.8 DISK PATCH/DISPLAY MENU

CE ENTERS '6' ON INPUT LINE (LINE 10)

```
*********************************************
*                                           *
*  ENTER THE NUMBER OF OPTION DESIRED:      *
* 1    KEYPUNCH                             *
* 2    DUPLICATE 80 COLUMN DECKS            *
* 3    VTOC DUMP                            *
* 4    DISK DUMP                            *
* 5    PUNCH PROGRAMS RESIDING ON DISK      *
* 6    PATCH/DISPLAY DISK RECORDS           *
* /&   TERMINATES SECTION--DISK I/O         *
*       ON D1-SET SSW22,23,24 FOR D1,D2,D3  *
* 6_ <-ENTER OPTION NUMBER & PRESS -ENTER-  *
*                                           *
*               READY-DISK I/O ON D1        *
*                                           *
*********************************************
```

THE NEXT DISPLAY GIVES MORE INFORMATION ABOUT THE OPTIONS AVAILABLE.

```
*********************************************
*                                           *
*  DISK PATCH/DISPLAY                       *
*    PF1 DISPLAYS FIRST 128 BYTES           *
*    PF2 DISPLAYS SECOND 128 BYTES          *
*    PF3 DISPLAYS NEXT SEQUENTIAL RECORD    *
*    PF6 PRINTS SCREEN CONTENTS             *
*    /& RETURNS TO MAIN MENU                *
*    TO WRITE ALTERED RECORD TO DISK,       *
*    ENTER 'WRITE' ON TOP LINE              *
*                                           *
* CCHHRR  <--ENTER CCHHRR, PRESS ENTER      *
*                                           *
*               READY-DISK I/O ON D1        *
*                                           *
*********************************************
```

NOTE THAT THIS OPTION MAY BE USED TO ALTER OR DISPLAY RECORD CONTENTS. 128 BYTES WILL BE DISPLAYED ON THE CRT AT A TIME.

1.8.1 ALTER EXAMPLE

AS AN EXAMPLE, CYL 05, HEAD 00, RECORD 5 NEEDS TO BE ALTERED. ENTER '050005' IN LINE 10 AND PRESS 'ENTER'. THE DISPLAY BELOW WILL BE GIVEN.

```
*********************************************
*                                           *
* 050005<-- MAY BE CHANGED AT WILL          *
* 00         E30A3A3AF0F1F2F3F4F5F6F7F8F9C1C2*
* 10         C3C4C5C6D1D2D3D4D5D6E1E2E3E4E5E6*
* 20         F0F0F0F0F0F0F0F1F1F1F1F1F1F1F1F1*
* 30         D2D2D2D2D2D2D2F2F2F2F2F2F2F2F2*
* 40         F3F3F3F3F3F3F3F4F4F4F4F4F4F4F4F4*
* 50         C3C3C3C3C3C5C5C5C5C5F2F2F2F2F2F2*
* 60         F3FFF3F3F3F4F4F4F4F4F5F5F5F5F6F6*
* 70         D3D3D3D3D4D4D4D4D5D5D5D5F9F9F9F9*
*                                           *
*                                           *
*               READY-DISK I/O ON D1        *
*                                           *
*********************************************
```

NOTE THAT THE TAB KEY MAY BE USED TO POSITION THE CURSOR AT THE BEGINNING OF EACH LINE OF DATA.

NOW ALTER THE DATA IN LINES 2 AND 3 AND PRESS THE ENTER KEY.

```
*********************************************
*                                           *
* 050005<-- MAY BE CHANGED AT WILL          *
* 00         E30A3A3AF0F1F2F3F4F5F6F7F8F9C4C5*
* 10         F0F0F0C6D1D2D3D4D5D6E1E2E3E4E5E6*
* 20         F0F0F0F0F0F0F0F1F1F1F1F1F1F1F1F1*
* 30         D2D2D2D2D2D2D2F2F2F2F2F2F2F2F2*
* 40         F3F3F3F3F3F3F3F4F4F4F4F4F4F4F4F4*
* 50         C3C3C3C3C3C5C5C5C5C5F2F2F2F2F2F2*
* 60         F3FFF3F3F3F4F4F4F4F4F5F5F5F5F6F6*
* 70         D3D3D3D3D4D4D4D4D5D5D5D5F9F9F9F9*
*                                           *
*                                           *
*               READY-DISK I/O ON D1        *
*                                           *
*********************************************
```

NOTE THAT THE '>' SIGN INDICATES LINES WHERE CHANGES WERE MADE.
ENTER 'WRITE' IN LINE 1 AND PRESS 'ENTER' SO THE NEW DATA WILL BE WRITTEN ON DISK. THE DISK WILL NOT BE ALTERED UNTIL 'WRITE' IS ENTERED.

```
*********************************************
*                                           *
* WRITE <-- MAY BE CHANGED AT WILL          *
* 00   >     E30A3A3AF0F1F2F3F4F5F6F7F8F9C4C5*
* 10   >     F0F0F0C6D1D2D3D4D5D6E1E2E3E4E5E6*
* 20         F0F0F0F0F0F0F0F1F1F1F1F1F1F1F1F1*
* 30         D2D2D2D2D2D2D2F2F2F2F2F2F2F2F2*
* 40         F3F3F3F3F3F3F3F4F4F4F4F4F4F4F4F4*
* 50         C3C3C3C3C3C5C5C5C5C5F2F2F2F2F2F2*
* 60         F3FFF3F3F3F4F4F4F4F4F5F5F5F5F6F6*
* 70         D3D3D3D3D4D4D4D4D5D5D5D5F9F9F9F9*
*                                           *
*                                           *
*               READY-DISK I/O ON D1        *
*                                           *
*********************************************
```

NOTE THAT THE MESSAGE 'CCHHRR WAS WRITTEN' WILL FLASH ON THE SCREEN AFTER THE RECORD HAS BEEN WRITTEN. THEN THE PATCH/DISPLAY MENU WILL BE DISPLAYED. NOTE THAT IF THE PF6 KEY IS PRESSED, THE CURRENT SCREEN CONTENTS WILL BE PRINTED ON THE 1403. THIS MAY BE USED TO GIVE A BEFORE AND AFTER RECORD OF THE DISK RECORD CONTENTS.

1.8.2 MOVE ONE RECORD TC ANOTHER

AS AN EXAMPLE, MOVE FROM CYLINDER 0D, HEAD 04, RECORD 01, TO CYLINDER 0F, HEAD 0C, RECORD 10. AFTER SELECTING OPTION 6 TO PATCH/DISPLAY, ENTER 0D0401 AS THE RECORD TO BE DISPLAYED. THE FOLLOWING DISPLAY WILL BE RECEIVED:

```
******************************************
*                                        *
* 0D0401<-- MAY BE CHANGED AT WILL       *
* 00      E30A3A3AF0F1F2F5F5F5F5F5F5F5C5C5*
* 10      F2F3F4C5D6D7D8D9D5D6E1E2E3E4E5E6*
* 20      F0F0F0F0F0F0F0F3F2F1F4F3F2F1F4F3*
* 30      D2D2D2D2D2D2D2F2F2F2F2F2F2F2F2F2*
* 40      F3F3F3F3F3F3F3F4F4F4F4F4F4F4F4F4*
* 50      C3C3C3C3C3C5C5C5C5C5F2F2F2F2F2F2*
* 60      F3FFF3F3F3F4F4F4F4F4F5F5F5F5F6F6*
* 70      D3D3D3D3D4D4D4D4D5D5D5D5F9F9F9F9*
*                                        *
*                                        *
*            READY-DISK I/O CN D1        *
*                                        *
******************************************
```

NOW ENTER 'MOVECCHHRR' IN THE UPPER LEFT HAND CORNER FOR THE LOCATICN THE RECORD SHOULD BE MOVED TO AND PRESS THE ENTER KEY.

```
******************************************
*                                        *
* MOVE0F0C10MAY BE CHANGED AT WILL       *
* 00      E30A3A3AF0F1F2F5F5F5F5F5F5F5C5C5*
* 10      F2F3F4C5D6D7D8D9D5D6E1E2E3E4E5E6*
* 20      F0F0F0F0F0F0F0F3F2F1F4F3F2F1F4F3*
* 30      D2D2D2D2D2D2D2F2F2F2F2F2F2F2F2F2*
* 40      F3F3F3F3F3F3F3F4F4F4F4F4F4F4F4F4*
* 50      C3C3C3C3C3C5C5C5C5C5F2F2F2F2F2F2*
* 60      F3FFF3F3F3F4F4F4F4F4F5F5F5F5F6F6*
* 70      D3D3D3D3D4D4D4D4D5D5D5D5F9F9F9F9*
*                                        *
*                                        *
*            READY-DISK I/O ON D1        *
*                                        *
******************************************
```

THE RECORD WILL BE MOVED (WRITTEN) TO THE NEW LOCATION AND THE DISK PATCH/DISPLAY MENU WILL BE REPEATED. THE RECORD MOVED FROM ('0D0401' IN THIS EXAMPLE) WILL REMAIN UNCHANGED.

1.8.3 COPY ONE RECORD TC ANOTHER DRIVE

AS AN EXAMPLE, MOVE FROM CYLINDER 10, HEAD 11, RECORD 01 OF DRIVE 1, TO DRIVE 3. AFTER SETTING THE PROPER SENSE SWITCH FOR THE FROM DRIVE, SELECT OPTION 6 TO PATCH/DISPLAY. ENTER 101101 AS THE RECORD TO BE DISPLAYED. THE FOLLOWING DISPLAY WILL BE RECEIVED.

```
******************************************
*                                        *
* 101101<-- MAY BE CHANGED AT WILL       *
* 00      E30A3A3AF0F1F2F5F5F5F5F5F5F5C5C5*
* 10      F2F3F4C5D6D7D8D9D5D6E1E2E3E4E5E6*
* 20      F0F0F0F0F0F0F0F3F2F1F4F3F2F1F4F3*
* 30      D2D2D2D2D2D2D2F2F2F2F2F2F2F2F2F2*
* 40      F3F3F3F3F3F3F3F4F4F4F4F4F4F4F4F4*
* 50      C3C3C3C3C3C5C5C5C5C5F2F2F2F2F2F2*
* 60      F3FFF3F3F3F4F4F4F4F4F5F5F5F5F6F6*
* 70      D3D3D3D3D4D4D4D4D5D5D5D5F9F9F9F9*
*                                        *
*                                        *
*            READY-DISK I/O CN D1        *
*                                        *
******************************************
```

NOW ENTER 'COPYDX' IN THE UPPER LEFT HAND CORNER FOR THE DRIVE THE RECORD SHOULD BE MOVED TO AND PRESS THE ENTER KEY.

```
******************************************
*                                        *
* COPYD3<-- MAY BE CHANGED AT WILL       *
* 00      E30A3A3AF0F1F2F5F5F5F5F5F5F5C5C5*
* 10      F2F3F4C5D6D7D8D9D5D6E1E2E3E4E5E6*
* 20      F0F0F0F0F0F0F0F3F2F1F4F3F2F1F4F3*
* 30      D2D2D2D2D2D2D2F2F2F2F2F2F2F2F2F2*
* 40      F3F3F3F3F3F3F3F4F4F4F4F4F4F4F4F4*
* 50      C3C3C3C3C3C5C5C5C5C5F2F2F2F2F2F2*
* 60      F3FFF3F3F3F4F4F4F4F4F5F5F5F5F6F6*
* 70      D3D3D3D3D4D4D4D4D5D5D5D5F9F9F9F9*
*                                        *
*                                        *
*            READY-DISK I/O CN D1        *
*                                        *
******************************************
```

THE RECORD WILL BE MOVED (WRITTEN) TO THE SAME LOCATION ON THE DESIGNATED DRIVE AND THE DISK/PATCH DISPLAY REPEATED. THE RECORD MOVED (101101 IN THIS EXAMPLE) WILL REMAIN UNCHANGED.

1.8.4 DISPLAYING SEQUENTIAL RECORDS

AFTER SELECTING OPTION 6, ENTER '0D0023' TO DISPLAY THAT RECORD.

```
******************************************
*                                        *
* 0D0023<-- MAY BE CHANGED AT WILL       *
* 00      E30A3A3AF0F1F2F5F5F5F5F5F5F5C5C5*
* 10      F2F3F4C5D6D7D8D9D5D6E1E2E3E4E5E6*
* 20      F0F0F0F0F0F0F0F3F2F1F4F3F2F1F4F3*
* 30      D2D2D2D2D2D2D2F2F2F2F2F2F2F2F2F2*
* 40      F3F3F3F3F3F3F3F4F4F4F4F4F4F4F4F4*
* 50      C3C3C3C3C3C5C5C5C5C5F2F2F2F2F2F2*
* 60      F3FFF3F3F3F4F4F4F4F4F5F5F5F5F6F6*
* 70      D3D3D3D3D4D4D4D4D5D5D5D5F9F9F9F9*
*                                        *
*                                        *
*            READY-DISK I/O ON D1        *
*                                        *
******************************************
```

NOW PRESS THE PF3 KEY AND THE NEXT RECORD WILL BE DISPLAYED.
NOTE THAT THE SAME COULD BE ACCOMPLISHED BY ENTERING '0D0024' OVER '0D0023' AND PRESSING THE ENTER KEY.

```
******************************************
*                                        *
* 0D0024<-- MAY BE CHANGED AT WILL       *
* 00      E30A723AF0F1F2F5F5F5F5F3F3F3C3C3*
* 10      F4F4F4C4D4D4D4D4D4D4E4E4E4E4E4E4*
* 20      F3F3F3F3F3F3F3F3F3F3F3F3F3F3F3F3*
* 30      D4D4D4D4D4D4D4F4F4F4F4F4F4F4F4F4*
* 40      F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5F5*
* 50      C6C6C6C6C6C6C6C6C6C6F6F6F6F6F6F6*
* 60      F7F7F7F7F7F7F7F7F7F7F7F7F7F7F7F7*
* 70      D8D8D8D8D8D8D8D8D8D8D8D8F8F8F8F8*
*                                        *
*                                        *
*            READY-DISK I/O ON D1        *
*                                        *
******************************************
```

RECORD '0D0023' COULD BE DISPLAYED AGAIN BY ENTERING '0D0023' IN THE UPPER LEFT HAND CORNER AND PRESSING THE ENTER KEY.

NOTE THAT IF A CYLINDER/HEAD/RECORD IS SELECTED WHICH HAS NOT BEEN INITIALIZED, A HALT WILL OCCUR. BYTE1, BIT4 (NO RECORD FOUND) OF THE 24 BYTE DIAGNOSTIC READ WILL BE ON. THE 24 BYTE DIAGNOSTIC READ IS PRINTED ON THE 1403 PRINTER.

IF A '/&' IS ENTERED IN THE UPPER LEFT-HAND CORNER OF ANY OF THESE DISPLAYS THE DISK PATCH/DISPLAY MENU WILL BE REDISPLAYED WITHOUT ANY DISK RECORDS BEING ALTERED.

3. INDEX TABLE FOR HALTS AND PRINTOUTS

HALT CODE	MEANING OF HALT	OPTION WHERE USED
10	3277 MICROCODE NOT LOADED OR AN ERROR WAS DETECTED DURING A 3277 FUNCTION. RESET THE HALT TO RETRY THE OPERATICN.	ALL
40	'$PUNCH' CONTROL RECORD MISSING. REFER TO SECTION 1.4 FOR DIRECTIONS.	DUP
42	USE PROGRAM 'DUP' (PN 5558037) TO DUPLICATE 96 COLUMN PROGRAMS.	DUP
43	UDT DOES NOT DEFINE A CARD DEVICE--SET SSW17 FOR 3741, SSW18 FOR 1442, SSW19 FOR 2560 OR SSW1A FOR 5424. SET SENSE SWITCH AND RESET THE HALT.	KEYPUNCH DUP PUNCH
45	INVALID ID ENTERED FOR THE PROGRAM TO BE PUNCHED. (DCP, CPU AND MEMORY, FFA, AND FFB CANNOT BE PUNCHED, ALL OTHER VALID ID'S WILL BE ACCEPTED).	PUNCH
46	INVALID HEAD SELECTED. VALID HEADS ARE 00 TO 13. RESET HALT TO RETRY.	DISK DUMP PCH/DISP
47	INVALID HEX NUMBER ENTERED FOR CYLINDER/TRACK/RECORD. RESET HALT TO RETRY.	DISK DUMP PCH/DISP
48	INVALID CYLINDER SELECTED. VALID CYLINDERS ARE 00-21. RESET HALT TO RETRY.	DISK DUMP PCH/DISP
49	INVALID RECORD SELECTED. VALID RECORDS ARE 01-30. RESET HALT TO RETRY.	DISK DUMP PCH/DISP
E9	THE 3741 WAS NOT IN THE INPUT MODE. AT THE 3741 KEYBOARD ENTER '41', DEPRESS UPPER 'FUNCT SEL' KEY AND THE INPUT KEY. RESET THE CPU HALT.	PUNCH ONLY
EC	THE CARD DEVICE IS NOT READY OR HAD AN ERROR. FOR THE 2560 AND 5424 READING IS DONE FROM THE PRIMARY, PUNCHING FROM THE SECONDARY.	KEYPUNCH DUP PUNCH
FC	3340 NOT READY OR UNIT CHECK. THE 24 BYTE DIAGNOSTIC READ IS PRINTED ON PRINTER. MAKE DEVICE READY OR CORRECT CHECK AND RETRY.	DISK DUMP PCH/DISP PUNCH
FE	A 3340 SIO INSTRUCTION HAS FAILED TEN TIMES. 24 BYTE DIAGNOSTIC READ IS PRINTED ON PRINTER.	DISK DUMP PCH/DISP PUNCH
FF	3340 ADAPTER CHECK. RELOAD ADAPTER MICROCODE AND RETRY OPERATION. IF ERROR PERSISTS RUN 3340 DIAGNOSTICS.	DISK DUMP PCH/DISP PUNCH

*****LAST PAGE*****

1. PROGRAM DESCRIPTION

PROGRAM 'CCC' (PN 5558403) IS USED DURING SYSTEM INSTALLATION (OR WHEN A FULLY FEATURED C.E. DIAGNOSTIC PACK IS RECEIVED).
IT IS USED TO DELETE CERTAIN PROGRAMS FROM THE C.E. DIAGNOSTIC PACK. THE PROGRAM COMMUNICATES TO THE C.E. VIA THE 3277 CRT/KEYBOARD. IT ENABLES HIM TO DELETE ALL PROGRAMS FOR DEVICES WHICH ARE NOT ATTACHED TO THE SYSTEM.

THE C.E. SHOULD RUN 'CCC' ONLY WHEN DIRECTED TO DO SO BY THE INSTALLATION INSTRUCTIONS.

2. PROGRAM OPERATION

THE PROGRAM RUNS UNDER DCP. REFER TO USER'S GUIDE BLOCK 10 FOR DCP OPERATING INSTRUCTIONS.

COMMENT CARDS ARE PRINTED OUT AS THE PROGRAM LOADS. THESE COMMENTS ARE THE DETAILED OPERATING INSTRUCTIONS FOR THE PROGRAM. READ THEM CAREFULLY.

READING THE COMMENTS AND FOLLOWING DIRECTIONS AS DISPLAYED ON THE SCREEN OF THE 3277 SHOULD BE SUFFICIENT OPERATING INSTRUCTIONS.

*********** END ***********

$LST   33445 10-26-79

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FC0-2 PN 5555530 EC 824801   3277/84 MICROCODE                   .  FF1-1 PN 5555571 EC 824829   SYS TEST RELOCATING LDR.  MOD 15
C19-1 PN 1607714 EC 824926   3340 ADAPTER MANUAL CPS -MOD 15     .  391-0 PN 2439005 EC 893611   1017 FUNCTION TEST 1442 COMPAT
392-0 PN 2439007 EC 893611   1017 GEN RD TEST 1442 COMPAT        .  39F-0 PN 2439009 EC 893611   39F - 1017 PT/RDR MODULE 1442C
092-0 PN 2439025 EC  893775   1017 READ OPERATION TIMING         .  3B1-0 PN 2441499 EC 893186    1018 PTP FCT TEST  1442 COMPAT
3BF-0 PN 2441500 EC 893186   3BF - 1018 PTP MOD  1442 COMPAT     .  098-1 PN 2441501 EC 893186    1018 PTP PUNCH TIMING  1442 COM
099-1 PN 2441502 EC 893186    1018 PTP PUNCH ECHO PULSES  144    .  313-1 PN 2441557 EC 893780   2501 READ EVALUATION TEST
3A1-1 PN 2450161 EC 823357   3881 FUNCTION TEST                  .  3AF-0 PN 2450163 EC 819984   3881 SYSTEM TEST MODULE
35F-1 PN 2495154 EC 138209   1255 SYS/3 TEST MODULE              .  715-3 PN 2521873 EC 443786   3410/3411 ERAP DATA CLEAR  715
70B-2 PN 2521875 EC 733796   3410 VELOCITY TEST       01SEP73    .  708-3 PN 2521883 EC 733796   CAPSTAN CONTROL F/L      01SEP73
70F-3 PN 2521889 EC 733797   70F - 3410/3411 TAPE     01MAY73    .  710-3 PN 2521891 EC 443786   3410/3411 ERAP DATA FORMAT 710
711-2 PN 2521893 EC 733796   3410/3411 LOG ANALYSIS  01SEP73     .  712-2 PN 2521895 EC 733796   3410/3411 LOG ANALYSIS  01SEP73
713-2 PN 2521897 EC 733796   3410/3411 STEP PGM       01SEP73    .  714-2 PN 2521899 EC 733796   3410/3411 STEP PGM 2     01SEP73
706-1 PN 2522118 EC 733796   WRITE RELIABILITY        01SEP73    .  707-1 PN 2522120 EC 733796   READ RELIABILITY         01SEP73
351-2 PN 2552542 EC 138209   1255 FUNCTION TEST                  .  352-2 PN 2552545 EC 138209   1255 READ AND STACKER SELECT
353-1 PN 2552548 EC 135963   1255 DOC SPACING, LENGTH MEASURE    .  E16-4 PN 2588486 EC 577143   HAMMER ADDR AND SENSE ANAL
E17-4 PN 2588488 EC 572221   SPECIAL ATTACHMENT TEST             .  203-1 PN 2588527 EC 819018   MLTA BASIC CHECKOUT
20F-4 PN 2588537 EC 577143   MLTA SYSTEM TEST MODULE             .  301-1 PN 2588794 EC 816761   SICC SECTION 3011    NO CONNECTOR
302-1 PN 2588795 EC 816761   SICC SECTION 3021 WITH CONNECTOR    .  303-2 PN 2588796 EC 816761   SICC SECTION 3032 WITH CONNECTOR
001-0 PN 2589651 EC 816592    PRI HOPPER TO WAIT TIMINGS         .  002-0 PN 2589652 EC 816592    SEC HOPPER TO WAIT TIMINGS
003-0 PN 2589653 EC 816592    PRI WAIT TO CORNER TIMINGS         .  004-0 PN 2589654 EC 816592    SEC WAIT TO CORNER TIMINGS
005-0 PN 2589655 EC 816592    CORNER TO STACKER TIMINGS          .  006-0 PN 2589656 EC 816592    PRI PUNCH CP START TIMINGS
007-0 PN 2589657 EC 816592    SEC PUNCH CP START TIMINGS         .  008-0 PN 2589658 EC 816592    PRI PUNCH CP END TIMINGS
009-0 PN 2589659 EC 816592    SEC PUNCH CP END TIMINGS           .  00A-0 PN 2589660 EC 816592    PRINT 3 LINES START TIMINGS
00B-0 PN 2589661 EC 816592    PRINT 3 LINES FINISH TIMINGS       .  00C-0 PN 2589662 EC 816592    PRINT 4 LINES FINISH TIMINGS
00D-0 PN 2589663 EC 816592    INJECT,KICK & STEP CB,S CHECK      .  021-0 PN 2589671 EC 816592    PRI HOPPER TO WAIT TIMINGS
022-0 PN 2589672 EC 816592    SEC HOPPER TO WAIT TIMINGS         .  023-0 PN 2589673 EC 816592    PRI WAIT TO CORNER TIMINGS
024-0 PN 2589674 EC 816592    SEC WAIT TO CORNER TIMINGS         .  025-0 PN 2589675 EC 816592    CORNER TO STACKER TIMINGS
026-0 PN 2589676 EC 816592    PRI PUNCH CP START TIMINGS         .  027-0 PN 2589677 EC 816592    SEC PUNCH CP START TIMINGS
028-0 PN 2589678 EC 816592    PRI PUNCH CP END TIMINGS           .  029-0 PN 2589679 EC 816592    SEC PUNCH CP END TIMINGS
02A-0 PN 2589680 EC 816592    PRINT 3 LINES START TIMINGS        .  02B-0 PN 2589681 EC 816592    PRINT 3 LINES FINISH TIMINGS
02C-0 PN 2589682 EC 816592    PRINT 4 LINES FINISH TIMINGS       .  02D-0 PN 2589683 EC 816592    INJECT,KICK & STEP CB,S CHECK
801-2 PN 2589701 EC 816667   BSCA DIAGNOSTIC 801-2               .  802-3 PN 2589703 EC 572216   BSCA   FUNCTION TEST
803-1 PN 2589705 EC 816773   BSCA DIAGNOSTIC                     .  804-1 PN 2589707 EC 577098   BSCA   FUNCTION TEST
805-0 PN 2589709 EC 816632   BSCA DIAGNOSTIC                     .  806-3 PN 2589711 EC 572239   BSCA   FUNCTION TEST
809-3 PN 2589715 EC 572216   BSCA ON-LINE REQUESTOR              .  80A-6 PN 2589717 EC 572216   BSCA ON-LINE RESPONDER
88F-0 PN 2589994 EC 818693   88F  BSCA 2 SYSTEM TEST MODULE      .  515-1 PN 2775689 EC 577108   1442 READ EVALUATION TEST
F03-3 PN 2589735 EC 572221   MFCU READ EVAL & ADJ DIAG           .  F05-1 PN 2589741 EC 818667   5424 KATAKANA RIPPLE PRINT TEST
088-0 PN 2775693 EC 818677    OVERALL FEED TIMING CHART          .  089-0 PN 2775694 EC 818677    READ CLUTCH RESPONSE TEST
08A-0 PN 2775695 EC 818677    EMITTER TIMING & DURATION TEST     .  08B-0 PN 2775696 EC 818677    PUNCH CB AND EMITTER DISPLAY
08C-0 PN 2775697 EC 818677    PUNCH CB LENGTH CHECK              .  08D-0 PN 2775698 EC 818677    FEED CLUTCH RESPONSE TEST
08E-0 PN 2775699 EC 818677    READ CLUTCH RESPONSE-MULT CARDS    .  093-0 PN 5554746 EC 821761          2501 ADJ      1000 CPM
094-0 PN 5554747 EC 821761           2501 ADJ      600 CPM       .  FF0-1 PN 5554852 EC 824808   MLTA MICROCODE DATA DECK MOD 15
F24-2 PN 5555500 EC 824829   MASTER TIMING ANALYSIS-2  MOD 15    .  F23-1 PN 5555503 EC 821761   READ EVAL & ADJUST PROG   MOD 15
F21-4 PN 5555505 EC 824888   2560 ATTACH. TESTS        MOD 15    .  F22-4 PN 5555507 EC 824880   2560 FUNCTION TESTS       MOD 15
F2F-2 PN 5555509 EC 821761   2560 SYSTEM TEST MODULE   MOD 15    .  141-1 PN 5555524 EC 821723   3277/84 ADAPTER TESTS     MOD 15
144-2 PN 5555528 EC 821723   3277/3284 UNIT FUNC TESTS-MOD 15    .  FC1-2 PN 5555532 EC 825050   3277 MICRO UPDATE PROGRAM-MOD 15
204-1 PN 5555550 EC 824934   MLTA FUNCTIONAL CHECKOUT  MOD 15    .  205-1 PN 5555552 EC 824829   MLTA MICROCODE LOADER     MOD 15
206-0 PN 5555554 EC 821490   MLTA LINE LOOP/WRAP TEST  MOD 15    .  207-0 PN 5555556 EC 821490   MLTA LINE TEST            MOD 15
0AA-0 PN 5555588 EC 821490   NPRO                                .  0AB-0 PN 5555589 EC 821490   NPRO
0A0-0 PN 5555590 EC 821490   ALL PURPOSE                         .  0A1-0 PN 5555591 EC 821715   PRIMARY HOPPER TO PRE-PUNCH
0A2-0 PN 5555592 EC 821715   SECONDARY HOPPER TO PRE-PUNCH       .  0A3-0 PN 5555593 EC 821490   PRI PRE-PCH TO STKR  W/ PRINT
0A4-0 PN 5555594 EC 821490   SEC PRE-PCH TO STKR  W/ PRINT       .  0A5-0 PN 5555595 EC 821490   PRI PRE-PCH TO STKR  W/O PRINT
0A6-0 PN 5555596 EC 821490   SEC PRE-PCH TO STKR  W/O PRINT      .  0A7-0 PN 5555597 EC 821490   FEED CLUTCH
0A8-0 PN 5555598 EC 821715   PUNCH PUSHER CLUTCH                 .  0A9-0 PN 5555599 EC 821490   PUNCH UNIT
FC2-0 PN 5558002 EC 821490   MFCU READ/PUNCH/PRINT TESTMOD 15    .  511-2 PN 5558005 EC 824896   1442 COMMAND RESPONSE      MOD 15
51F-0 PN 5558007 EC 821490   1442 SYSTEM TEST          MOD 15    .  E12-0 PN 5558012 EC 821490   PRINTER FUNCTION TEST      MOD 15
E13-0 PN 5558014 EC 821490   CHARACTER COUNTER TEST    MOD 15    .  E14-1 PN 5558016 EC 821761   CHAIN EMITTER TIMING TEST MOD 15
E1F-0 PN 5558024 EC 821490   1403 PRINTER SYSTEM TEST  MOD 15    .  F0F-0 PN 5558026 EC 821490   5424 MFCU SYSTEM TEST      MOD 15
14F-2 PN 5558028 EC 824801   3277/3284 SYSTEM TEST     MOD 15    .  C4C-0 PN5558053  EC 821715   ALL PURPOSE
041-0 PN5558054  EC 821715   PRIMARY HOPPER TO PRE-PUNCH         .  042-0 PN5558055  EC 821715   SECONDARY HOPPER TO PRE-PUNCH
045-0 PN5558056  EC 821715   PRI PRE-PCH TO STKR                 .  046-0 PN5558057  EC 821715   SEC PRE-PCH TO STKR
047-0 PN5558058  EC 821715   FEED CLUTCH                         .  048-0 PN5558059  EC 821715   PUNCH PUSHER CLUTCH
049-0 PN5558060  EC 821715   PUNCH UNIT                          .  04A-0 PN5558061  EC 821715   RUN IN
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24R-0 PN5558062  EC 821715   NPRC                            .  E15-0 PN 5558063 EC 821715  1403 SYS. CARR. DIAG. I   MOD 15
015-0 PN 5558068 EC 821715   1403 CARRIAGE TAP               .  016-0 PN 5558069 EC 821715  1403 CARRIAGE TAP
017-0 PN 5558070 EC 821715   1403 CARRIAGE TAP               .  0AC-0 PN 5558071 EC 821715  PUNCH PUSHER CLUTCH
04C-0 PN5558072  EC 821715   PUNCH PUSHER CLUTCH             .  00F-0 PN 5558336 EC 821761   PRINT CLUTCH CHECK  5 LINE PNT
010-0 PN 5558337 EC 821761    PRINT CLUTCH CHECK  4 LINE PNT .  011-0 PN 5558338 EC 824843   PRINT DATA CHECK
013-0 PN 5558339 EC 821761    PRINT 3 LINES COMPLETE CYCLE   .  014-0 PN 5558340 EC 821761   PRINT 4 LINES COMPLETE CYCLE
02F-0 PN 5558342 EC 821761    PRINT CLUTCH CHECK  3 LINE PRT .  030-0 PN 5558343 EC 821761   PRINT CLUTCH CHECK  4 LINE PRT
031-0 PN 5558344 EC 824766    PRINT DATA CHECK               .  033-0 PN 5558345 EC 821761   PRINT 3 LINES COMPLETE CYCLE
034-0 PN 5558346 EC 821761   PRINT 4 LINES COMPLETE CYCLE    .  512-1 PN 5558418 EC 824880  1442 FUNCTION TESTS      MOD 15
401-1 PN 5558420 EC 824870   3741 ATT TEST W/O WRAP CONNECTOR . 402-1 PN 5558422 EC 824870  3741 ATT TEST WITH WRAP CONNECT.
CD9-0 PN 5558798 EC 824829   PACK INITIALIZER        - MOD 15 . 716-0 PN 5558914 EC 824829  3410/3411 ERAP DATA FORMAT 716
881-1 PN 7369821 EC 577098   BSCA-2 FUNCTION TEST            .  882-2 PN 7369823 EC 572216  BSCA-2 FUNCTION TEST
883-0 PN 7369825 EC 818693   BSCA 2 DIAGNOSTIC               .  884-1 PN 7369827 EC 577098  BSCA-2 FUNCTION TEST
885-0 PN 7369829 EC 818693   BSCA 2 DIAGNOSTIC               .  886-1 PN 7369831 EC 572239  BSCA-2 FUNCTION TEST
821-1 PN 7369833 EC 818396   2972-8/11 FUNCTIONAL TEST       .  822-1 PN 7369835 EC 818396  2972-8/11 FUNCTIONAL TEST
823-1 PN 7369837 EC 818396   2972-8/11 FUNCTIONAL TEST       .  824-2 PN 7369839 EC 577058  2972-8/11 FUNCTIONAL TEST
825-1 PN 7369841 EC 818396   2972-8/11 FUNCTIONAL TEST       .  826-1 PN 7369843 EC 818396  2972-8/11 FUNCTIONAL TEST
827-2 PN 7369845 EC 577058   2972-8/11 EXERCISER             .  143-2 PN 5555526 EC 824930  3277  MICRO-CODE LOADER---MOD 15
3E1-1 PN 2441613 EC 893222   HDW MULT/DIVIDE FUNC TEST MOD 15 . 3EF-1 PN 2441615 EC 893222  3EF - HDW MULT/DIV MODULE MOD 15
FF4-8 PN 2589722 EC 572266   MASTER TIMING ANALYSIS PROGRAM  .  F01-2 PN 5558000 EC 825055  MFCU FUNCTION TEST       MOD 15
E11-3 PN 5558010 EC 825055   1403 ATTACHMENT TEST     MOD 15 .  E18-2 PN 5558018 EC 825055  1403 SYS. CARR. DIAG. II  MOD 15
403-2 PN 5558780 EC 825057   3741 ATT DATA TRANSFER TEST     .  404-2 PN 5558775 EC 825057  404 - 3741 FUNCTION TEST
FE7-2 PN 5558048 EC 825047   MLTA CONFIGURE PROGRAM   MOD 15 .  893-0 PN 4234256 EC 825023  FC7  MICRO-CODE LOADER
872-5 PN 2588495 EC 571781   3270 PATTERN TEST               .  80F-2 PN 2589996 EC 571781  80F  BSCA-1 SYSTEM TEST MODULE
40F-1 PN 5558777 EC 824870   40F - 3741 SYS TEST MOD         .  C11-1 PN 1607700 EC 825068  3340 CONTROL STORE TEST - MOD 15
C14-1 PN 1607704 EC 825068   3340 ATTACHMENT TESTS - MODEL 15 . C15-4 PN 1607706 EC 825068  3340 ATTACHMENT TESTS - MOD 15
C17-3 PN 1607710 EC 825068   3340 MICROCODE LOADER --- MOD 15 . 00E-0 PN 5558335 EC 825068   PUNCH CB, PUNCH MAG 1 TIMINGS
02E-0 PN 5558341 EC 825068    PUNCH CB, PUNCH MAG 1 TIMINGS  .  FA2-3 PN 5558927 EC 825068  3340 MICRO-DIAG PART-2 MODEL 15
89F-1 PN 4234260 EC 825032   89F DA SYSTEM TEST              .  891-2 PN 4234254 EC 825034      SYS/3 DISPLAY ADAPTER TEST
311-2 PN 5558044 EC 827878   2501 GENERAL FUNC TEST   MOD 15 .  312-3 PN 2441556 EC 827878  2501 READ TEST
31F-1 PN 5558046 EC 827878   2501 SYSTEM TEST MODULE  MOD 15 .  FA6-2 PN 5558922 EC 825101  3340 DISK IPL MICROCODE - MOD 15
701-6 PN 2521877 EC 443820   3410 FUNCT TEST  SECT 1 01AUG75 .  702-4 PN 2521879 EC 443820  3410 FUNCT TEST-2        20JAN76
70A-5 PN 2521865 EC 443820   TRACK ALIGN/SKEW CHECK  20JAN76 .  70E-3 PN 2521887 EC 443820  3410 TAPE EXERCISER        20NOV75
C16-1 PN 4238696 EC 830235   3340/44 MICRO-DIAG CTRL - MOD 15 . FA1-0 PN 4238712 EC 825106  3340/44 MICRODIAG MONITOR MOD 15
371-0 PN 1966287 EC 196286    1419 FUNCTION TEST             .  372-0 PN 1966290 EC 196286    1419 READ SELECT TEST
373-0 PN 1966293 EC 196286    1419 LOGIC ANALYSIS TEST       .  0CB-0 PN 1966294 EC 196286   1419 LOGIC ANALYSIS DATA DECK
871-6 PN 2588493 EC 571781   3270 PATTERN TEST               .  FF2-1 PN 5555573 EC 830234  SYSTEM TEST SUPERVISOR    MOD 15
894-5 PN 4234258 EC 572306   894 DA FUNCTIONAL TESTS         .  FC7-3 PN 4234262 EC 572306    DISPLAY ADAPTER MICRO CODE
C1C-1 PN 4238728 EC 825149   3340/3344 INITIALIZER    MOD 15 .  CD6-6 PN 5558794 EC 825149  3340 CE DISK EDITOR       MOD 15
D44-4 PN 5558796 EC 825149   3340 AND CARD UTILITIES  MOD 15 .  FA3-3 PN 5558928 EC 825149  3340 MICRO-DIAG PART-3 MODEL 15
FA4-5 PN 5558929 EC 825149   3340 MICRO-DIAG PART-4 MODEL 15 .  FA5-4 PN 5558930 EC 825149  3340 MICRO-DIAG PART-5 MODEL 15
202-4 PN 2588525 EC 572307   MLTA ERAP                       .  80E-3 PN 2589992 EC 572307  TERMINAL STATISTICS
FC8-1 PN 4234264 EC 572307   FC7 MICRO UPDATE PROGRAM MOD 15 .  FE5-4 PN 5555558 EC 572307  MICROCODE CUST PACK UPDAT MOD 15
FF8-3 PN 5558041 EC 824880   USAGE METER TEST         MOD 15 .  CCC-4 PN 5558403 EC 572307  CCC - INSTALLATION AID    MOD 15
281-3 PN 4835401 EC 572349   BSCC ATTACHMENT TEST ---- MOD 15 . 284-2 PN 4835403 EC 572305  BSCC ALTOPOLL TEST        MOD 15
289-1 PN 4835405 EC 828448   BSCC ON-LINE REQUESTOR   MOD 15 .  28C-3 PN 4835409 EC 572349  BSCC MICROCODE LOADER --- MOD 15
28E-1 PN 4835413 EC 828448   BSCC TERMINAL STATISTICS MOD 15 .  28F-1 PN 4835415 EC 828448  BSCC SYSTEM TEST MODULE   MOD 15
FB0-3 PN 4835417 EC 572349    BSCC FUNCTIONAL MICROCODE-5415D . FD1-3 PN 4835419 EC 572305  BSCC DIAGNOSTIC MICROCODE MOD 15
FD5-2 PN 4835421 EC 572305   BSCC SYSTEM PACK UPDATE  MOD 15 .  FD6-3 PN 5555514 EC 828437  5415 LSR FEATURE TEST     MOD 15
FD7-5 PN 5555517 EC 828444   MEMORY PRINT PROGRAM     MOD 15 .  FE1-2 PN 5558030 EC 828444  5415 CPU SYSTEM TEST      MOD 15
C12-3 PN 4238694 EC 825149   3340/3344 FUNCTION TESTS MOD 15 .  C18-1 PN 4238698 EC 830233  3340/3344 FRIENDS TEST -- MOD 15
C1A-1 PN 4238700 EC 830233   3340/3344 PROBE LOOP ---- MOD 15 . C1B-3 PN 4238702 EC 572300  3340/3344 SCAN PROGRAM -- MOD 15
C1F-2 PN 4238704 EC 825149   3340/3344 SYS TEST MOD -- MOD 15 . FA0-2 PN 4238706 EC 825144  3340/3344 DISK MICROCODE--MOD 15
FA7-2 PN 4238708 EC 830242   3340/3344 IPL LOADER --- MOD15D .  FC2-1 PN 4238710 EC 830233  3340/3344 IPL FORMATTER --MOD15D
FA8-3 PN 4238713 EC 825149   3344 MICRO-DIAG PART-1 MODEL 15 .  FA9-1 PN 4238714 EC 830233  3344 MICRO-DIAG PART-2 MODEL 15
FAA-2 PN 4238715 EC 830242   3344 MICRO-DIAG PART-3 MODEL 15 .  FF7-B PN 5555578 EC 828461  DISK ERAP                 MOD 15
0CF-B PN 5558036 EC 828461   ERAP  PID FF7  DATA DECK  MOD 15 .


FFA-0 PN 5558910 EC 824829   3340 DCP BOOTSTRAP LOADER-MOD 15 . FFB-0 PN 5558912 EC 824829  FFB- DCP LOADER FOR 3340  MOD 15
FFF-7 PN 5555562  EC 830234  DIAGNOSTIC CONTROL PROG---MOD 15 . CPU-2 PN 4238724 EC 828444  3340 CPU AND MEM TESTS     MOD 15

NO. OF PGM. ENTRIES LEFT IS 505, SPACE AVAILABLE FOR PGMS. IS 05460 SECTORS.
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July 20-29

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ID FFFC. PROG DD66-C1. SSWS
1.  TURN ON SSW TO SELECT INPUT DEVICE.   17-3741    18-1442    19-2560    1A-MFCU    NONE-3277
         **NOTE  3741 CAN ONLY BE USED TO ADD PROGRAMS **
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2.  DISK DRIVE 1 WILL BE USED.  IF DRIVE 2,3, OR 4 IS DESIRED, SET ON SSWS  22,23,24, RESPECTIVELY.
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BSCC added

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$LST

FC0-2 PN 5555530 EC 824801    3277/84 MICROCODE                .  FF1-1 PN 5555571 EC 824829   SYS TEST RELOCATING LDR.  MOD 15
C18-1 PN 1607712 EC 824926   3340 FRIENDS TEST ------- MOD 15  .  C19-1 PN 1607714 EC 824926   3340 ADAPTER MANUAL OPS -MOD 15
C1A-0 PN 1607716 EC 824829   3340 CTL-I PROBE LOOP --- MOD 15  .  391-0 PN 2439005 EC 893611   1017 FUNCTION TEST 1442 COMPAT
392-0 PN 2439007 EC 893611   1017 GEN RD TEST 1442 COMPAT      .  39F-0 PN 2439009 EC 893611   39F - 1017 PT/RDR MODULE 1442C
C92-0 PN 2439025 EC  893775    1017 READ OPERATION TIMING      .  3B1-0 PN 2441499 EC 893186    1018 PTP FCT TEST  1442 COMPAT
3BF-0 PN 2441500 EC 893186   3BF - 1018 PTP MOD  1442 COMPAT   .  098-1 PN 2441501 EC 893186    1018 PTP PUNCH TIMING  1442 COM
C99-1 PN 2441502 EC 893186    1018 PTP PUNCH ECHO PULSES  144  .  313-1 PN 2441557 EC 893780   2501 READ EVALUATION TEST
3A1-1 PN 2450161 EC 823357   3881 FUNCTION TEST                .  3AF-0 PN 2450163 EC 819984   3881 SYSTEM TEST MODULE
35F-1 PN 2495154 EC 138209   1255 SYS/3 TEST MODULE            .  715-3 PN 2521873 EC 443786   3410/3411 ERAP DATA CLEAR  715
7C8-2 PN 2521875 EC 733796   3410 VELOCITY TEST        01SEP73 .  708-3 PN 2521883 EC 733796   CAPSTAN CONTROL F/L     01SEP73
70F-3 PN 2521889 EC 733797   70F - 3410/3411 TAPE      01MAY73 .  710-3 PN 2521891 EC 443786   3410/3411 ERAP DATA FORMAT 710
711-2 PN 2521893 EC 733796   3410/3411 LOG ANALYSIS    01SEP73 .  712-2 PN 2521895 EC 733796   3410/3411 LOG ANALYSIS   01SEP73
713-2 PN 2521897 EC 733796   3410/3411 STEP PGM        01SEP73 .  714-2 PN 2521899 EC 733796   3410/3411 STEP PGM 2     01SEP73
706-1 PN 2522118 EC 733796   WRITE RELIABILITY         01SEP73 .  707-1 PN 2522120 EC 733796   READ RELIABILITY         01SEP73
351-2 PN 2552542 EC 138209   1255 FUNCTION TEST                .  352-2 PN 2552545 EC 138209   1255 READ AND STACKER SELECT
353-1 PN 2552548 EC 135963   1255 DOC SPACING, LENGTH MEASURE  .  E16-4 PN 2588486 EC 577143   HAMMER ADDR AND SENSE ANAL
E17-4 PN 2588488 EC 572221   SPECIAL ATTACHMENT TEST           .  203-1 PN 2588527 EC 819018   MLTA BASIC CHECKOUT
20F-4 PN 2588537 EC 577143   MLTA SYSTEM TEST MODULE           .  301-1 PN 2588794 EC 816761   SIOC SECTION 3011   NO CONNECTOR
302-1 PN 2588795 EC 816761   SIOC SECTION 3021 WITH CONNECTOR  .  303-2 PN 2588796 EC 816761   SIOC SECTION 3032 WITH CONNECTOR
001-0 PN 2589651 EC 816592    PRI HOPPER TO WAIT TIMINGS       .  002-0 PN 2589652 EC 816592    SEC HOPPER TO WAIT TIMINGS
003-0 PN 2589653 EC 816592    PRI WAIT TO CORNER TIMINGS       .  004-0 PN 2589654 EC 816592    SEC WAIT TO CORNER TIMINGS
005-0 PN 2589655 EC 816592    CORNER TO STACKER TIMINGS        .  006-0 PN 2589656 EC 816592    PRI PUNCH CB START TIMINGS
007-0 PN 2589657 EC 816592    SEC PUNCH CB START TIMINGS       .  008-0 PN 2589658 EC 816592    PRI PUNCH CB END TIMINGS
009-0 PN 2589659 EC 816592    SEC PUNCH CB END TIMINGS         .  00A-0 PN 2589660 EC 816592    PRINT 3 LINES START TIMINGS
00B-0 PN 2589661 EC 816592    PRINT 3 LINES FINISH TIMINGS     .  00C-0 PN 2589662 EC 816592    PRINT 4 LINES FINISH TIMINGS
00D-0 PN 2589663 EC 816592    INJECT,KICK & STEP CB,S CHECK    .  021-0 PN 2589671 EC 816592    PRI HOPPER TO WAIT TIMINGS
022-0 PN 2589672 EC 816592    SEC HOPPER TO WAIT TIMINGS       .  023-0 PN 2589673 EC 816592    PRI WAIT TO CORNER TIMINGS
024-0 PN 2589674 EC 816592    SEC WAIT TO CORNER TIMINGS       .  025-0 PN 2589675 EC 816592    CORNER TO STACKER TIMINGS
026-0 PN 2589676 EC 816592    PRI PUNCH CB START TIMINGS       .  027-0 PN 2589677 EC 816592    SEC PUNCH CB START TIMINGS
028-0 PN 2589678 EC 816592    PRI PUNCH CB END TIMINGS         .  029-0 PN 2589679 EC 816592    SEC PUNCH CB END TIMINGS
02A-0 PN 2589680 EC 816592    PRINT 3 LINES START TIMINGS      .  02B-0 PN 2589681 EC 816592    PRINT 3 LINES FINISH TIMINGS
02C-0 PN 2589682 EC 816592    PRINT 4 LINES FINISH TIMINGS     .  02D-0 PN 2589683 EC 816592    INJECT,KICK & STEP CB,S CHECK
801-2 PN 2589701 EC 818660   BSCA DIAGNOSTIC 801-2             .  802-3 PN 2589703 EC 572216   BSCA    FUNCTION TEST
803-1 PN 2589705 EC 816773   BSCA DIAGNOSTIC                   .  804-1 PN 2589707 EC 577098   BSCA    FUNCTION TEST
805-0 PN 2589709 EC 816632   BSCA DIAGNOSTIC                   .  806-3 PN 2589711 EC 572239   BSCA    FUNCTION TEST
809-3 PN 2589715 EC 572216   BSCA ON-LINE REQUESTOR            .  80A-6 PN 2589717 EC 572216   BSCA ON-LINE RESPONDER
88F-0 PN 2589994 EC 818693   88F  BSCA 2 SYSTEM TEST MODULE    .  515-1 PN 2775689 EC 577108   1442 READ EVALUATION TEST
F03-3 PN 2589735 EC 572221   MFCU READ EVAL & ADJ DIAG         .  F05-1 PN 2589741 EC 818667   5424 KATAKANA RIPPLE PRINT TEST
C88-0 PN 2775693 EC 818677    OVERALL FEED TIMING CHART        .  C89-0 PN 2775694 EC 818677    READ CLUTCH RESPONSE TEST
C8A-0 PN 2775695 EC 818677    EMITTER TIMING & DURATION TEST   .  C8B-0 PN 2775696 EC 818677    PUNCH CB AND EMITTER DISPLAY
C8C-0 PN 2775697 EC 818677    PUNCH CB LENGTH CHECK            .  C8D-0 PN 2775698 EC 818677    FEED CLUTCH RESPONSE TEST
C8E-0 PN 2775699 EC 818677    READ CLUTCH RESPONSE-MULT CARDS  .  C93-0 PN 5554746 EC 821761              2501 A02      1000 CPM
C94-0 PN 5554747 EC 821761              2501 A01      600 CPM  .  FF0-1 PN 5554852 EC 824808    MLTA MICROCODE DATA DECK MOD 15
F24-2 PN 5555500 EC 824829   MASTER TIMING ANALYSIS-2  MOD 15  .  F23-1 PN 5555503 EC 821761   READ EVAL & ADJUST PROG    MOD 15
F21-4 PN 5555505 EC 824888   2560 ATTACH. TESTS        MOD 15  .  F22-4 PN 5555507 EC 824880   2560 FUNCTION TESTS        MOD 15
F2F-2 PN 5555509 EC 821761   2560 SYSTEM TEST MODULE   MOD 15  .  FD7-4 PN 5555517 EC 824943   MEMORY PRINT PROGRAM       MOD 15
141-1 PN 5555524 EC 821723   3277/84 ADAPTER TESTS     MOD 15  .  144-2 PN 5555528 EC 821723   3277/3284 UNIT FUNC TESTS-MOD 15
FC1-2 PN 5555532 EC 825050   3277 MICRO UPDATE PROGRAM-MOD 15  .  204-1 PN 5555550 EC 824934   MLTA FUNCTIONAL CHECKOUT   MOD 15
205-1 PN 5555552 EC 824829   MLTA MICROCODE LOADER     MOD 15  .  206-0 PN 5555554 EC 821490   MLTA LINE LOOP/WRAP TEST   MOD 15
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2C7-C	PN 5555586	EC 821490	MLTA LINE TEST MOD 15	CAA-C	PN 5555588	EC 821490	NPRO
CAB-C	PN 5555589	EC 821490	NPRO	CAC-C	PN 5555590	EC 821490	ALL PURPOSE
CA1-C	PN 5555591	EC 821715	PRIMARY HOPPER TO PRE-PUNCH	CA2-C	PN 5555592	EC 821715	SECONDARY HOPPER TO PRE-PUNCH
CA3-C	PN 5555593	EC 821490	PRI PRE-PCH TO STKR W/ PRINT	CA4-C	PN 5555594	EC 821490	SEC PRE-PCH TO STKR W/ PRINT
CA5-C	PN 5555595	EC 821490	PRI PRE-PCH TO STKR W/O PRINT	CA6-C	PN 5555596	EC 821490	SEC PRE-PCH TO STKR W/O PRINT
CA7-C	PN 5555597	EC 821490	FEED CLUTCH	CA8-C	PN 5555598	EC 821715	PUNCH PUSHER CLUTCH
CA9-C	PN 5555599	EC 821490	PUNCH UNIT	FC2-C	PN 5558002	EC 821490	MFCU READ/PUNCH/PRINT TESTMOD 15
511-2	PN 5558005	EC 824896	1442 COMMAND RESPONSE MOD 15	51F-C	PN 5558007	EC 821490	1442 SYSTEM TEST MOD 15
E12-C	PN 5558012	EC 821490	PRINTER FUNCTION TEST MOD 15	E13-C	PN 5558014	EC 821490	CHARACTER COUNTER TEST MOD 15
E14-1	PN 5558016	EC 821761	CHAIN EMITTER TIMING TEST MOD 15	E1F-C	PN 5558024	EC 821490	1403 PRINTER SYSTEM TEST MOD 15
FOF-C	PN 5558026	EC 821490	5424 MFCU SYSTEM TEST MOD 15	14F-2	PN 5558028	EC 824801	3277/3284 SYSTEM TEST MOD 15
FE1-1	PN 5558030	EC 824934	5415 CPU SYSTEM TEST MOD 15	C4C-C	PN5558053	EC 821715	ALL PURPOSE
C41-C	PN5558054	EC 821715	PRIMARY HOPPER TO PRE-PUNCH	C42-C	PN5558055	EC 821715	SECONDARY HOPPER TO PRE-PUNCH
C45-C	PN5558056	EC 821715	PRI PRE-PCH TO STKR	C46-C	PN5558057	EC 821715	SEC PRE-PCH TO STKR
C47-C	PN5558058	EC 821715	FEED CLUTCH	C48-C	PN5558059	EC 821715	PUNCH PUSHER CLUTCH
C49-C	PN5558060	EC 821715	PUNCH UNIT	C4A-C	PN5558061	EC 821715	RUN IN
C4B-C	PN5558062	EC 821715	NPRO	E15-C	PN 5558063	EC 821715	1403 SYS. CARR. DIAG. I MOD 15
O15-C	PN 5558068	EC 821715	1403 CARRIAGE TAP	C16-C	PN 5558069	EC 821715	1403 CARRIAGE TAP
O17-C	PN 5558070	EC 821715	1403 CARRIAGE TAP	CAC-C	PN 5558071	EC 821715	PUNCH PUSHER CLUTCH
C4C-C	PN5558072	EC 821715	PUNCH PUSHER CLUTCH	COF-C	PN 5558336	EC 821761	PRINT CLUTCH CHECK 3 LINE PNT
O1O-C	PN 5558337	EC 821761	PRINT CLUTCH CHECK 4 LINE PNT	O11-C	PN 5558338	EC 824843	PRINT DATA CHECK
O13-C	PN 5558339	EC 821761	PRINT 3 LINES COMPLETE CYCLE	O14-C	PN 5558340	EC 821761	PRINT 4 LINES COMPLETE CYCLE
O2F-C	PN 5558342	EC 821761	PRINT CLUTCH CHECK 3 LINE PRT	O3O-C	PN 5558343	EC 821761	PRINT CLUTCH CHECK 4 LINE PRT
O31-C	PN 5558344	EC 824766	PRINT DATA CHECK	O33-C	PN 5558345	EC 821761	PRINT 3 LINES COMPLETE CYCLE
O34-C	PN 5558346	EC 821761	PRINT 4 LINES COMPLETE CYCLE	512-1	PN 5558418	EC 824880	1442 FUNCTION TESTS MOD 15
401-1	PN 5558420	EC 824870	3741 ATT TEST W/O WRAP CONNECTOR	402-1	PN 5558422	EC 824870	3741 ATT TEST WITH WRAP CONNECT.
DD9-C	PN 5558798	EC 824829	PACK INITIALIZER - MOD 15	716-C	PN 5558914	EC 824829	3410/3411 ERAP DATA FORMAT 716
881-1	PN 7369821	EC 577098	BSCA-2 FUNCTION TEST	882-2	PN 7369823	EC 572216	BSCA-2 FUNCTION TEST
883-C	PN 7369825	EC 818693	BSCA 2 DIAGNOSTIC	884-1	PN 7369827	EC 577098	BSCA-2 FUNCTION TEST
885-C	PN 7369829	EC 818693	BSCA 2 DIAGNOSTIC	886-1	PN 7369831	EC 572239	BSCA-2 FUNCTION TEST
821-1	PN 7369833	EC 818396	2972-8/11 FUNCTIONAL TEST	822-1	PN 7369835	EC 818396	2972-8/11 FUNCTIONAL TEST
823-1	PN 7369837	EC 818396	2972-8/11 FUNCTIONAL TEST	824-2	PN 7369839	EC 577058	2972-8/11 FUNCTIONAL TEST
825-1	PN 7369841	EC 818396	2972-8/11 FUNCTIONAL TEST	826-1	PN 7369843	EC 818396	2972-8/11 FUNCTIONAL TEST
827-2	PN 7369845	EC 577058	2972-8/11 EXERCISER	143-2	PN 5555526	EC 824930	3277 MICRO-CODE LOADER---MOD 15
3E1-1	PN 2441613	EC 893222	HDW MULT/DIVIDE FUNC TEST MOD 15	3EF-1	PN 2441615	EC 893222	3EF - HDW MULT/DIV MODULE MOD 15
FF4-8	PN 2589722	EC 572266	MASTER TIMING ANALYSIS PROGRAM	FC1-2	PN 5558000	EC 825055	MFCU FUNCTION TEST MOD 15
E11-3	PN 5558010	EC 825055	1403 ATTACHMENT TEST MOD 15	E18-2	PN 5558018	EC 825055	1403 SYS. CARR. DIAG. II MOD 15
403-2	PN 5558780	EC 825057	3741 ATT DATA TRANSFER TEST	404-2	PN 5558775	EC 825057	404 - 3741 FUNCTION TEST
FE7-2	PN 5558048	EC 825047	MLTA CONFIGURE PROGRAM MOD 15	893-C	PN 4234256	EC 825023	FC7 MICRO-CODE LOADER
872-5	PN 2588495	EC 571781	3270 PATTERN TEST	8CF-2	PN 2589996	EC 571781	8CF BSCA-1 SYSTEM TEST MODULE
4OF-1	PN 5558777	EC 824870	40F - 3741 SYS TEST MOD	C11-1	PN 1607700	EC 825068	3340 CONTROL STORE TEST - MOD 15
C14-1	PN 1607704	EC 825068	3340 ATTACHMENT TESTS - MODEL 15	C15-4	PN 1607706	EC 825068	3340 ATTACHMENT TESTS - MODEL 15
C17-3	PN 1607710	EC 825068	3340 MICROCODE LOADER --- MOD 15	CCE-C	PN 5558335	EC 825068	PUNCH CB, PUNCH MAG 1 TIMINGS
C2E-C	PN 5558341	EC 825068	PUNCH CB, PUNCH MAG 1 TIMINGS	FA2-3	PN 5558927	EC 825068	3340 MICRO-DIAG PART-2 MODEL 15
FA7-2	PN 5558924	EC 825068	3340 DISK IPL LOADER ---- MOD 15	89F-1	PN 4234260	EC 825032	89F DA SYSTEM TEST
891-2	PN 4234254	EC 825034	SYS/3 DISPLAY ADAPTER TEST	311-2	PN 5558044	EC 827878	2501 GENERAL FUNC TEST MOD 15
312-3	PN 2441556	EC 827878	2501 READ TEST	31F-1	PN 5558046	EC 827878	2501 SYSTEM TEST MODULE MOD 15
FA6-2	PN 5558922	EC 825101	3340 DISK IPL MICROCODE - MOD 15	FC2-3	PN 5558916	EC 825101	3340 MICRO UPDATE ON CYLO-MOD 15
701-6	PN 2521877	EC 443820	3410 FUNCT TEST SECT 1 01AUG75	702-4	PN 2521879	EC 443820	3410 FUNCT TEST-2 20JAN76
70A-5	PN 2521885	EC 443820	TRACK ALIGN/SKEW CHECK 20JAN76	70E-3	PN 2521887	EC 443820	3410 TAPE EXERCISER 20NOV75
C12-5	PN 1607702	EC 830233	3340 FUNCTION TESTS ----- MOD 15	C16-1	PN 4238696	EC 830233	3340/44 MICRO-DIAG CTRL - MOD 15
FA1-C	PN 4238712	EC 825106	3340/44 MICRODIAG MONITOR MOD 15	371-C	PN 1966287	EC 196286	1419 FUNCTION TEST
372-C	PN 1966290	EC 196286	1419 READ SELECT TEST	373-C	PN 1966293	EC 196286	1419 LOGIC ANALYSIS TEST
OCB-C	PN 1966294	EC 196286	1419 LOGIC ANALYSIS DATA DECK	871-6	PN 2588493	EC 571781	3270 PATTERN TEST
FF2-1	PN 5555573	EC 830234	SYSTEM TEST SUPERVISOR MOD 15	C1F-3	PN 1607720	EC 830233	3340 SYSTEM TEST MODULE - MOD 15
894-5	PN 4234258	EC 572306	894 DA FUNCTIONAL TESTS	FC7-3	PN 4234262	EC 572306	DISPLAY ADAPTER MICRO CODE
C1C-1	PN 4238728	EC 825149	3340/3344 INITIALIZER MOD 15	DD6-6	PN 5558794	EC 825149	3340 CE DISK EDITOR MOD 15
D44-4	PN 5558796	EC 825149	3340 AND CARD UTILITIES MOD 15	FAC-6	PN 5558920	EC 825149	3340 DISK MICROCODE ----- MOD 15
FA3-3	PN 5558928	EC 825149	3340 MICRO-DIAG PART-3 MODEL 15	FA4-5	PN 5558929	EC 825149	3340 MICRO-DIAG PART-4 MODEL 15
FA5-4	PN 5558930	EC 825149	3340 MICRO-DIAG PART-5 MODEL 15	2C2-4	PN 2588525	EC 572307	MLTA ERAP
80E-3	PN 2589992	EC 572307	TERMINAL STATISTICS	FC8-1	PN 4234264	EC 572307	FC7 MICRO UPDATE PROGRAM MOD 15
C1B-3	PN 4238702	EC 572300	3340/3344 SCAN PROGRAM -- MOD 15	FE5-4	PN 5555558	EC 572307	MICROCODE CUST PACK UPDAT MOD 15
FF8-3	PN 5558041	EC 824880	USAGE METER TEST MOD 15	CCC-4	PN 5558403	EC 572307	CCC - INSTALLATION AID MOD 15
281-3	PN 4835401	EC 572349	BSCC ATTACHMENT TEST ---- MOD 15	284-2	PN 4835403	EC 572305	BSCC AUTOPOLL TEST MOD 15
289-1	PN 4835405	EC 828448	BSCC ON-LINE REQUESTOR MOD 15	28C-3	PN 4835409	EC 572349	BSCC MICROCODE LOADER --- MOD 15
28E-1	PN 4835413	EC 828448	BSCC TERMINAL STATISTICS MOD 15	28F-1	PN 4835415	EC 828448	BSCC SYSTEM TEST MODULE MOD 15

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FBC-3 PN 4835417 EC 572349   ESCC FUNCTIONAL MICROCODE-5415D  .  FD1-3 PN 4835419 EC 572305   ESCC DIAGNOSTIC MICROCODE MOD 15
FD5-2 PN 4835421 EC 572305   ESCC SYSTEM PACK UPDATE   MOD 15  .  FD6-3 PN 5555514 EC 828437   5415 LSR FEATURE TEST     MOD 15
FF7-B PN 5555578 EC 828461   DISK ERAP                 MOD 15  .  CCF-B PN 5558036 EC 828461   ERAP  FID FF7  DATA DECK  MOD 15


FFA-C PN 5558910 EC 824829   3340 DCP BOOTSTRAP LOADER-MOD 15  .  FFB-C PN 5558912 EC 824829   FFB- DCP LOADER FOR 3340  MOD 15
FFF-7 PN 5555562  EC 830234  DIAGNOSTIC CONTROL PROG---MOD 15  .  CPL-1 PN 4238724 EC 830233   3340 CPL AND MEM TESTS    MOD 15

NO. OF PGM. ENTRIES LEFT IS 520, SPACE AVAILABLE FOR PGMS. IS 08137 SECTORS.
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