

SECTION	14.1	CASSETTE CONTROL UNIT IDENTIFICATIONS	PAGE 14-2
	14.2	INSTALLATION DETAILS	14-3
	14.3	INTERFACE CONNECTION	14-5
	14.4	HARDWARE-SOFTWARE INTERFACE DETAILS	14-7
	14.4.1	Status Word	14-8
	14.5	SHORT DESCRIPTION TESTPROGRAM	14-10
	14.6	SHORT ROUTINES	14-11
	14.7	PREVENTIVE MAINTENANCE	14-13/14

LIST OF ILLUSTRATIONS

FIGURE	14.1	CASSETTE EQUIPMENT SHELF	14-3
	14.2	STRAPSETTING CASSETTE CONTROL CARD	14-3
	14.3	CASSETTE TAPE CHASSIS LAYOUT	14-3
	14.4	BREAK AND BUS CONNECTIONS	14-4
	14.5	CASSETTE TAPE CHASSIS CIRCUIT	14-5
	14.6	BLOCKDIAGRAM / COMMAND-WORD FORMATS	14-6
	14.7	INSTRUCTION / COMMAND-WORD FORMATS	14-7
	14.8	LUBRICATION POINTS OF THE DIGITAL CASSETTE RECORDS	14-15
		CASSETTE RECORDS	

LIST OF TABLES

TABLE	14.1	INTERFACE CONNECTION	14-6
-------	------	----------------------	------

#### 14.1 CASSETTE CONTROL UNIT - IDENTIFICATIONS

Type Number : P-833-152 (incl. rack)  
Testprogram : BCASS1  
Channel : Programmed (PC) or Hardware MIOP/IOP/IOZR channel.  
Devices : DCR1 - P-833-001  
          DCR3 - P-833-002  
Power Consumption : Self-contained.

## 14.2 INSTALLATION DETAILS

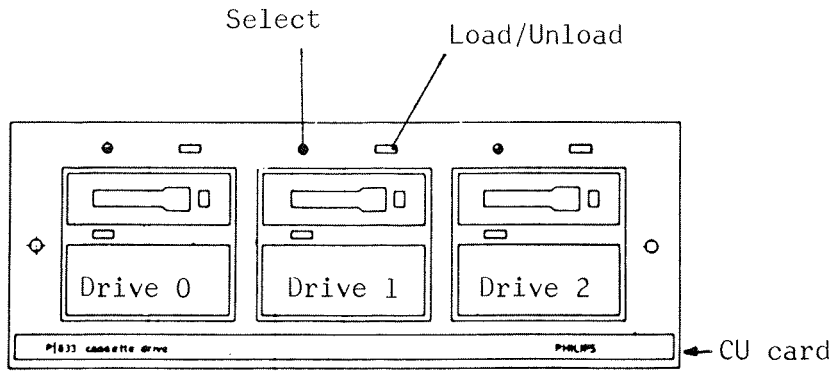


Figure 14.1 CASSETTE EQUIPMENT SHELF

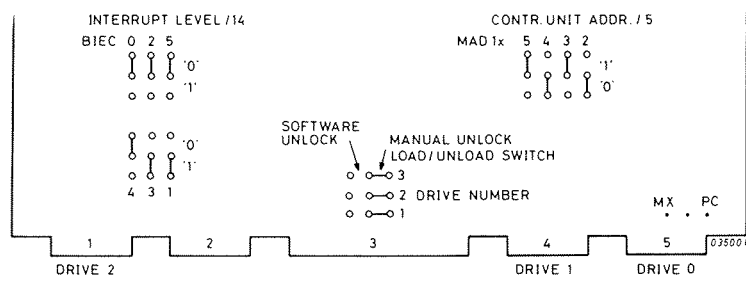


Figure 14.2 STRAPSETTING CASSETTE CONTROL CARD

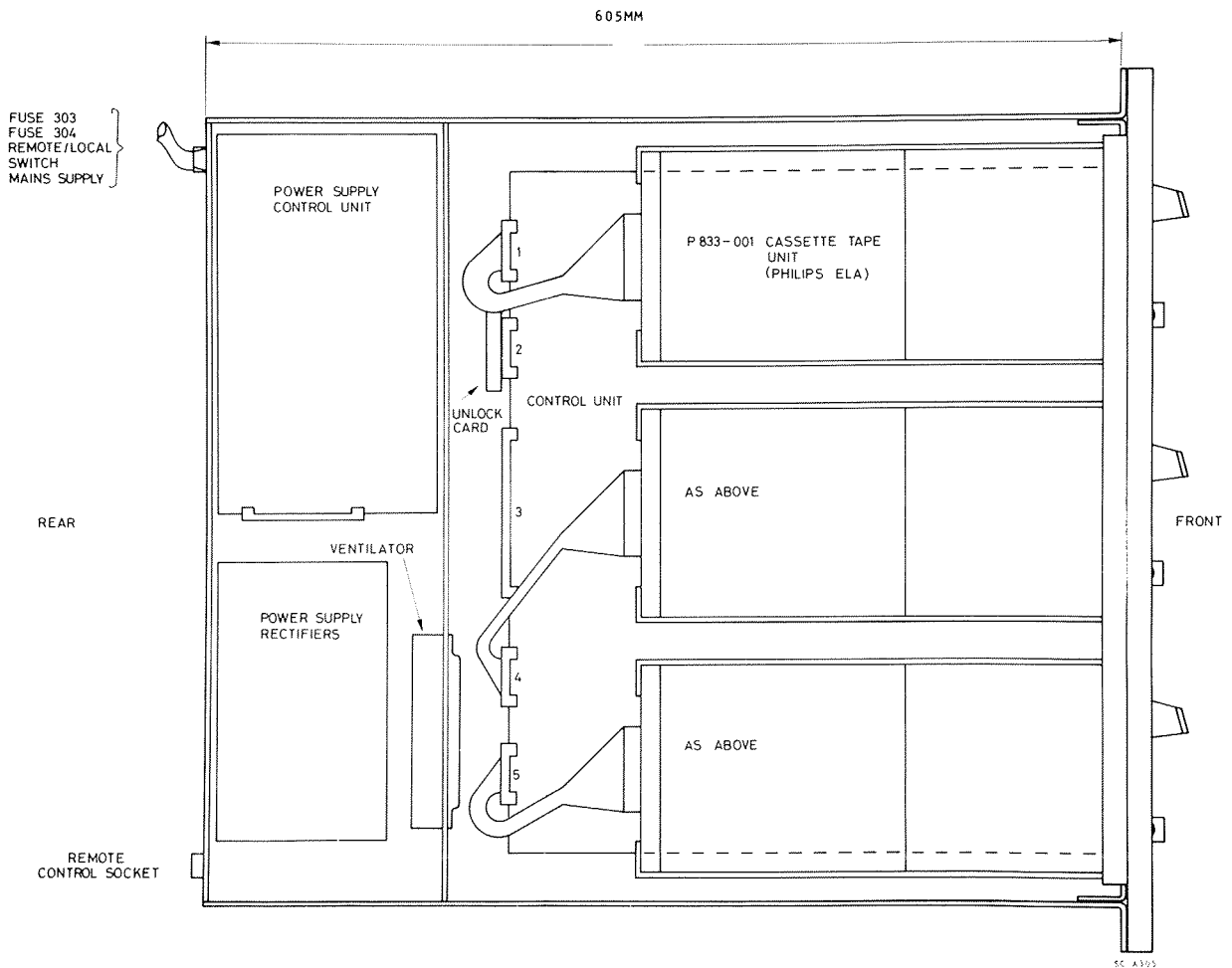


Figure 14.3 CASSETTE TAPE CHASSIS LAYOUT (P833-152 EQUIPMENT SHELVES)

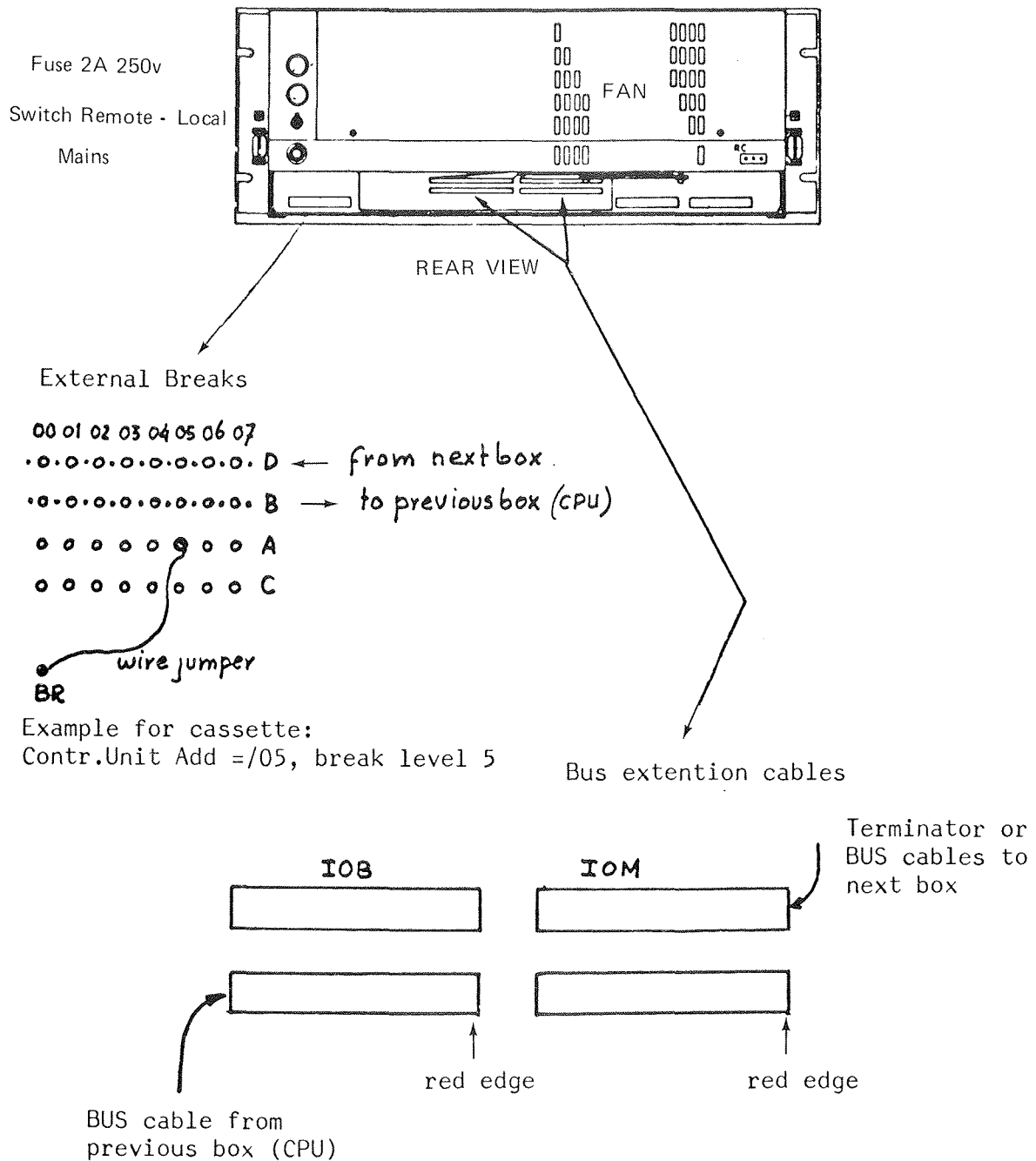


Figure 14.4 BREAK AND BUS CONNECTIONS



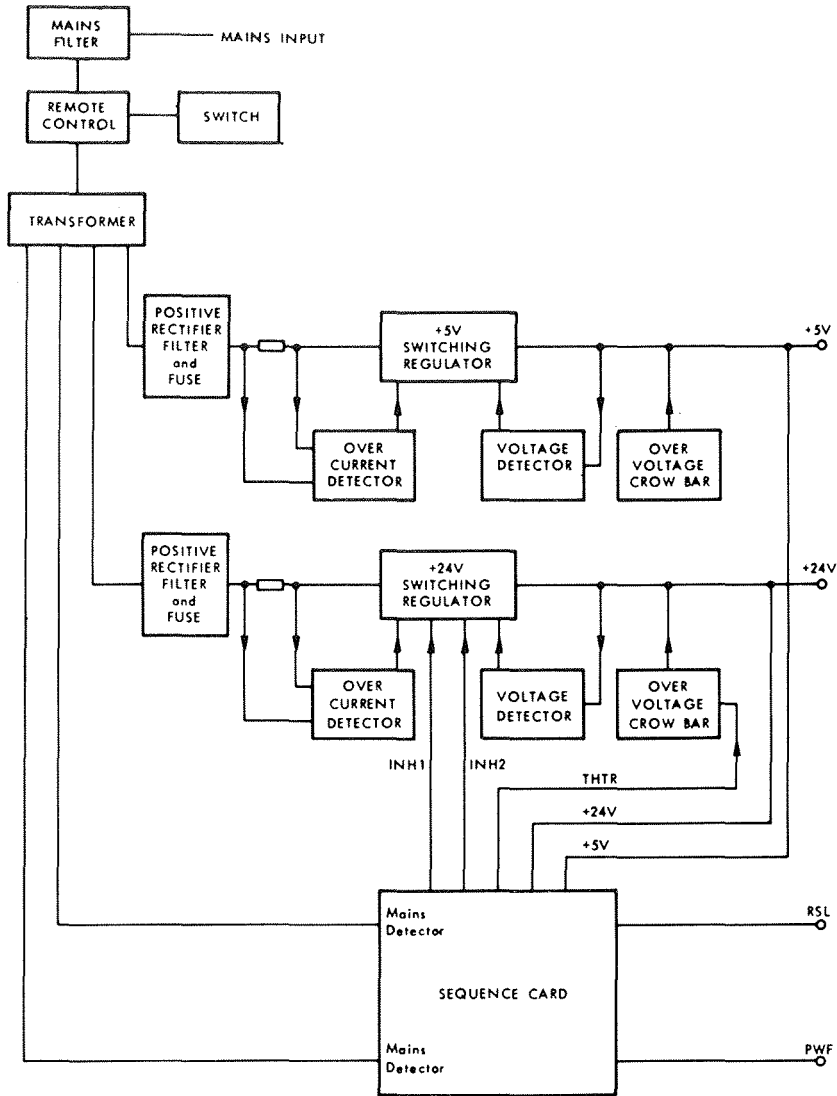


Figure 14.6 BLOCKDIAGRAM POWER SUPPLY

Signal Name *	Cassette Connector Pin No.	Cassette-Cu Connector Pin No.	Meaning
WEN <sub>n</sub> N	B	nA12	Write Enable
BET <sub>n</sub> N	C	nA11	Beginning/End of Tape
LOCK <sub>n</sub>	D	nA10	Lock Command
RWD <sub>n</sub>	E	nA09	Rewind Command
RCD <sub>n</sub>	F	nA08	Read Command
WCD <sub>n</sub>	H	nA07	Write Command
RDAn <sub>n</sub>	J	nA06	Read Data
WDLn <sub>n</sub>	K	nA04	Write Data
FAST <sub>n</sub>	1	nB01	Fast Command
CIPn <sub>n</sub>	3	nB03	Cassette in Place
RDYn <sub>n</sub>	4	nB04	Head in Contact
ASn <sub>n</sub>	5	nB05	'A' Side Up
REVn <sub>n</sub>	6	nB06	Reverse Command
FWDn <sub>n</sub>	7	nB07	Forward Command
Signal Ground	L		
+5V	9		
+24V	10		See Power Supply connections
0V (supply)	8		

\* for drive 0, n - 5  
for drive 1, n - 4  
for drive 2, n - 1

Table 14.1 INTERFACE CONNECTION

# 14.4 HARDWARE-SOFTWARE INTERFACE DETAILS

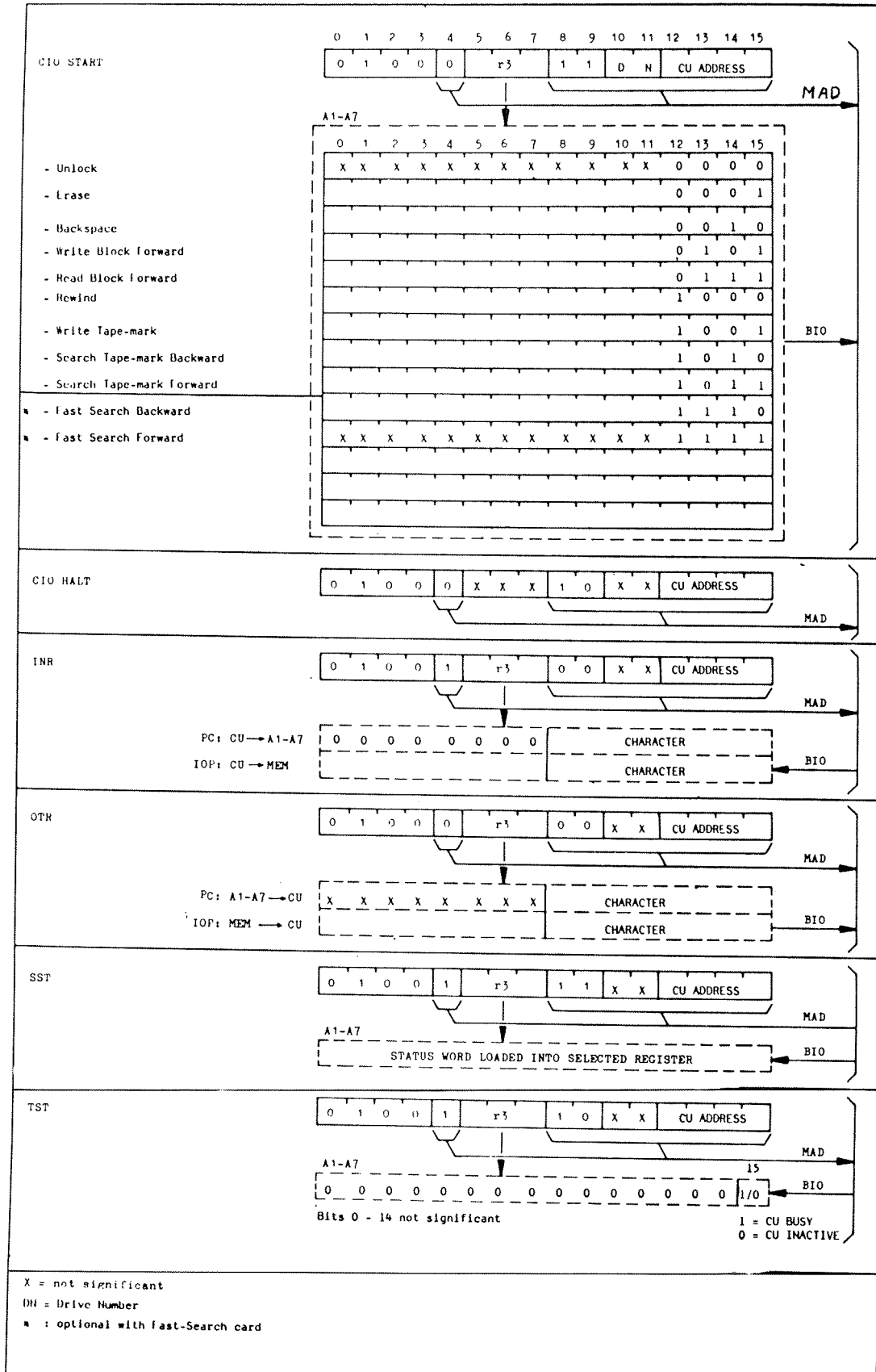
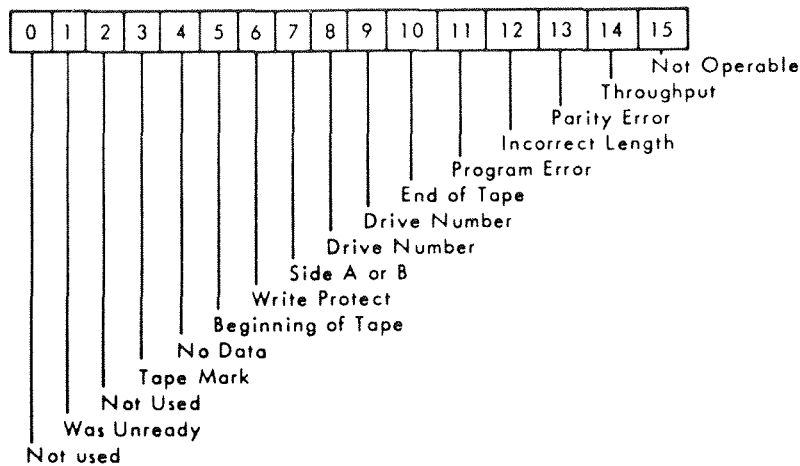


Figure 14.7 INSTRUCTION / COMMAND-WORD FORMATS

### 14.4.1 STATUS WORD



#### Not Operable

Bit 15 is set if the selected drive unit is inoperable due to either the control unit/drive unit being busy, cassette not loaded, cassette not locked, or power failure in the cassette drive.

#### Throughput Error

Bit 14 is set when serialization or deserialization of a character has ended before the CPU has answered the exchange data request. When this error occurs data exchange requests are inhibited, the tape stops when the interblock gap is realized, and the control unit switches into the Wait Status state.

#### Parity Error

Bit 13 is set when the Cyclic Redundancy Check (CRC) fails at the end of either a Read or Write command.

#### Incorrect Length

Bit 12 is set during a Read command whenever the physical length is different from the programmed block length.



### Program Error

Bit 11 is set when an invalid CIO start, INR, or OTR command is received. This error stops any data exchange.

### End of Tape

Bit 10 is set when the End of Tape hole is passed in the forward direction. It is reset when the hole is passed in the reverse direction.

### Drive Number

Bits 8 and 9 set in binary to indicate the selected drive unit as follows:

bits	8	9
Drive 0	0	0
Drive 1	0	1
Drive 2	1	0

### Side A or B

Bit 7 is set when side A of the cassette is up and reset when side B of the cassette is up.

### Write Protect

Bit 6 is set when a Write or Erase command has been attempted on a file protected track.

### Beginning of Tape

Bit 5 is set when the Beginning of Tape hole is passed in the reverse direction. It is used to indicate the end of rewind operations.

### No Data

Bit 4 is set during a Read command when no data has been read for 400 mm.

### Tape Mark

Bit 3 is set when the Tape Mark is detected during Read, Space, or Search commands.

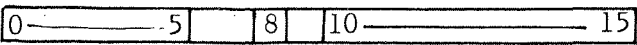
### Was Unready

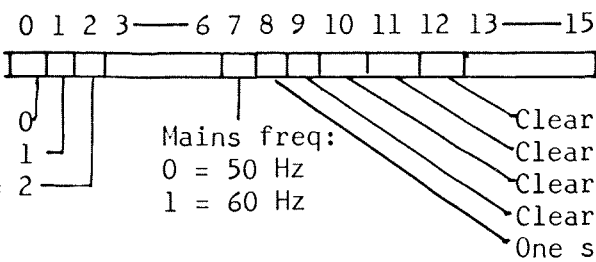
Bit 1 is set during a scanning operation when a drive state has changed from inoperable to operable.

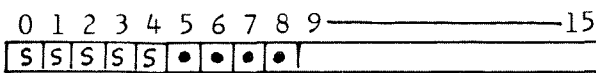
## 14.5 SHORT DESCRIPTION TESTPROGRAM

Test-program BCASS1 4K

- 1) IPL  
Program stops at /700 (=restart address and normal end)
- 2) Switch on RTC (PP/AR also possible) and insert cassette on A-side
- 3)

A8: 
  
 Int.Level 0=MX CU Address Stand.levels P852/6/7/8/9.
   
 1=PC Preset: /5005
   
 Int.Lev.: /14
   
 DA: /05

A9: 
  
 Drive 0
   
 Drive 1
   
 Drive 2
   
 Mains freq:
   
 0 = 50 Hz
   
 1 = 60 Hz
   
 Clear stop on information
   
 Clear edition
   
 Clear stop on program
   
 Clear stop on error
   
 One shot
   
 Preset: /8000

A10: 
  
 S = Standard setting, • = optional
   
 Checks to be executed

- 4) Depress MC, RUN

Error stop at /5F0 (A1 indicates fault)  
 Restart after power-off at /6EE  
 Interrupts return to /700  
 Information stop at /5E0

For more information, see official description of test-program.

# 14.6 SHORT ROUTINES

```

DATE 04-01-80      IDENT  TESTK7

00000              IDENT  TESTK7
00001              *
00002              *=====PUT STRAP TO PROGRAMMED CHANNEL=====
00003              *
00004              *THIS PROGRAM TESTS THE MOST IMPORTANT CASSETTE COMMANDS
00005              *PER BLOCK
00006              *
00007              * A1 COMMAND
00008              * A7 DATA WRITE
00009              * A3 STATUS
00010              * A4 LENGTH (4-256 CHAR)
00011              * A5 GEN USE
00012              * A2 DATA READ
00013              *
00014              *HLT CAN BE REPLACED BY RB FOR LOOP ON COMMAND
00015              *
00016      0005      DA      EQU      /05
00017              AORG      /80
00018      0080      FFFF      DATA  /FFFF
00019      0082      0000      DATA  0
00020      0084      207F      START  HLT
00021      0086      20BF      INH
00022      0088      04FF      LDK      A4,/FF      PRESET LENGTH (MAX)
00023      008A      0755      LDK      A7,/55      PRESET DATA ('U')
00024      008C      207F      HLT
00025              *
00026      008E      0109      LDK      A1,9
00027      0090      41C5      CIO      A1,1,DA
00028      0092      4185      CIO      A1,0,DA      WRITE TAPE MARK
00029      0094      4BC5      SST      A3,DA
00030      0096      5C04      RB(4)   *-2
00031      0098      207F      HLT
00032              *
00033      009A      0101      LDK      A1,1      ERASE FWD
00034      009C      41C5      CIO      A1,1,DA
00035      009E      4BC5      SST      A3,DA
00036      00A0      5C04      RB(4)   *-2
00037      00A2      207F      HLT
00038              *
00039      00A4      8510      LDR      A5,A4      WRITE ONE BLOCK FWD
00040      00A6      0105      LDK      A1,5
00041      00A8      41C5      CIO      A1,1,DA
00042      00AA      4705      OTR      A7,0,DA
00043      00AC      5C04      RB(4)   *-2
00044      00AE      1D01      SUK      A5,1
00045      00B0      5C08      RB(4)   *-6
00046      00B2      4185      CIO      A1,0,DA
00047      00B4      4BC5      SST      A3,DA
00048      00B6      5C04      RB(4)   *-2
00049      00B8      207F      HLT
00050              *
00051      00BA      0102      LDK      A1,2      BACKSPACE
00052      00BC      41C5      CIO      A1,1,DA
00053      00BE      4BC5      SST      A3,DA
00054      00C0      5C04      RB(4)   *-2
00055      00C2      207F      HLT
00056              *
00057      00C4      8510      LDR      A5,A4      READ BLOCK FWD
00058      00C6      0107      LDK      A1,7
00059      00C8      41C5      CIO      A1,1,DA
00060      00CA      4A05      INR      A2,0,DA
00061      00CC      5C04      RB(4)   *-2
00062      00CE      00CE      ANKL     A2,/FF
00063              *
00064      00D2      EA1C      CWR      A2,A7
00065      00D4      5002      RF(0)   **4
00066      00D6      207F      HLT      DATA FAULT
00067      00D8      1D01      SUK      A5,1
00068      00DA      5C12      RB(4)   *-10
00069      00DC      4185      CIO      A1,0,DA
00070      00DE      4BC5      SST      A3,DA
00071      00E0      5C04      RB(4)   *-2
00072      00E2      207F      HLT
00073              *
00074      00E4      010A      LDK      A1,/A      SEARCH TAPE MARK BWD
00075      00E6      41C5      CIO      A1,1,DA
00076      00E8      4BC5      SST      A3,DA
00077      00EA      5C04      RB(4)   *-2
00078      00EC      207F      HLT
00079              *
00079      00EE      5F64      RB      START+8
00080              END      START

```

DATE 04-01-80 IDENT TESTK7 FOR PTS

SYMBOL TABLE

DA 0005 A START 0084 A

ASS.ERR. 00000

:EOF

PROG ELAPSED TIME: 00H-00M-17S-080MS-

PAGE 1 DATE 80-03-13 IDENT MEMCAS

```

00000 IDENT MEMCAS
00001 *PROGRAM TO PUT SMALLPROGRAMS ON CASSETTE
00002 *CASSETTE ON PROGRAMMED CHANNEL DEVICE ADDR /05
00003 * PUT THE FIRST ADDRESS OF THE PROG IN A1
00004 * PUT THE LAST ADDRESS IN A2
00005 * FOR NORMAL IPL NOT MORE THAN 80 CHAR IN A BLOCK
00006 * IF MORE CHARACTERS IN A BLOCK ARE NECESSARY USE ROUTINE CASG80
00007 AORG /80
00008 0080 FFFF DATA /FFFF
00009 0082 0000 DATA 0
00010 0084 207F START HLT
00011 0086 20BF INH
00012 0088 1202 ADK A2,2
00013 008A 0305 LDK A3,5
00014 008C 43C5 CIO A3,1,/05
00015 008E E324 OUT LCR A3,A1
00016 0090 4305 OTR A3,0,/05
00017 0092 5C04 RB(4) *-2
00018 0094 1101 ADK A1,1
00019 0096 E908 CWR A1,A2
00020 0098 5D0C RB(5) OUT
00021 009A 4385 CIO A3,0,/05
00022 009C 4CC5 SST A4,/05
00023 009E 5C04 RB(4) *-2
00024 00A0 5F1E RB START
00025 * IF THERE ARE ALREADY ROUTINES ON THE CASSETTE
00026 * YOU CAN SKIP BLOCK WITH THE NEXT ROUTINE
00027 * SO START ON ADDRESS /00A2
00028 00A2 207F SKIP HLT
00029 00A4 20BF INH
00030 00A6 0307 LDK A3,7
00031 00AB 43C5 CIO A3,1,/05
00032 00AA 4CC5 SST A4,/05
00033 00AC 5C04 RB(4) *-2
00034 00AE 5F0E RB SKIP
00035
00036 * IF THERE ARE MORE ROUTINES ON THE CASSETTE YOU CAN
00037 * LOAD THE NEXT ONE BY THE NEXT IPL
00038
00039 END START

```

DATE 80-03-13 IDENT CASG80

```

00000 IDENT CASG80
00001 *PROGRAM FOR MORE THAN 80 CHAR ON CASSETTE
00002 *PUT THIS ROUTINE AS A BLOCK IN FRONT OF THE LONGER ROUTINE
00003 * NUMBER IS THE NUMBER OF CHARACTERS IN THE NEXT ROUTINE
00004 *THE ROUTINE IS PRESET FOR 256 CHARACTER
00005
00006 0000 FFFF DATA /FFFF
00007 0002 0000 DATA 0
00008 0004 8520 START LDKL A5,NUMBER
00009 0006 0100
00009 0008 0680 LDK A6,/80
00010 000A 0F42 AB /0042
00011 0100 NUMBER EQU 256
00012 END START

```

## 14.7 PREVENTIVE MAINTENANCE TO DCR 1

Every 600 hours the following preventive maintenance is to be executed on DCR:

- Clean the write/read head surface with a head cleaning cassette (wet type) or with cotton wool buds or chamois leather cloth and "isopropanol" liquid.  
Note: Do not use too much isopropanol in order to remove grease from bearing etc.

Every 6 months, in addition to the 600 hours maintenance, the following preventive maintenance is to be executed:

- Clean the capstan, pinch rollers, read/write head, with cotton wool buds or chamois leather cloth and isopropanol.

Clean the chassie from wear and dust particles with a brush

Clean the BOT/EOT detector (49) with a brush and also replace the BOT/EOT lamp ass. (69).

Clean the gear wheels (78) with a brush.

Clean the belt (62) with isopropanol and check the condition (if necessary replace the belt)

- Grease (only use Molykote BR2) following points:

The "contact-faces" of the retrieval segment (107) and latch assembly (96) with the cassette holder top section (106).

The "contact-faces" of the retrieval arm (102) with the A-side lever (112) and write-enable lever (113).

The "contact-faces" of the two clamps (58A,B9) with the nipples (56A,B9).

Every 12 months, in addition to the 600 hours and the 6 months maintenance, execute the following preventive maintenance:

- Grease also the following, pivots of the cassette holder lift section  
the lift levers (99) and (101) with the cassette holder bottom section (98),  
the lift levers (99) and (101) with the chassis (1),  
the two guides (76A) and (76B),  
the contact-face of the retrieval lever (2) with the chassis (1),  
the contact-face of the lock slide (8) with the chassis (1),  
the contact-face of the lever (51) with the chassis (1),  
the pivots of the four solenoid flap assemblies (11A), (11B), (11C) and (12),  
the pivot of the rod (33) with the rocker arm assembly (35),  
the contact-face of the nipple (26) with the rod (33).



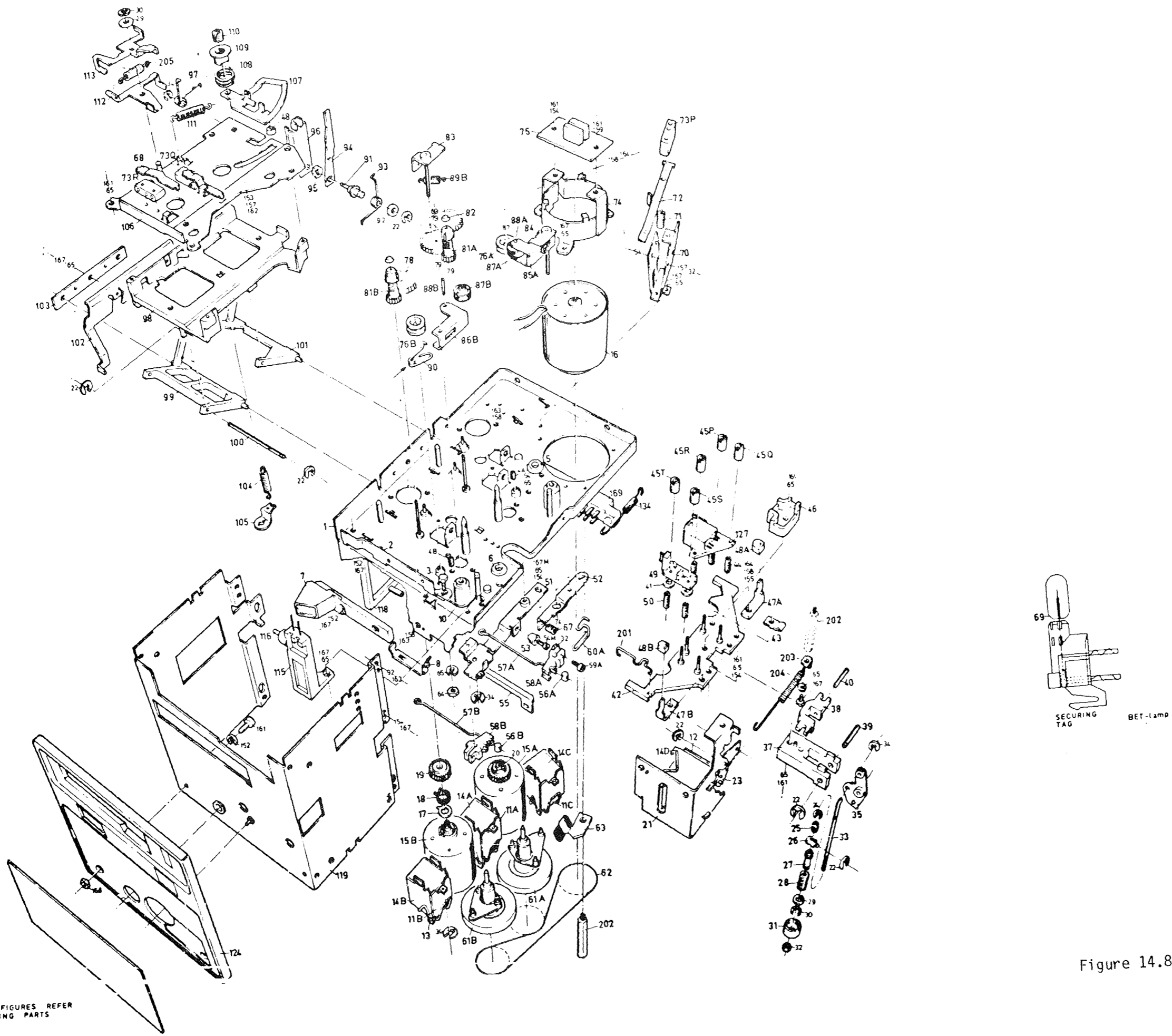


Figure 14.8 LUBRICATION POINTS OF THE DIGITAL CASSETTE RECORDER

P858/859 REF





SECTION	15.1	FLEXIBLE DISC CONTROL UNIT - IDENTIFICATIONS	PAGE 15-2
	15.2	INSTALLATION DETAILS	15-3
	15.3	INTERFACE CONNECTIONS	15-9
	15.4	HARDWARE-SOFTWARE INTERFACE DETAILS	15-10
	15.4.1	Status Word	15-11
	15.5	SHORT DESCRIPTION TESTPROGRAMS	15-13
	15.6	SHORT ROUTINES	15-14
	15.7	PREVENTIVE MAINTENANCE	15-17
	15.8	OPERATING FREQUENCY CONVERSION	15-19

## LIST OF ILLUSTRATIONS

FIGURE	15.1	CONNECTORS, CABLES, U-LINKS	15-3
	15.2	INSTALLATION DETAILS	15-4
	15.3	FLOPPY DRIVE CHASSIS, FRONT VIEW	15-5
	15.4	FLOPPY DRIVE CHASSIS, REAR VIEW	15-5
	15.5	FLOPPY DRIVE CHASSIS, RIGHT SIDE INTERIOR	15-6
	15.6	POWER SUPPLY SCHEMATIC	15-7
	15.7	FLOPPY DISC DRIVE POWER CONNECTORS	15-8
	15.8	INSTRUCTION / COMMAND-WORD FORMATS	15-10
	15.9	SEARCH KEY, READ-KEY PATTERN, DATA LOADING	15-12
	15.10	HEAD LOAD PAD REPLACEMENT	15-18
	15.11	FDD FREQUENCY CONVERSION INSTRUCTIONS	15-19
	15.12	DISCETTE DIMENSIONS	15-20

## LIST OF TABLES

TABLE	15.1	CU-DEVICE INTERFACE	15-9
-------	------	---------------------	------

## 15.1 FLEXIBLE DISC CONTROL UNIT - IDENTIFICATIONS

Type Number : P-830-045  
Testprogram : BFLOP1  
Channel : PC or MX  
Break-connection: 3A43  
Devices : Flexible Disc Drive CDC 9404, with doorlock P830-006  
CDC 9404, no doorlock P830-015  
Power Consumption : +5 Volt, 4.7 Amp.  
+25 Volt, 1.3 Amp. (Drive)  
+5 Volt, 0.8 Amp. (Drive)

# 15.2 INSTALLATION DETAILS

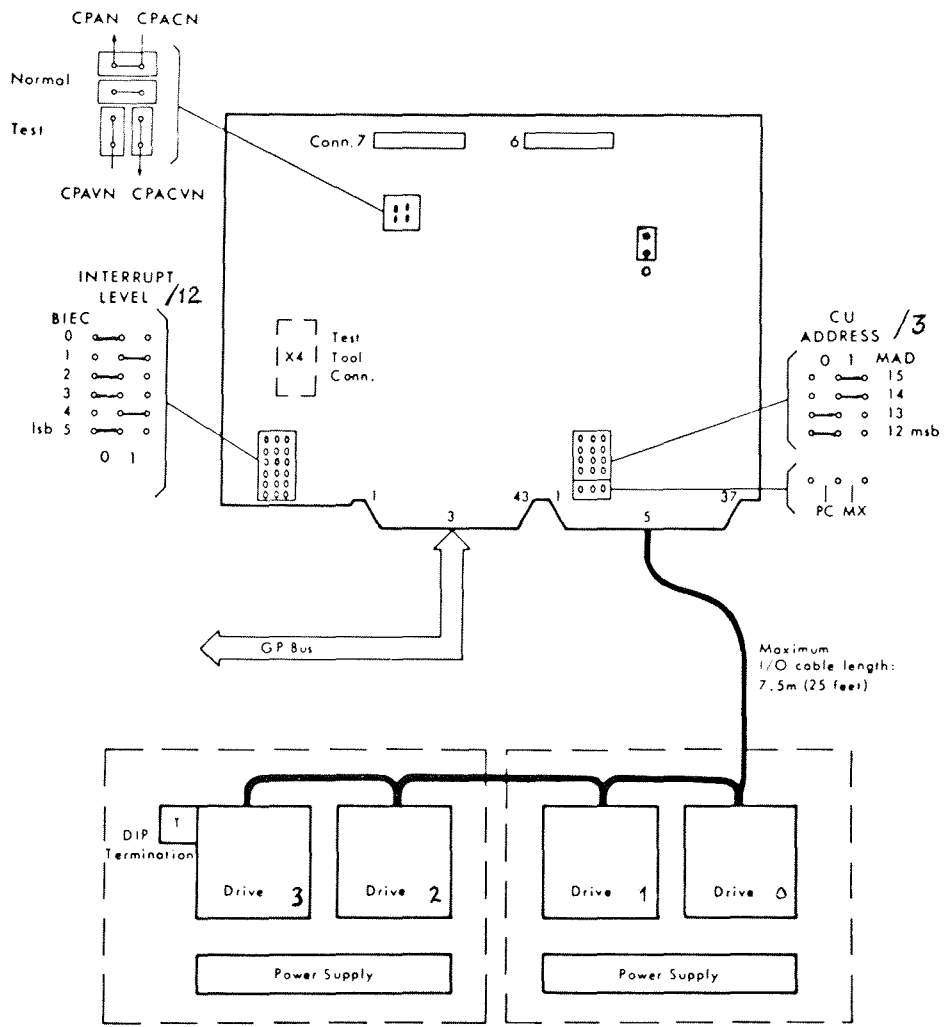
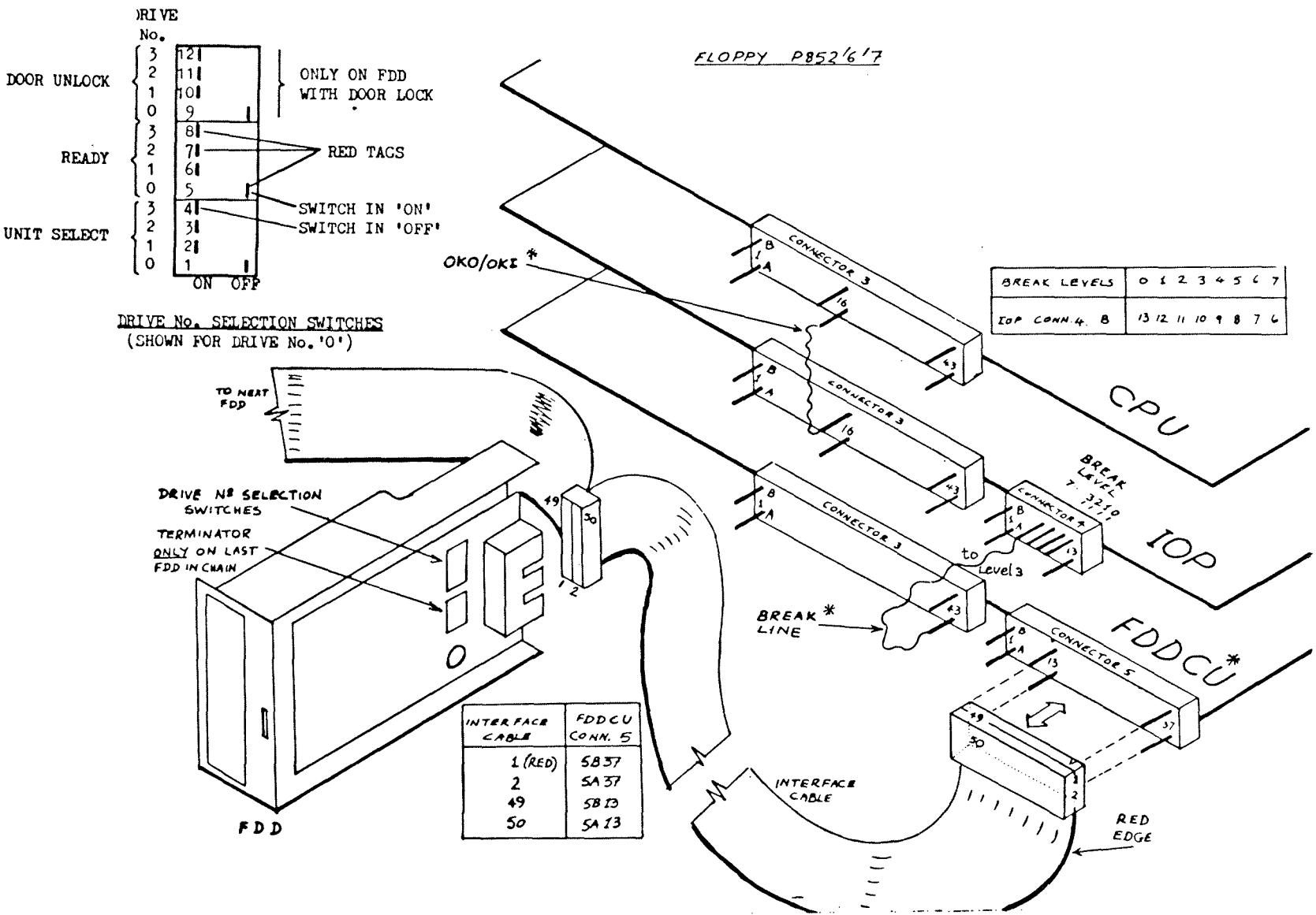


Figure 15.1 CONNECTORS, CABLES, U-LINKS



\* Note: P858/9: OKO/OKI and BREAK connected to MIOp (channel 0) see chapter INSTALLATION

Figure 15.2 INSTALLATION DETAILS

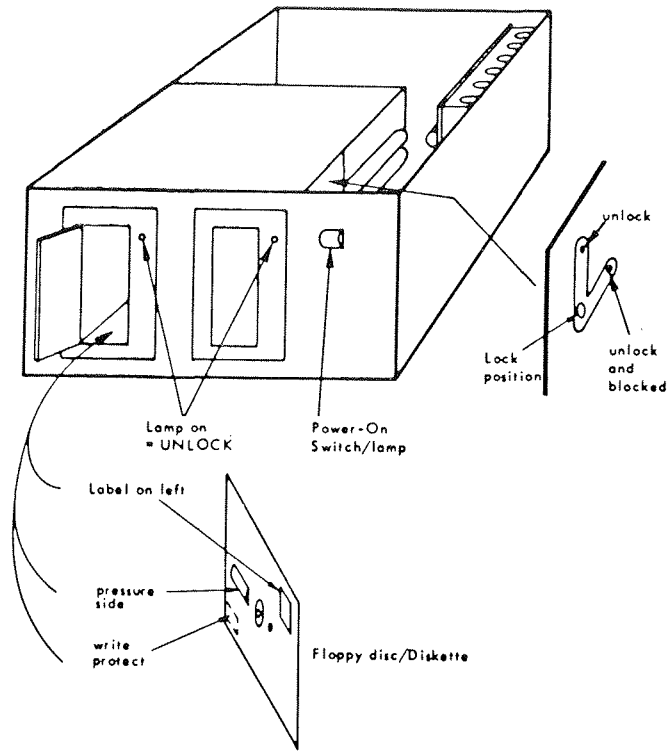


Figure 15.3 FLOPPY DRIVE CHASSIS, FRONT VIEW

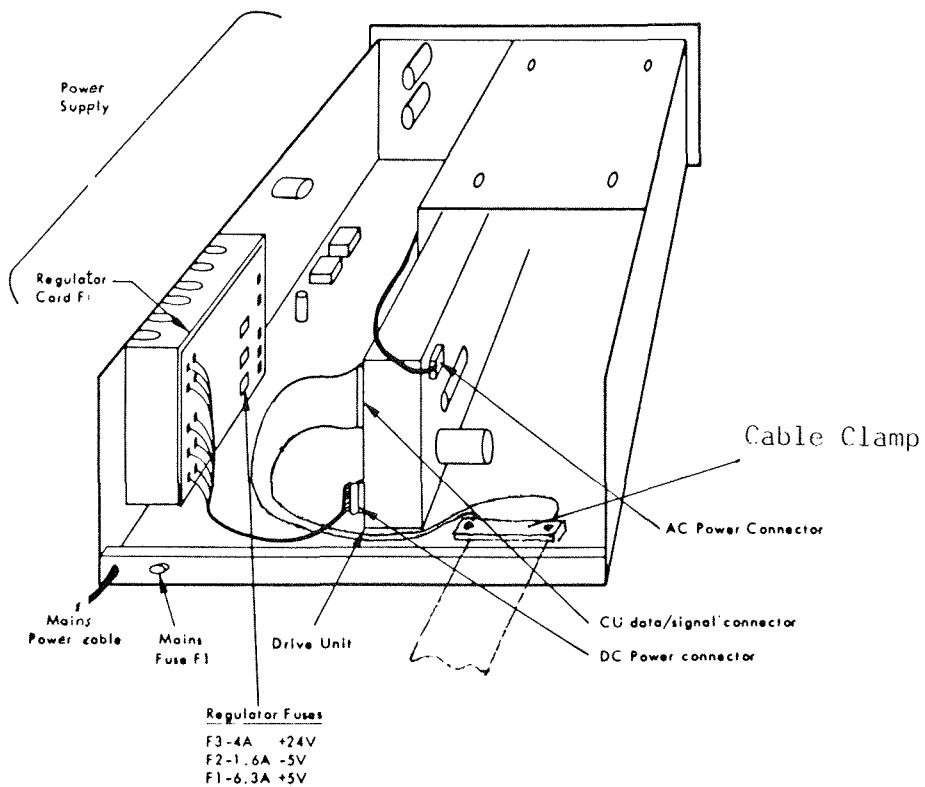


Figure 15.4 FLOPPY DRIVE CHASSIS, REAR VIEW

Device Address/Lock Coding Switches

Later Model Drives (50/60Hz)

With Lock	Without Lock
BRBA5D	BRBA2M
77839150	

Early Model Drives (50 Hz only)

With Lock	Without Lock	
BRBA5B	BRBA2S	drive unit number
77831900	77881706	drive unit circuit card

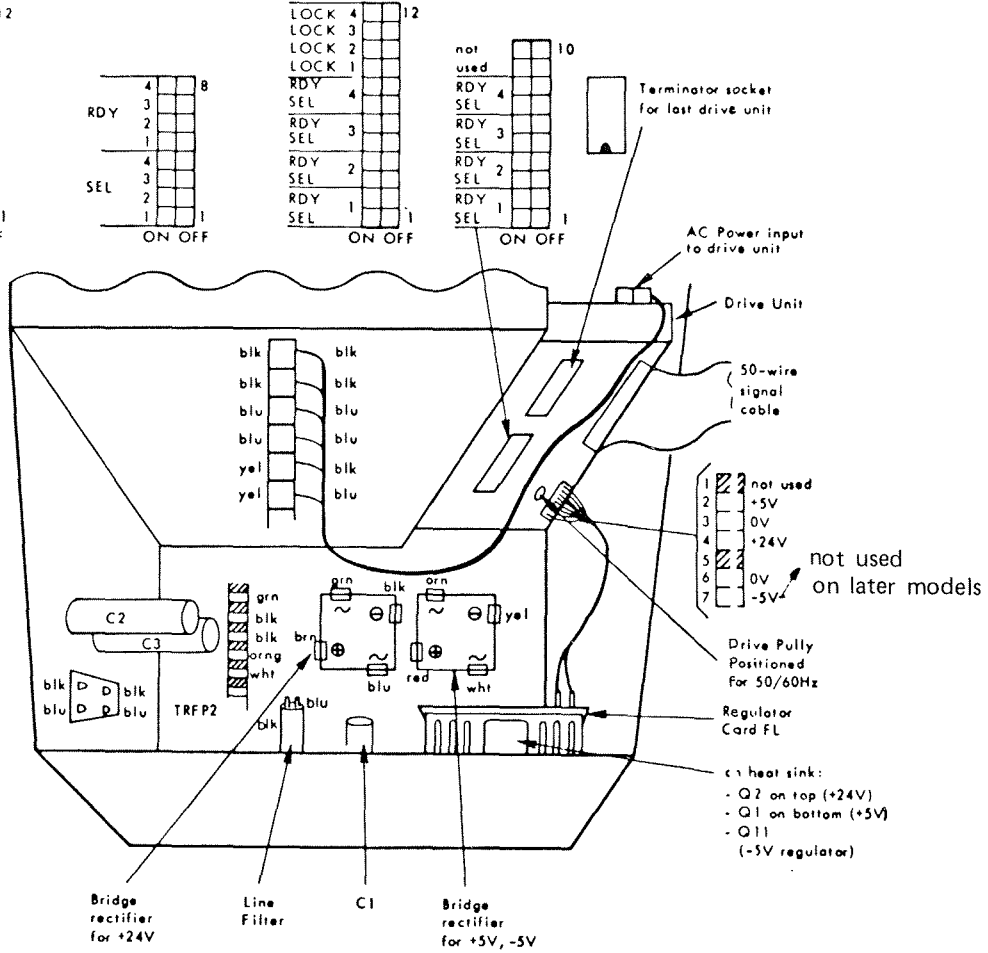
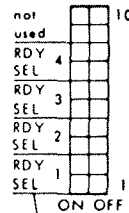
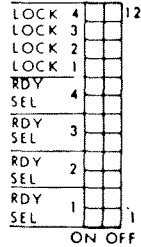
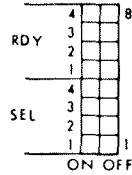
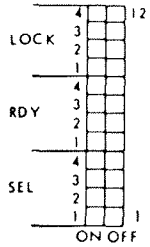
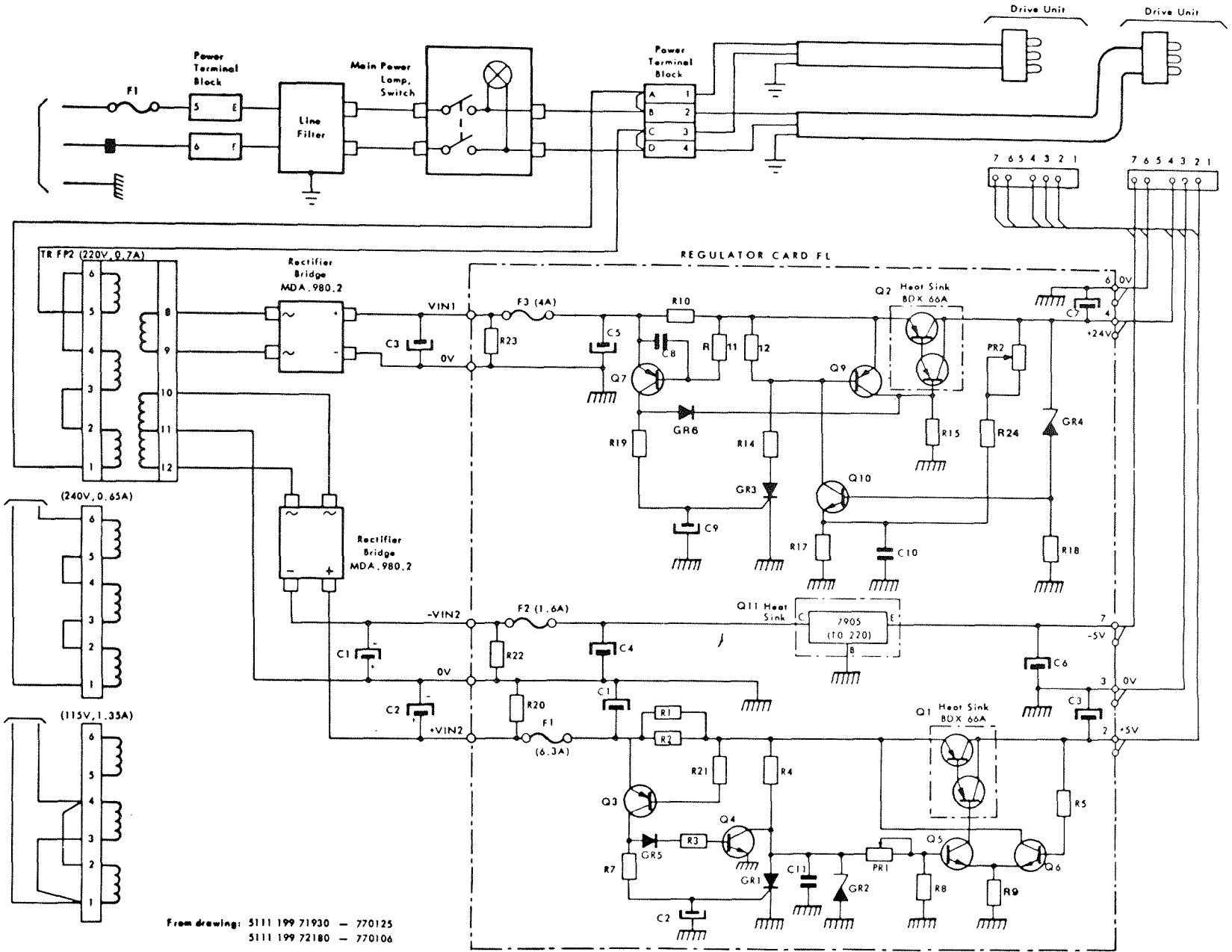


Figure 15.5 FLOPPY DRIVE CHASSIS, RIGHT SIDE INTERIOR

Figure 15.6 POWER SUPPLY SCHEMATIC



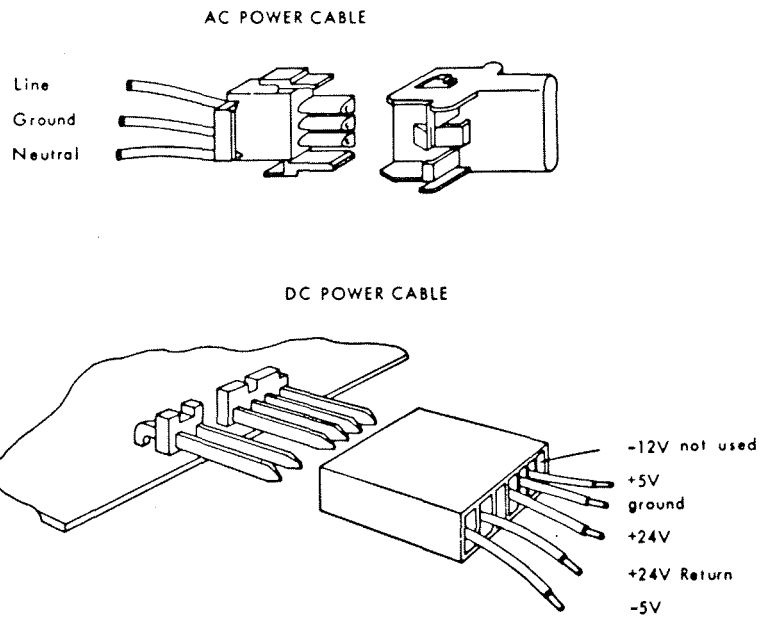


Figure 15.7 FLOPPY DISC DRIVE POWER CONNECTORS



# 15.3 INTERFACE CONNECTIONS

Logic Sheet	Control Unit		Signal Name	Disc Drive			
	I/O Conn	I/O Conn		3M	AMP		
e	7A02	5A37	← RDLN	ground	1	A	
				READ DATA/CLOCK COMPOSITE	2	B	
			ground	3	C		
	7A03	5A36	HEADLN		ground	4	D
				→ HEAD LOAD		5	E
				ground	6	F	
	7A04	5A35	← TRON		TRACK 00	7	H
					ground	8	J
				ground	9	K	
	7A05	5A34	← INDN		INDEX	10	L
					ground	11	M
	7A06	5A33	LWCN		LOW WRITE CURRENT	12	N
					ground	13	P
	7A07	5A32	STEPN		STEP	14	R
					ground	15	S
	7A08	5A31	DIRN		DIRECTION	16	T
					ground	17	U
	7A09	5A30	WEN		WRITE ENABLE	18	V
					ground	19	W
	7A10	5A29	WDLN		WRITE DATA	20	X
					ground	21	Y
	7A11	5A28	SEL0N		UNIT SELECT 1	22	Z
					ground	23	AA
	7A12	5A27	SEL1N		UNIT SELECT 2	24	BB
					ground	25	CC
	7A13	5A26	SEL2N		UNIT SELECT 3	26	DD
					ground	27	EE
	6A02	5A25	SEL3N		UNIT SELECT 4	28	FF
					ground	29	HH
	6A03	5A12	← RDY0N		UNIT READY INTERRUPT 1	30	JJ
					ground	31	KK
	6A04	5A11	← RDY1N		UNIT READY INTERRUPT 2	32	LL
					ground	33	MM
	6A05	5A10	← RDY2N		UNIT READY INTERRUPT 3	34	NN
					ground	35	PP
	6A06	5A09	← RDY3N		UNIT READY INTERRUPT 4	36	RR
					ground	37	SS
	6A07	5A08	← WRPN		WRITE PROTECT	38	TT
					ground	39	UU
d	6A09	5A06	UNLOCK0N	→ DOOR UNLOCK 1	40	VV	
					ground	41	WW
	6A10	5A05	UNLOCK1N	→ DOOR UNLOCK 2	42	XX	
					ground	43	YY
				WRITE FAULT	44	ZZ	
				ground	45	AB	
				WRITE FAULT RESET	46	AC	
				ground	47	AD	
	6A12	5A02	UNLOCK2N	→ DOOR UNLOCK 3	48	AE	
					ground	49	AF
6A13	5A01	UNLOCK3N	→ DOOR UNLOCK 4	50	AH		

for special options

Table 15.1 CU - DEVICE INTERFACE

# 15.4 HARDWARE-SOFTWARE INTERFACE DETAILS

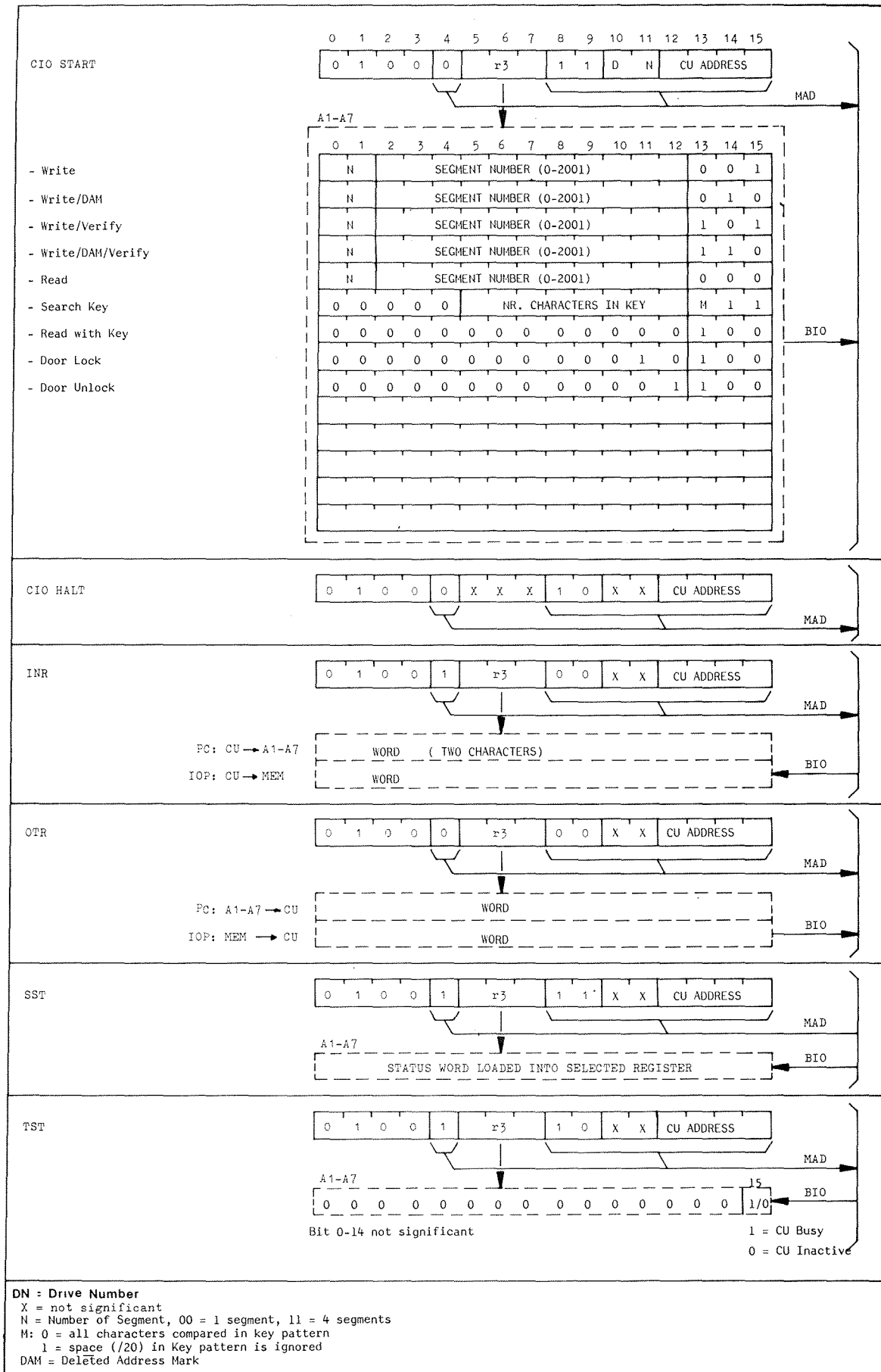


Figure 15.8 INSTRUCTION / COMMAND-WORD FORMATS

### 15.4.1 STATUS WORD

BIO	Drive Ready after Not Ready Key Not Found			Deleted Data Adr. Mark Record Not Found Write Protect			Drive (msb)	Drive (lsb)	Retry	Program Error	Incorrect Length	Data Fault	Drive Not Operable	Possible Configurations:			
	0	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Write, Write/DAM performed correctly
0	0	0	0	0	Y	0	0	0	0	Y	0	0	0	0	0	0	Read, Search Key performed correctly
0	0	0	0	0	0	0	0	0	0	0	Y	0	0	0	0	0	Read Key Segment performed correctly
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Door command performed correctly
0	0	0	0	0	0	x	x	0	0	Y	x	x	0	0	x	x	Write, Write/DAM incorrect
0	0	0	0	0	0	x	x	0	0	Y	x	x	x	0	x	x	Write/Ver, Write/DAM/Verify incorrect
0	0	0	0	0	Y	x	0	0	0	Y	x	x	x	0	x	x	Read incorrect
0	0	x	0	Y	x	0	0	0	0	Y	x	x	x	0	x	x	Search Key incorrect
0	0	0	0	0	0	0	0	0	0	0	x	x	0	0	x	x	Read Key Segment incorrect
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Device just became operable
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	Door command not performed

Y = bit can be 1 or 0

x = at least one of these bits must be set to 1.

The status bits have the following meanings:

- 15 means command attempted on a Non-Operable Drive or the selected drive goes non-operable. (A non-selected drive going inoperable does not set CU status.) Note: a diskette inserted upside-down will cause the non-operable condition.
- 13 means Data Fault: In the Write/Verify or Write/DAM/Verify mode a CRC error has been detected during the verify reading. In the Read mode there is data-field CRC error non-recoverable with read retries (bit 10 also set). In the Search Key mode there is a non-recoverable data-field CRC error in any segment and the key is not found in any other segment (bits 2, 10 also set).
- 12 means Incorrect Length: Block length specified by channel does not correspond to number of segments to be transferred or required block length. Allowed lengths are:

Any Write command  $\leq (N+1) \times 64$  words

Read  $(N+1) \times 64$  words

Search Key  $\frac{n}{2} + 2$  words, or  $\frac{n+1}{2} + 2$  words

(n = even or odd number of characters)

Read Key Segment 65 words

- 11 means Program Error:

— Channel sends INR instead of OTR during any Write or Search Key, or

Key command.

— Segment number command is greater than 2001 or converts to a track number greater than 76.

— The first segment number is greater than the second segment number for Search Key.

— Unknown command.

Track	Sector	Segment	Hexadecimal
00	1-26	0- 25	/000-/019
01	1-26	26- 51	/01A-/033
02	1-26	52- 77	/034-/04D
-----			
73	1-26	1898-1923	/76A-/783
74	1-26	1924-1949	/784-/79D
75	1-26	1950-1975	/79E-/7B7
76	1-26	1976-2001	/7B8-/7D1

Software Limit





# 15.6 SHORT ROUTINES

```

DATE 80-03-13      IDENT  FIDWRT  ON PROGRAMMED CHANNEL

00000              IDENT  FIDWRT      ON PROGRAMMED CHANNEL
00001      *PROGRAM  FOR WRITE OR WRITE KEY COMMANDS
00002      *          REG. A3  COMMAND
00003      *          REG. A1  NUMBER OF WORDS TO EXCHANGE
00004      *          REG. A2  BUFFER ADDRESS IN MEMORY
00005
00006      *AFTER EXECUTION THE PROGRAM STOPS AT ADDR. /86
00007      *          REG. A7  STATUS WORD
00008
00009              AORG    /80
00010 0080 FFFF      DATA  /FFFF
00011 0082 0000      DATA  0
00012 0084 207F      START  HLT              STATUS IN A7
00013 0086 20BF      INH
00014 0088 8508      LDR    A5,A2          SAVE A2
00015 008A 8604      LDR    A6,A1          SAVE A1
00016 008C 43C3      CIO    A3,1,3        START CONTROLLER
00017 008E 5C04      RB(4)  *-2
00018 0090 8434      OUT    LDR*   A4,A5          LOAD WORD
00019 0092 4403      OTR    OTR    A4,0,3        OUTPUT WORD
00020 0094 5408      RF(4)  SST
00021 0096 1502      ADK    A5,2          UPDATE BUFFER ADDRESS
00022 0098 1E01      SUK    A6,1          DECREMENT NO OF EXCHANGES
00023 009A 5C0C      RB(4)  OUT
00024 009C 4483      CIO    A4,0,3        STOP CONTROLLER
00025 009E 4FC3      SST    SST    A7,3          GET STATUS
00026 00A0 5C10      RB(4)  OTR
00027 00A2 5F20      RB    START
00028              END    START

```

```

DATE 80-03-13      IDENT  FIDRD  ON PROGRAMMED CHANNEL

00000              IDENT  FIDRD      ON PROGRAMMED CHANNEL
00001      *PROGRAM  FOR READ OR READ KEY COMMANDS
00002      *          REG. A3  COMMAND
00003      *          REG. A1  NUMBER OF WORDS TO EXCHANGE
00004      *          REG. A2  BUFFER ADDRESS IN MEMORY
00005
00006      *AFTER EXECUTION THE PROGRAM STOPS AT ADDR. /86
00007      *          REG. A7  STATUS WORD
00008
00009              AORG    /80
00010 0080 FFFF      DATA  /FFFF
00011 0082 0000      DATA  0
00012 0084 207F      START  HLT              STATUS IN A7
00013 0086 20BF      INH
00014 0088 8508      LDR    A5,A2          SAVE A2
00015 008A 8604      LDR    A6,A1          SAVE A1
00016 008C 43C3      CIO    A3,1,3        START CONTROLLER
00017 008E 5C04      RB(4)  *-2
00018 0090 4C03      INR    INR    A4,0,3        READ WORD
00019 0092 540A      RF(4)  SST
00020 0094 8435      STR    A4,A5          WORD TO BUFFER
00021 0096 1502      ADK    A5,2          UPDATE BUFFER ADDRESS
00022 0098 1E01      SUK    A6,1          DECREMENT NO OF EXCHANGES
00023 009A 5C0C      RB(4)  INR
00024 009C 4483      CIO    A4,0,3        STOP CONTROLLER
00025 009E 4FC3      SST    SST    A7,3          GET STATUS
00026 00A0 5C12      RB(4)  INR
00027 00A2 5F20      RB    START
00028              END    START

```

```

00000          IDENT      FDDRWD          ON IOP CHANNEL
00001          *PROGRAM  FOR WRITE AND READ COMMANDS
00002          *          REG. A1  FIRST CONTROL WORD
00003          *          REG. A2  SECOND CONTROL WORD (BUFFER ADDRESS)
00004          *          REG. A3  COMMAND
00005
00006          *AFTER EXECUTION PROGRAM STOPS AT ADDRESS /86
00007          *          REG. A7  STATUS WORD
00008
00009          AORG      /80
00010 0080 FFFF      DATA  /FFFF
00011 0082 0000      DATA  0
00012 0084 207F      START  HLT          STATUS IN A7
00013 0086 20BF      *          INH
00014          *          PREPARE IOP
00015 0088 7106      WER      A1,6      FIRST CONTROL WORD
00016 008A 7207      WER      A2,7      SECOND CONTROL WORD
00017 008C 43C3      CIO      A3,1,3    START CONTROLLER
00018 008E 5C04      RB(4)   *-2
00019 0090 4FC3      SST      A7,3      GET STATUS
00020 0092 5C04      RB(4)   *-2
00021 0094 5F12      RB      START
00022          END      START
    
```

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

WRITE A1 

1	1	0	0
---	---	---	---

 No. of words to Exchange n/2 /C040 max. for  
A2 

Start address WRITE BUFFER			
----------------------------	--	--	--

 1 segment  
A3 

N	Segment no.(0-1928)			0	0	1
---	---------------------	--	--	---	---	---

 /0001-/3C19

SEARCH A1 

1	1	0	0
---	---	---	---

 No.of words to Exch. n/2+2  
A2 

Start address KEY BUFFER			
--------------------------	--	--	--

  
A3 

0	0	0	0	0	Characters in KEY	0	1	1
---	---	---	---	---	-------------------	---	---	---

READ KEY A1 

1	0	0	0	n/2+1		
---	---	---	---	-------	--	--

  
A2 

Start addr. of READ KEY BUFFER			
--------------------------------	--	--	--

  
A3 

0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

READ A1 

1	0	0	0	n/2		
---	---	---	---	-----	--	--

 /8040 max. for  
A2 

Start address READ BUFFER			
---------------------------	--	--	--

 1 segment  
A3 

N	Segment no. (0-1923)			0	0	0
---	----------------------	--	--	---	---	---

 /0000-/3C18

Number of Segments:	Number of Characters:
N = 00 = 1	n 128
01 = 2	256
10 = 3	384
11 = 4	512

DATE 80-03-13

IDENT FLTST ON P800

```

00000 IDENT FLTST ON P800
00001 * READ-WRITE TEST OF DISCETTE
00002 * PROGRAM PRESET:
00003 * FOR DRIVE 0 , DA /03
00004 * START SEGMENT NUMBER 0
00005 * WRITTEN DATA /30 (ASCII FOR '0')
00006
00007 * PROGRAM STOP ON /BC:
00008 * WRITTEN DATA CAN BE CHANGED IN A2
00009 * START SEGMENT NUMBER CAN BE CHANGED IN A5
00010 * AFTER EXECUTION DISCETTE IS CORRECT
00011
00012 * ERROR STOP ON /E2:
00013 * STATUS IN A6
00014 * SEGMENT NUMBER IN A5
00015
00016
00017 * A5 BIT CONFIGURATION
00018 * 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
00019 * ** SEGMENT NUMBER ** * *
00020 ADRG /B0
00021 00B0 FFFF DATA /FFFF
00022 00B2 0000 DATA 0
00023 00B4 8220 START LDKL A2,/3030 PRESET CHARACTER 0
00024 00B6 3030
00024 00B8 0500 BEGIN LDK A5,0 PRESET SEGMENT 0
00025 00BA 207F HLT
00026 00BC 20BF INH
00027 00BE 0100 LDK A1,0 RESET INDEX FOR BUFFER
00028 0090 8245 ST A2,BUF,A1 FILL THE WRITE BUFFER
00029 0092 00EC
00029 0094 1102 ADK A1,2
00030 0096 E920 CWK A1,/200
00030 0098 0200
00031 009A 5D0C RB(5) *-A
00032 009C 0100 LDK A1,0 RESET EXECUTE POINTER
00033 009E 8720 LDKL A7,/FC1D END SEGMENT
00034 00A0 FC1D
00034 00A2 9520 ADKL A5,/C005 SELECT WRITE VERIFY WITH 4 SEGMENT
00034 00A4 C005
00035 * PREPARE THE IOP
00036 00A6 8320 RET LDKL A3,/C100
00036 00A8 C100
00037 00AA 8420 LDKL A4,/C040 FOR 1 SEGMENT MODE
00037 00AC C040
00038 00AE F045 EX WER,A1 EXECUTE WER A3 OR WER A4.
00039 00B0 00E4 LDKL A4,BUF
00039 00B2 8420
00039 00B4 00EC
00040 00B6 7407 WER A4,7
00041 00B8 45C3 CIO A5,1,3 START CONTROLLER
00042 00BA 5C04 RB(4) *-2
00043 00BC 4EC3 SST A6,3 GET STATUS
00044 00BE 5C04 RB(4) *-2
00045 * CHECK STATUS
00046 00C0 A620 ANKL A6,/641D
00046 00C2 641D
00047 00C4 5010 RF(0) CONT STATUS OKE
00048 00C6 8104 LDR A1,A1 CHECK 4 SEGMENT OR 1 SEGMENT
00049 00C8 5116 RF(1) STOP
00050 * STATUS IS WRONG CHANGE TO WRITE VERIFY SEGMENT BY SEGMENT
00051 00CA 9D20 SUKL A5,/C000
00051 00CC C000
00052 00CE 1102 ADK A1,2 UPDATE EXECUTE POINTER FOR 1 SEGMENT MOD
00053 00D0 B720 XRKL A7,/C000 CHANGE TO TO 1 SEGMENT MODE
00054 00D2 C000
00054 00D4 5F30 RB RET DO THE LAST ONES AGAIN IN 1 SEGMENTMODE
00055 00D6 F045 CONT EX UPDSEG,A1 NEXT SEGMENTS TO DO
00055 00D8 00E8
00056 00DA ED1C CHR A5,A7 IS IT THE LAST ONE
00057 00DC 5D38 RB(5) RET NO
00058 00DE 5F58 RB BEGIN-2 YES
00059 00E0 207F STOP HLT STATUS ERROR
00060 00E2 5F5C RB BEGIN-2 RESTART
00061 00E4 7306 WER WER A3,6
00062 00E6 7406 WER A4,6
00063 00E8 1520 UPDSEG ADK A5,/20
00064 00EA 1508 ADK A5,B
00065 00EC BUF RES /100
00066 END START

```



## 15.7 PREVENTIVE MAINTENANCE

### CLEANING THE READ/WRITE HEAD

Every 600 hours the read/write head requires cleaning which is carried out as follows:

- Use a lint free cloth to lightly dry buff head surface. Cleaning is completed if deposits are removed.
- If oxide deposits were not removed in the step above, dampen (do not soak) cloth with head cleaning solution (isopropanol), and wipe head surface. Finish by slightly dry buffing again to ensure that the head is dry and no alcohol residue is left.

#### CAUTION

Do not smoke while cleaning.  
Do not touch a head surface with fingers.  
Do not leave residue or line on the head surfaces. Residual particles can result in a stored disc and/or loss of a head.

### REPLACING THE HEAD LOAD PAD (SEE FIGURE 15.10)

Every 1200 hours, in addition to the cleaning above, the head load pad should be inspected. If the pad is worn, dirty, torn or loose it should be replaced, as described below:

- . Remove power from the unit.
- . Move the carriage assembly to its rear most position (toward the stepper motor) by turning the back part of the stepper motor shaft (figure 4-32). This will provide clearance for lifting the head load arm.
- . Lift the head load arm until the head load pad is visible (see figure 4-32).
- . If head load arm is a 77603108 (figure 15.10) proceed four steps ahead, if not go to next step.
- . Remove the used pad with a sharp tool, if necessary, and discard. Be sure to remove all of the old pad and adhesive. Alcohol may be used to remove the old adhesive.
- . Remove the protective packing from the new head load pad and position pad in approximate center of recess in head load arm. Press pad firmly to insure adhesion with a clean tongue depressor or with a thumb using a lintfree cloth to protect pad from grease or dirt.
- . Go to the last step.
- . Loosen clamping screw holding rim of head load pad.
- . Insert screw driver and rotate head load pad so flat side with clear clamping screw.
- . Remove Pad Holder Assembly.
- . Insert new Assembly, with flat side toward clamping screw.
- . Assuring that head load pad is fully seated, rotate pad 180°.
- . Tighten clamping screw to hold pad in place.
- . Lower arm gently on to head.

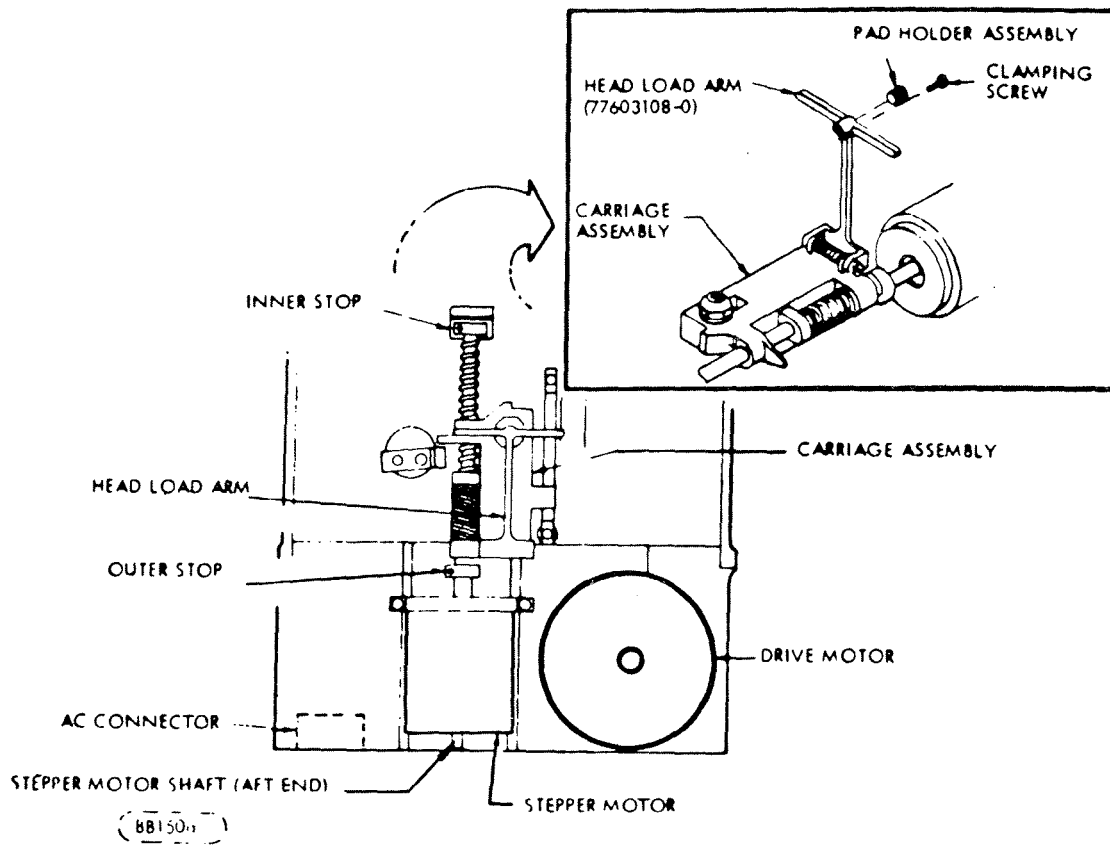


Figure 15.10 HEAD LOAD PAD REPLACEMENT

## 15.8 OPERATING FREQUENCY CONVERSION PROCEDURE

This procedure should be used to convert the FDD unit from 50Hz. operation to 60Hz. operation or vice vers. This is accomplished by reversing the dual diameter reversible pulley on the spindle motor shaft using the following steps:

- . Remove AC power.
- . Disconnect I/O cable from J1 on the printed circuit board.
- . Disconnect I/O harnesses from J2, J3, J4, J5 and J6 on the board.
- . Remove two screws from board adjacent to connector J1 (see figure A).
- . Remove board by detaching it from the four push-in clips shown in figure A.
- . Remove the belt from the spindle motor pulley (accessible from the under side of unit).
- . Loosen set-screw and remove pulley.
- . Reverse pulley and replace on motor shaft.
- . Position pulley allowing tolerance of  $0.079'' (2.01 \text{ mm}) \pm 0.010'' (0.254 \text{ mm})$  between shoulder of motor mounting screws and pulley. (Figure B).
- . Tighten down set-screw.
- . Replace belt and printed circuit board.

Note: It is important that the new operating frequency is marked on the units rating nameplate.

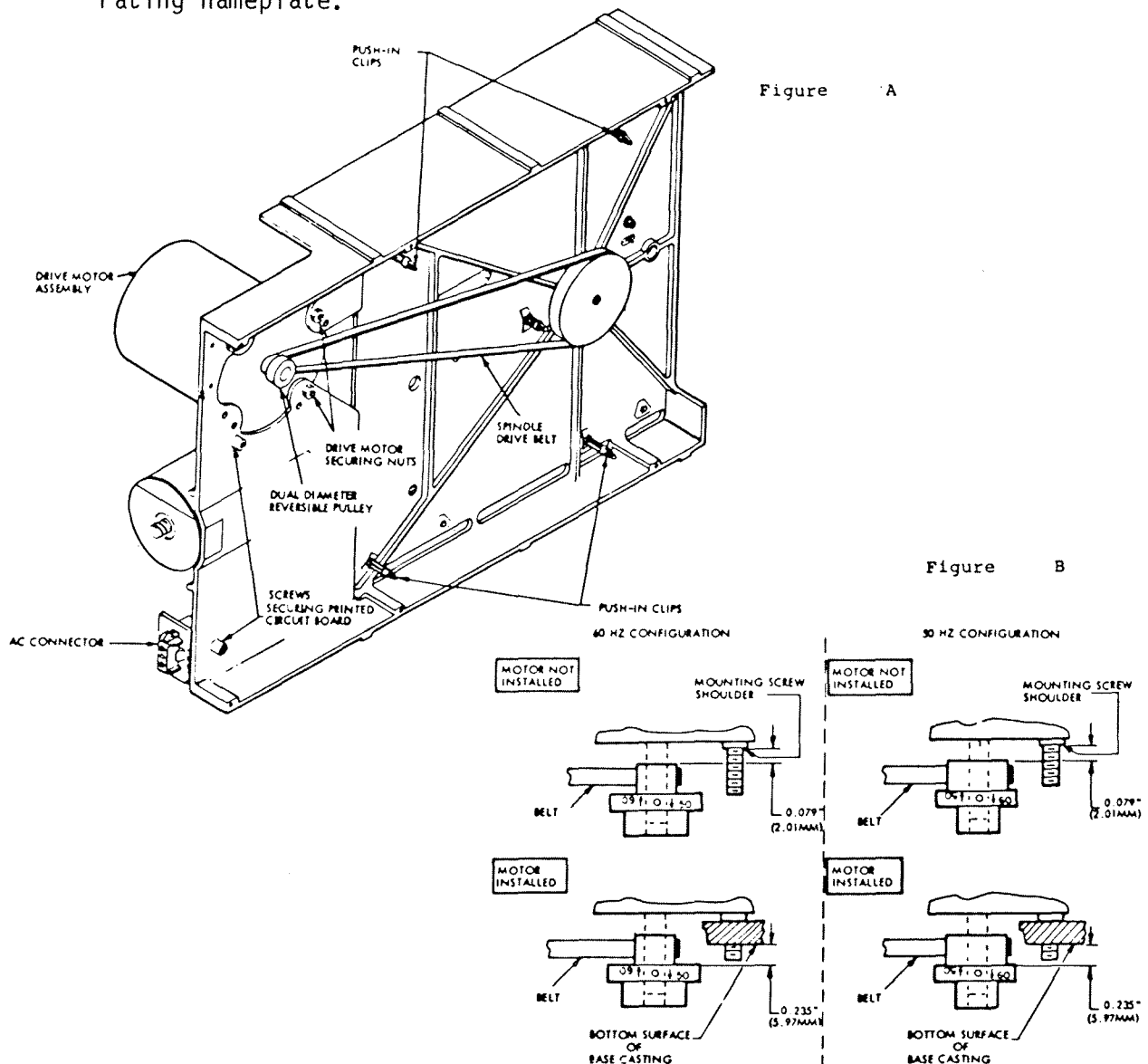


Figure 15.11 FDD FREQUENCY CONVERSION INSTRUCTIONS

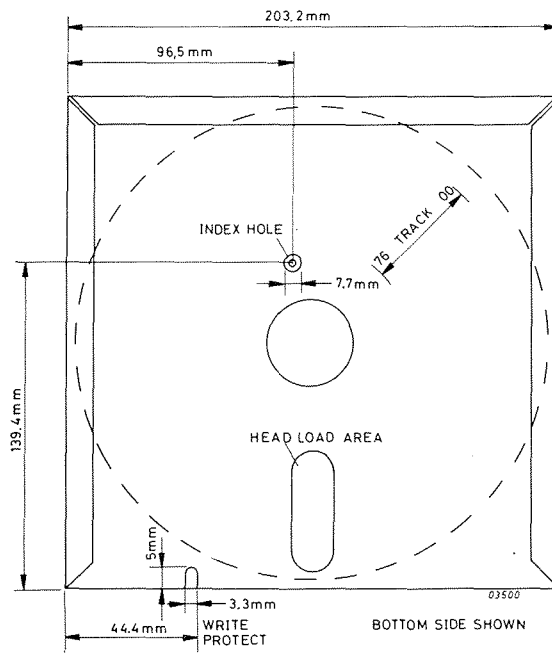


Figure 15.12 DISCETTE DIMENSIONS

SECTION	16.1	FLEXIBLE DISC CONTROL UNIT - IDENTIFICATIONS	PAGE 16-2
	16.2	INSTALLATION DETAILS	16-3
	16.3	INTERFACE CONNECTIONS	16-7
	16.4	HARDWARE-SOFTWARE INTERFACE DETAILS	16-10
	16.4.1	SOP Panel	16-11
	16.4.2	Status Word	16-13
	16.5	SHORT DESCRIPTION OF TESTPROGRAMS	16-15
	16.6	SHORT ROUTINES	16-16

## LIST OF ILLUSTRATIONS

FIGURE	16.1	POSITION OF F1MB IN SYSTEM	16-3
	16.2	LAYOUT OF F1MB CARD	16-4
	16.3	INSTALLATION DETAILS F1MB	16-6
	16.4	INSTRUCTION / COMMAND-WORD FORMATS	16-10
	16.5	SOP COMMAND WORD FORMATS	16-12
	16.6	EXPLANATION OF STATUS WORD	16-13
	16.7	STATUS WORD - POSSIBLE CONFIGURATIONS	16-14

## LIST OF TABLES

TABLE	16.1	CONNECTIONS TO FLOPPY DISC DRIVES	16-7
	16.2	CONNECTIONS FOR FLOPPY DISC DRIVES	16-8
	16.3	SYSTEM OPERATOR'S PANEL CONNECTIONS	16-8
	16.4	TEST CONNECTIONS	16-9

## 16.1 FLEXIBLE DISC CONTROL UNIT (F1MB) - IDENTIFICATIONS

Type Number : P830-050 (F1MB)  
Testprogram : BFIMB  
Channel : IOP/MIOP only. Break connection: 3A43.  
Devices : Flexible Disc Drive CDC 9404 with or without doorlock option.  
CDC 9406 with doorlock option (max. 2).  
CDC 9406 without doorlock options  
(max. 4).

Power Consumption: +5 Volt, 3 Amp.

## 16.2 INSTALLATION DETAILS

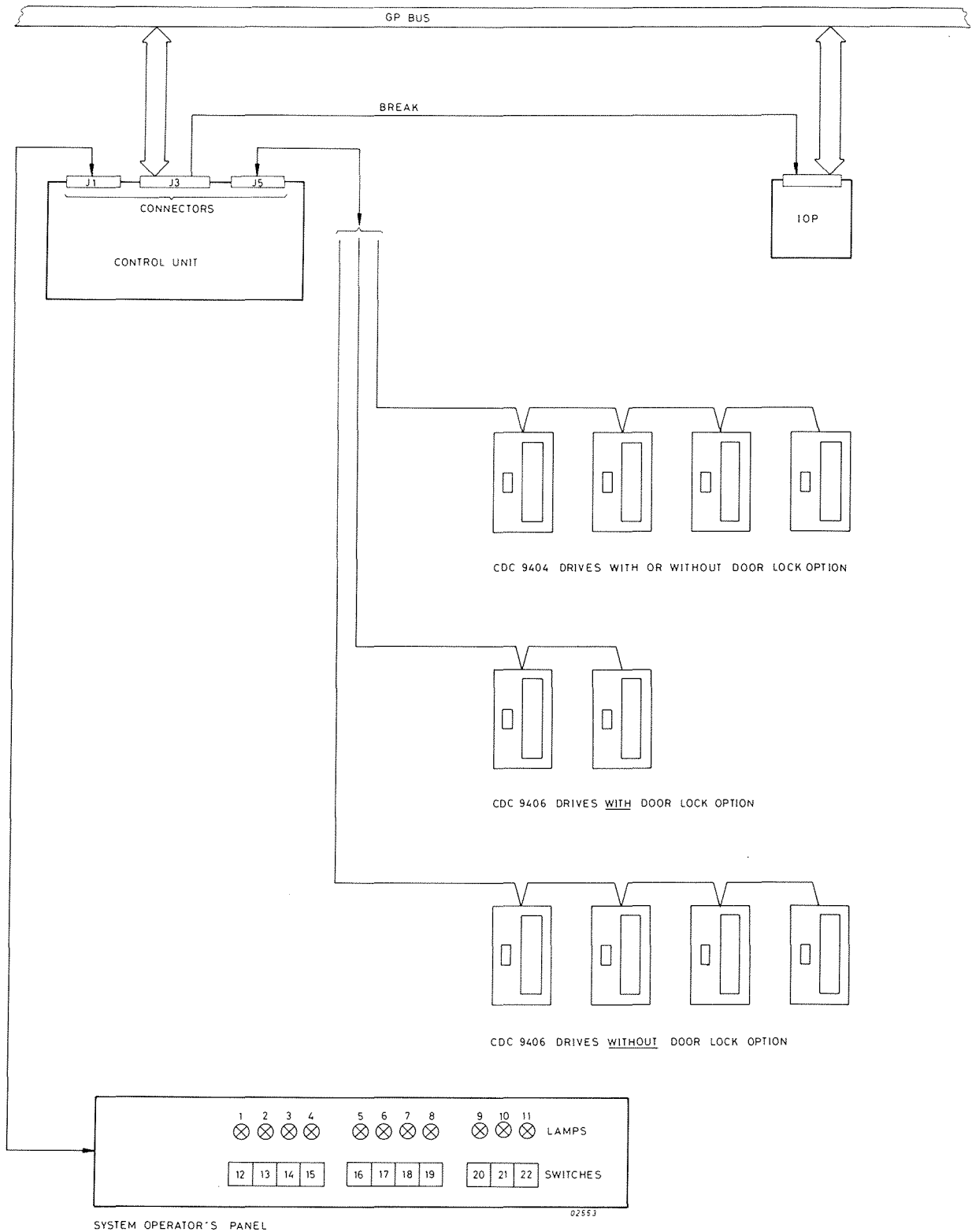


Figure 16.1 POSITION OF F1MB IN SYSTEM

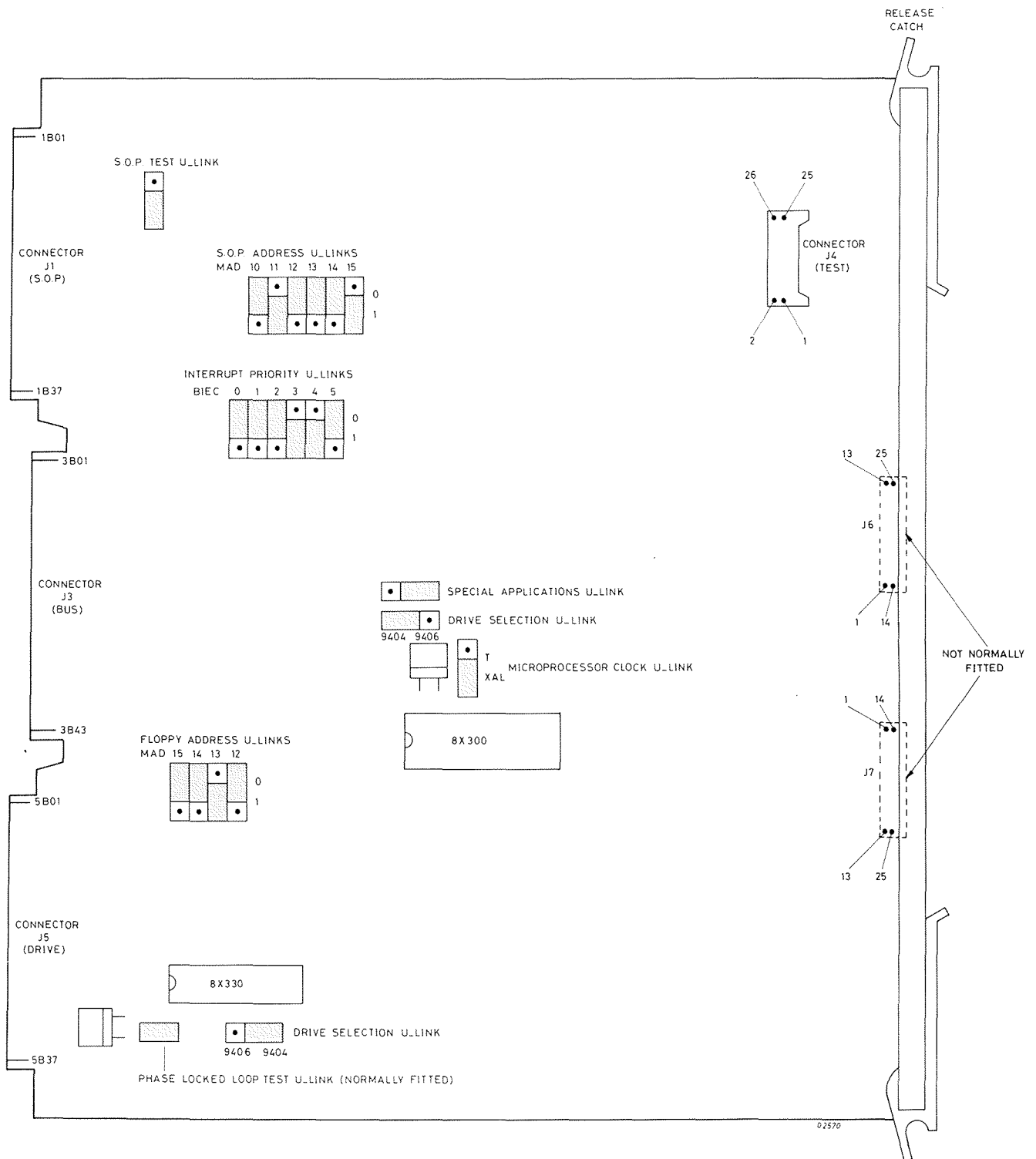


Figure 16.2 LAYOUT OF F1MB CARD

Note: SOP Test U-link shown in position for normal operation of card.  
 SOP address U-links shown for SOP address 17 (010001).  
 Interrupt priority U-links shown for Floppy Disc interrupt level 6, SOP interrupt level 7 (000110).  
 Special applications U-link shown in position for normal operation.  
 Drive selection U-links (2 off) shown for use with type 9404 drive.  
 Floppy disc address U-link shown for CU address 4 (0100).  
 Microprocessor clock U-link shown in position for normal operation (XAL).  
 Phase locked loop test U-link normally fitted.



## INITIAL PROGRAM LOADING

The IPL can be loaded from floppy disc using the standard P800 bootstrap (P843-053) sequential and disc bootstrap. The control panel data switches must be positioned as follows:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
0	1	1	0	Sector No. (0-15)				1	1	Drive No.			CU Address			

With this bootstrap the IPL is loaded from cylinder 0, head 0. This track is always formatted with format 0 (single density, 26 sectors/track and 128 bytes/sector).

Note: This IPL procedure is not applicable to the SOP.

## POWER FAILURE AUTOMATIC RESTART

The CU and disc drive will be restarted after a power failure without operator action. Information on the disc will not be destroyed but a sector of the disc being written when a power failure occurs must be completely rewritten after the CU is restarted.

## DRIVE CONTROL

Up to four drives may be controlled from a single CU but the drives must all be of the same type. The drives cannot operate simultaneously, a command for one drive must be finished before the CU will accept a command for another drive.

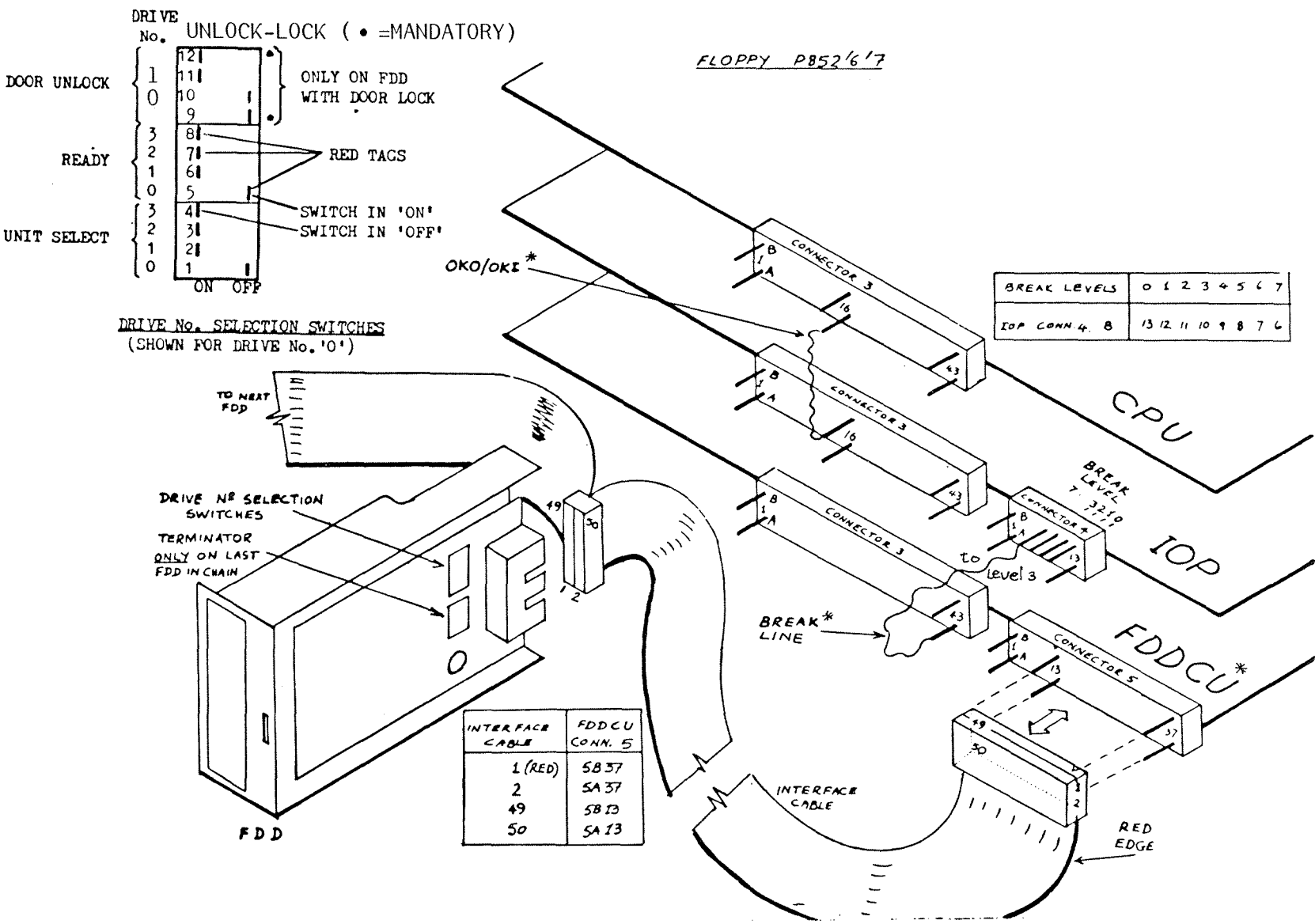
## STRAP SETTINGS (refer to figure 1.2)

U-Links on the card are used to select

- . Floppy CU address
- . SOP interface address
- . Interrupt Priority for both Floppy CU and SOP interface.
- . Drive type selection
- . Special Applications

These U-links are set at system installation time. Three other U-links are provided for test purposes.

- . Phase locked loop test link for testing the floppy disc controller chip fitted during normal operation of the card, removed for test.
- . Microprocessor clock input selection, set at position XAL for normal operation of the card, set at 'T' for test.
- . SOP test U-link, shown in figure 16.3 in its position for normal operation, set at the lower position for test.



\* Note: P858/859: OKO/OKI and BREAK connected to MIOp (channel 0) see chapter INSTALLATION

Figure 16.3 INSTALLATION DETAILS

### 16.3 INTERFACE CONNECTIONS

Pin No.	Signal Mnemonic	Signal Function	
5A01	DC50N	Disc Type (9406)	Unit 4 door lock (9406)
5A02	DC48N	Unit 2 door lock (9406)	Unit 3 door lock 9404)
5A03,4	--	Not used	
5A05	DC42N	Unit 1 door lock (9406)	Unit 2 door lock (9404)
5A06	DC40N	Head Select (9406)	Unit 1 door lock (9404)
5A07	RDY0N	Drive unit 1 ready signal	
5A08	WRPN	Write protected disc	
5A09	RDY3N	Drive unit 4 ready signal	
5A10	RDY2N	Drive unit 3 ready signal	
5A11	RDY1N	Drive unit 2 ready signal	
5A12-24	--	Not used	
5A25	SEL3N	Drive unit 4 selection signal	
5A26	SEL2N	Drive unit 3 selection signal	
5A27	SEL1N	Drive unit 2 selection signal	
5A28	SEL0N	Drive unit 1 selection signal	
5A29	WDN	Write data signal	
5A30	WEN	Write enable signal	
5A31	DIRN	} Each pulse of STEPN moves the head one track in the direction specified by DIRN	
5A32	STEPN		
5A33	LWCN	Low write current select	
5A34	INDN	Index pulse	
5A35	TRON	Track zero detect	
5A36	HLN	Head load signal	
5A37	RDLN	Read data/clock composite signal	
5B01	0V	Ground	
5B02	DC47N	Special applications (9406) (see table 16.2)	Not used (9404)
5B03	DC45N		Not used (9404)
5B04-11	0V	Ground	
5B12-24	--	Not used	
5B25-37	0V	Ground	

Table 16.1 CONNECTIONS TO FLOPPY DISC DRIVES (connector J5)

CU signal name	Pin No.	CU function with 9404	9404 drive signal name	CU function with 9406	9406 drive signal name
DC40N	5A06	Lock unit 0	Lock unit 1	Head select	Head select
DC42N	5A05	Lock unit 1	Lock unit 2	Lock unit 0	Lock unit 1
DC45N	5B03	--	Ground	Lock unit 2	Ground
DC47N	5B02	--	Ground	Lock unit 3	Ground
DC48N	5A02	Lock unit 2	Lock unit 3	Lock unit 1	Lock unit 2
DC50N	5A01	Lock unit 3	Lock unit 4	Disc type	Disc type

Table 16.2 CONNECIIONS FOR FLOPPY DISC DRIVES

Pin No.	Signal Mnemonic	Signal Function
1A10	DS06N	Panel switch 12 operated
1A08	DS07N	13
1B01	DS08N	14
1A01	DS09N	15
1B02	DS10N	16
1A02	DS11N	17
1A03	DS12N	18
1A05	DS13N	19
1A06	DS14N	20
1A07	DS15N	21
1B11	DL05N	Illuminate panel lamp 1
1A11	DL06N	2
1A12	DL07N	3
1A13	DL08N	4
1A14	DL09N	5
1A18,1B18	DL10N	6
1A15,1B15	DL11N	7
1A16	DL12N	8
1B20	DL13N	9
1A17,1B17	DL14N	10
1A19	DL15N	11
1A04	0V	Power supply return
1A09	CHAEND	Switch operated detect
1A20	+5V	Power supply
1A21-37	--	Not used
1B03-6,8-10,12-14,16	0V	Power supply return
1B07	CHABEGN	Activate switch chain on panel
1B19	+5V	Power supply
1B21-37	--	Not used

Table 16.3 SYSTEM OPERATOR'S PANEL CONNECTIONS (connector J1)


Pin No.	Signal Mnemonic	Signal Function
4J01,3 4J02-16 (even nos.) 4J25,23, 5-21 (odd nos.) 4J18 4J20 4J22,24	+5V IVB7N-0N RAD02-12  CX1TEST CX2TEST 0V	Power supply  CU internal bus lines PROM address lines   Test input for microprocessor clock  Power supply

Table 16.4 TEST CONNECTIONS (connector J4)

16.4 HARDWARE-SOFTWARE INTERFACE DETAILS

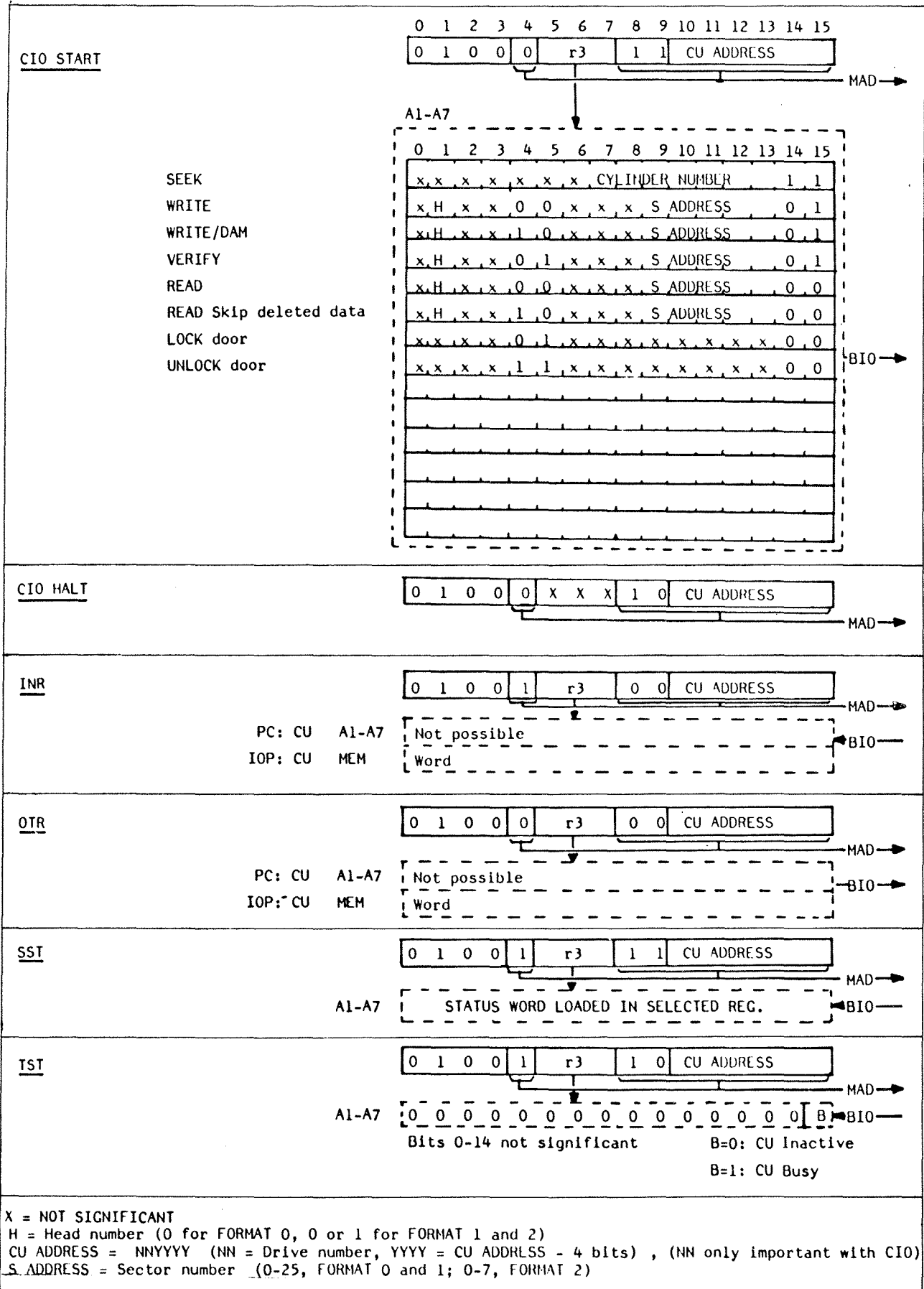


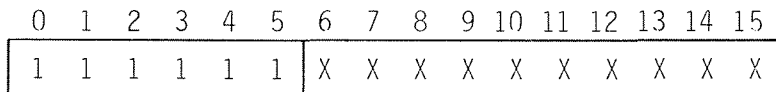
Figure 16.4 INSTRUCTION / COMMAND-WORD FORMATS

## 16.4.1 SOP PANEL

### FUNCTIONS

The SOP can be used either to send a data word to the CPU or to receive a data word and display it on a visual display.

Operation of one of the switches 12-21 on the panel generates a 16 bit data word in the SOP interface, as shown below. The SOP interface then indicates to the CPU that it is ready to transfer a data word.



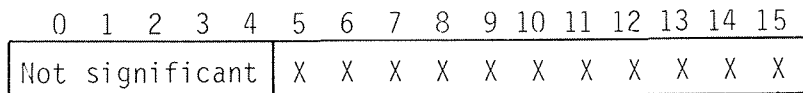
These bits correspond to switches 12 to 21 respectively.

X = 1 for the switch that is operated.

= 0 for all other bits.

Switch 22 on the panel does not generate a data word but is used for testing the indicator lamps.

The CPU may send a data word of the following format for display on the panel, lamps are lit according to the bit pattern of the word.



These bits correspond to lamps 1 to 11 respectively.

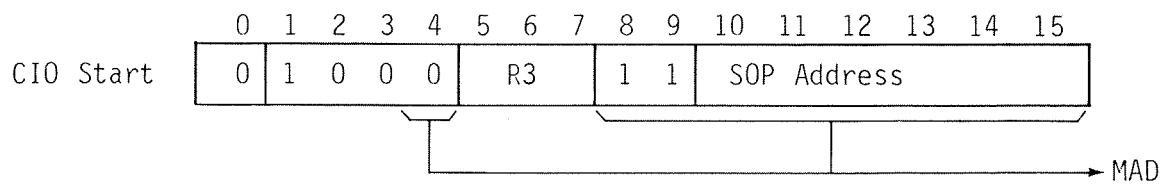
If X = 1 the corresponding lamp is lit.

X = 0 the lamp is unlit.

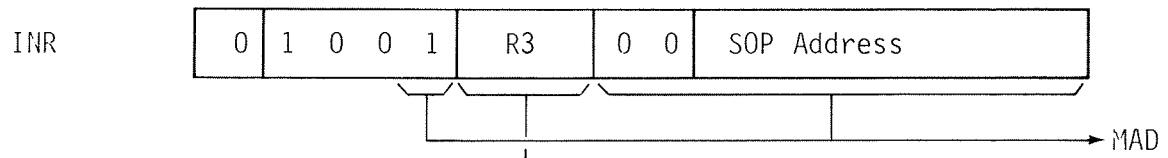
### STRUCTURE

Figure 16.1 shows a block diagram of the SOP interface. Data words are transferred to and from the SOP via BIO00N-15N. The SOP address and commands are sent via the MAD lines and timing signal TPMN is set low to validate the command. If the address is recognised TPMN is set low. If the SOP is in the correct state to accept the command signal ACN is set low. Commands accepted by the SOP interface are shown in figure 16.5.

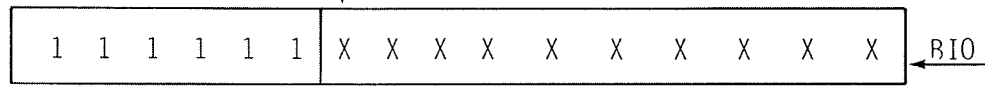
The CPU scans the SOP interrupt by setting signal SCEIN low. If the SOP is ready to send a data word it sends a coded interrupt on BIECO-6 in reply to SCEIN.



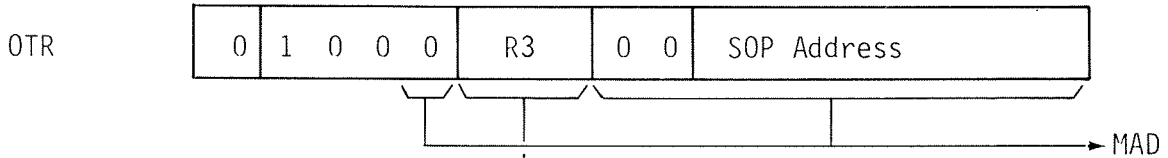
R3 = Operand register not used with this command



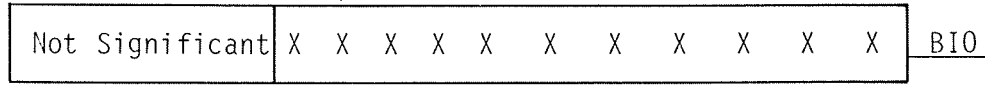
Reg. (A1-7)



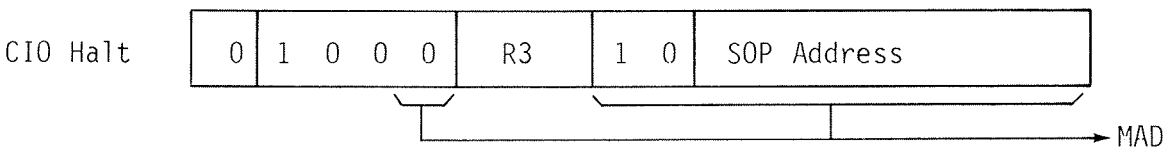
X = 1 for the switch which is operated  
= 0 for all other bits



Reg. (A1-7)



X = 1 if the panel indicator is to be lit  
= 0 for all other bits



R3 is not used with this command

Figure 16.5 SOP COMMAND WORD FORMATS



## 16.4.2 STATUS WORD

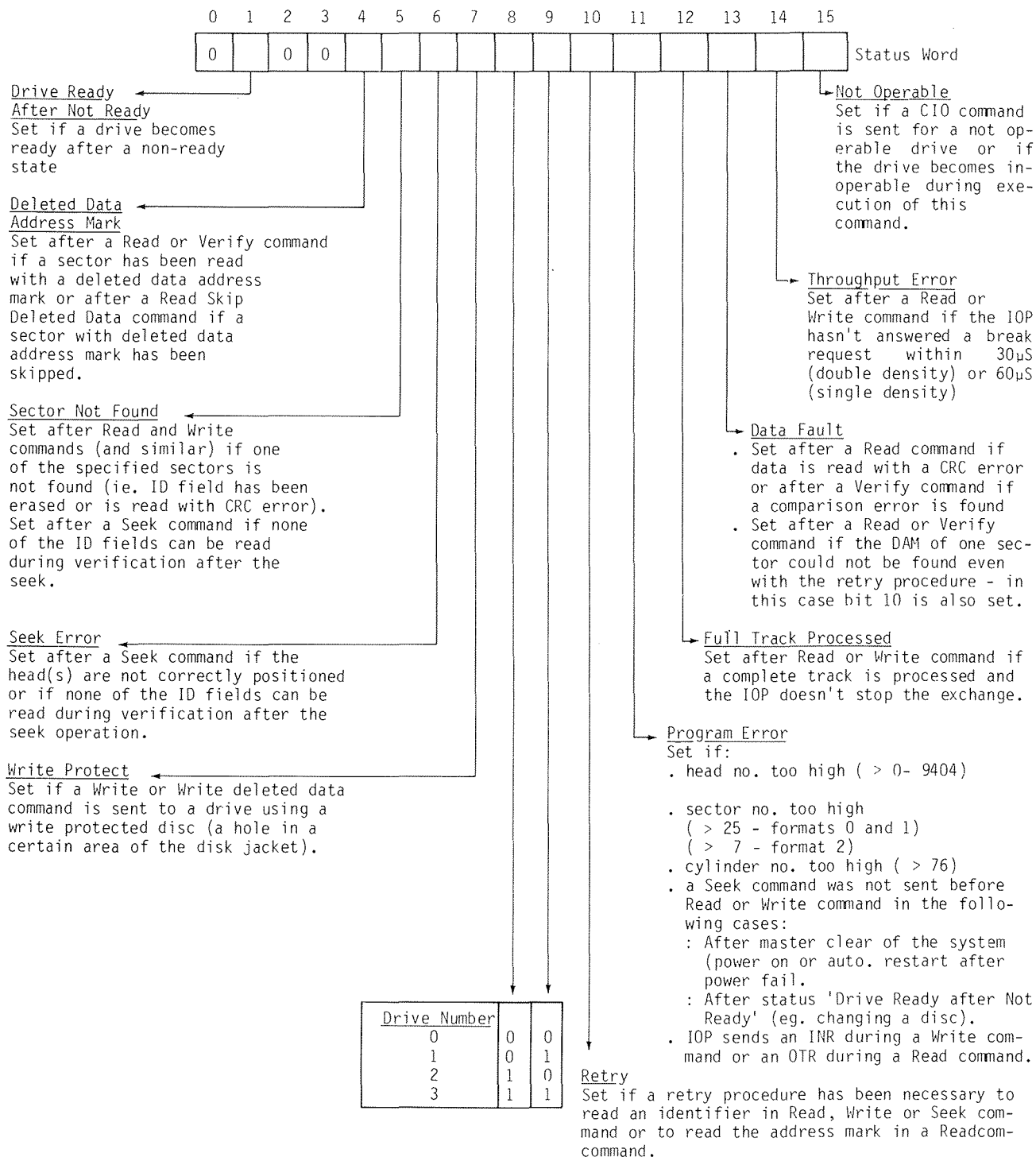


Figure 16.6 EXPLANATION OF STATUS WORD



## 16.5 SHORT DESCRIPTION OF TESTPROGRAMS

TESTPROGRAM F1MB for testing floppy drives connected to the 1Mb CU.

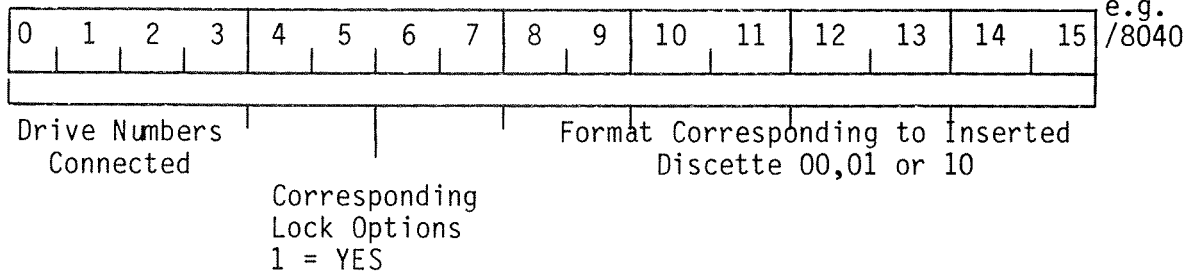
*F1MZ*

. IPL

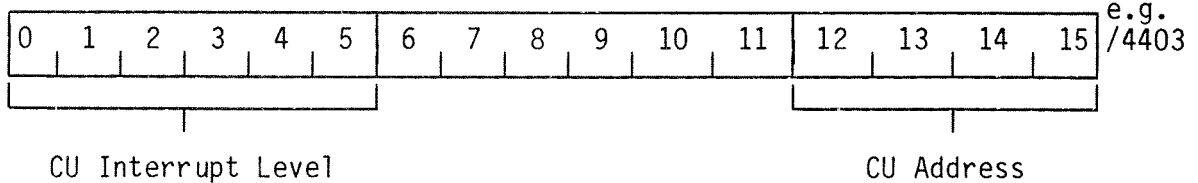
Program stops at /700 = restart = stop on interrupt.

. Fill in registers:

A7



A8



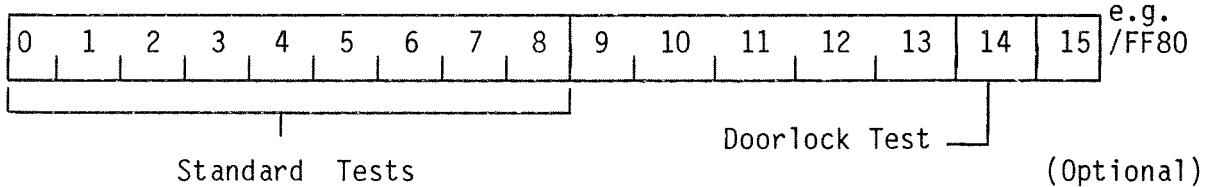
0-5: ~~SOP CU Address all zeroes~~  
 Address "0",  
 if no SOP

6-15: Program Control

A9



A10



. Insert discettes

. RTC on

. MCL, RUN

/700 = normal end (restart) of program

/5E0 = information stop

/5F0 = error stop. A1 contains error code.

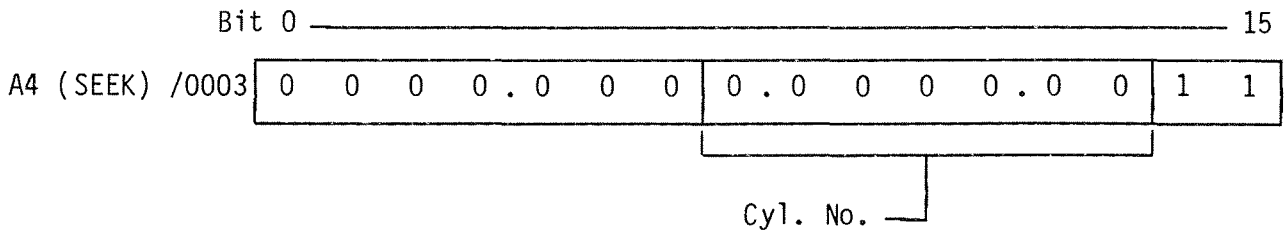
For further information see the official description of the testprogram.



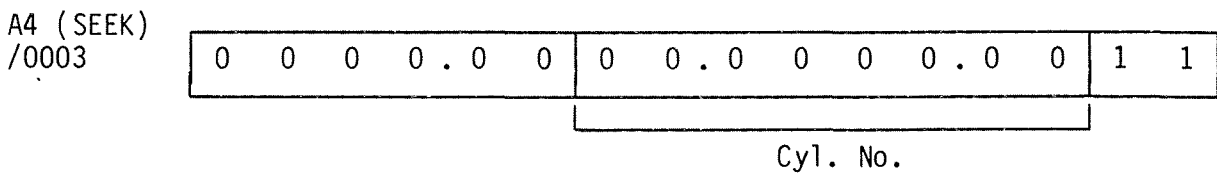
THIS PROGRAM EXECUTES SEEKS BETWEEN CYL. '00' AND '32'.

Device address 3.  
 Drive '0' only.  
 Register A5 contains status.

Preset registers:



/100	/20BF	INH			
2	44C3	RET	CIO	A4,1,3	] SEEK
4	5C04		RB(4)	*-2	
6	4DC3		SST	A5,3	] STATUS
8	5C04		RB(4)	*-2	
A	8514		LDR	A5,A5	
C	5104		RF(1)	ST	CHANGE '0' INTO '32' etc.
E	3480		XRK	A4,/80	
10	5F10		RB	RET	STATUS FAULT
2	207F	ST	HLT		





17 BIG DISC CONTROL UNIT (P825-040 (BIGD))

SECTION	17.1	BIG DISC CONTROL UNIT IDENTIFICATIONS	PAGE 17-2
	17.2	INSTALLATION DETAILS	17-3
	17.3	INTERFACE CONNECTIONS	17-4
	17.4	HARDWARE-SOFTWARE INTERFACE DETAILS	17-5
	17.4.1	Status Word	17-6
	17.5	SHORT DESCRIPTION TESTPROGRAM	17-7
	17.6	SHORT ROUTINES	17-8
		LIST OF ILLUSTRATIONS	
FIGURE	17.1	STRAPSETTING AND INTERFACE	17-3
	17.2	INSTRUCTION / COMMAND-WORD FORMATS	17-5
		LIST OF TABLES	
TABLE	17.1	CU-DEVICE INTERFACE	17-4

## 17.1 BIG DISC CONTROL UNIT IDENTIFICATIONS

Type Number : P825-040  
Testprogram : BCDC2 for both disc drives 0,7 usec. memory obliged.  
Channel : DMA OKI 3B16, OKO 3A16  
Devices : 2x 40Mb drives, P825-007 (CDC 9760)  
          2x 80mB drives, P825-008 (CDC 9762)  
          Cartridge 40Mb, P825-100 (CDC 9876)  
          Cartridge 80Mb, P825-200 (CDC 9877)  
Power Consumption : +5V, 8.0 A  
                    -5V, 0.4 A



17.2 INSTALLATION DETAILS

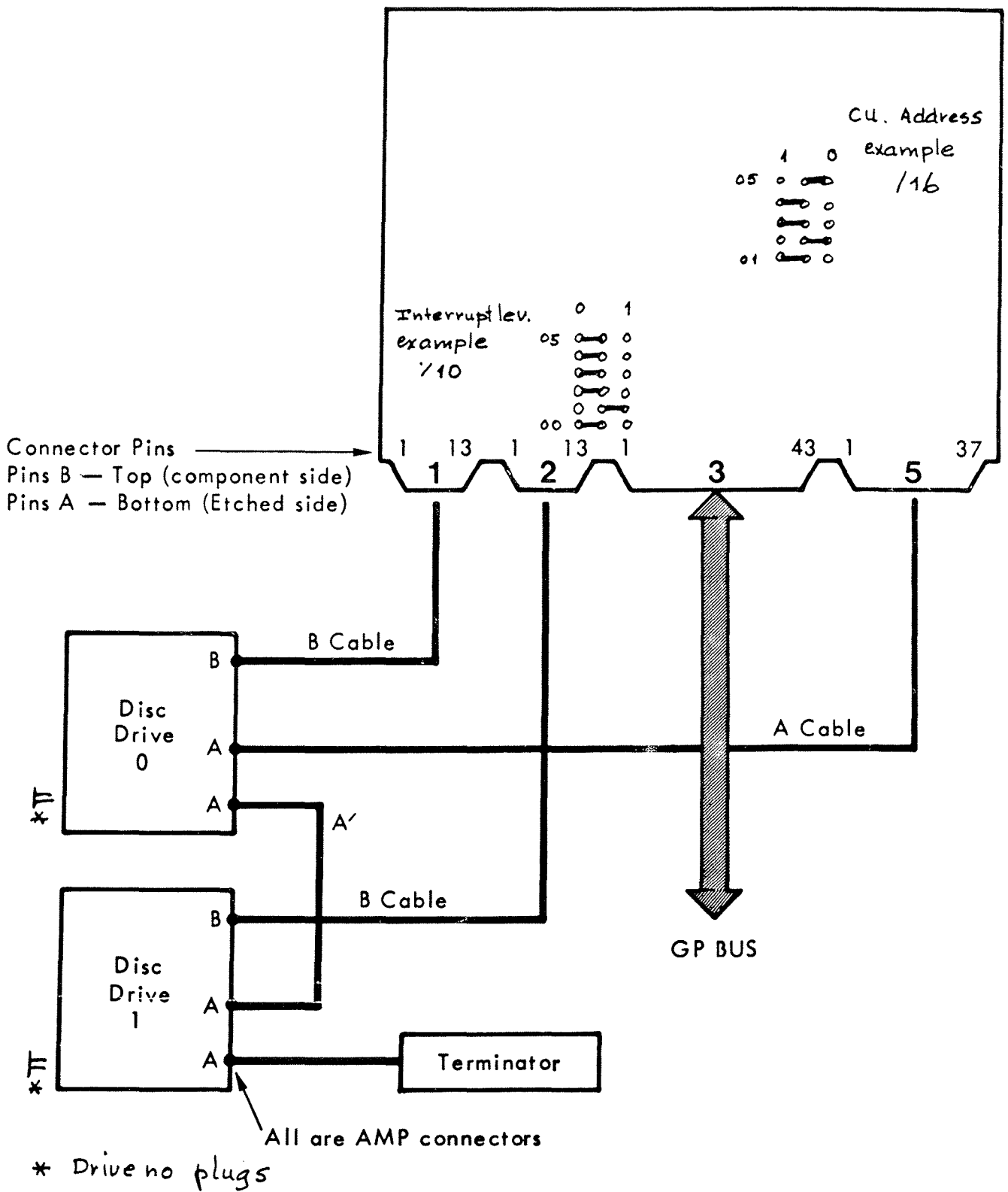


Figure 17.1 STRAPSETTING AND INTERFACE

17.3 INTERFACE CONNECTIONS

Signal	Con. 5	AMP Con.	Device Name, Remarks
<b>A Cable Output Signals</b>			
SEL, N	A37, B37	25, 22	UNIT SELECT, Disc Selection
TAG1, N	A12, B12	49, 46	Cylinder Selection
TAG2, N	A13, B13	51, 48	Head Selection
TAG3, N	A25, B25	55, 52	Control Selection
BUS0, N	A8, B8	26, 23	Bit 0-9, Data Lines
BUS1, N	A9, B9	27, 24	
BUS2, N	A10, B10	31, 28	
BUS3, N	A11, B11	32, 29	
BUS4, N	A31, B31	33, 30	
BUS5, N	A32, B32	37, 34	
BUS6, N	A33, B33	38, 35	
BUS7, N	A34, B34	39, 36	
BUS8, N	A35, B35	43, 40	
BUS9, N	A36, B36	44, 41	
AD0, N	A7, B7	4, 1	UNIT SELECT 0-3, Disc Address
AD1, N	A28, B28	5, 2	
AD2, N	A29, B29	7, 3	
AD3, N	A30, B30	12, 8	
OCD, N	A6, B6	20, 16	Open Cable Detector
<b>A Cable Input Signals</b>			
IND, N	A3, B3	13, 10	INDEX Pulse
SEC, N	A27, B27	77, 74	Not Used (grounded)
SER, N	A5, B5	78, 75	SEEK ERROR
ONCIL, N	A1, B1	18, 15	ON CYLINDER
RDY, N	A4, B4	21, 17	UNIT READY
AMF, N	A2, B2	45, 42	ADDRESS MARK FOUND
FAULT, N	A26, B26	14, 11	Not Used (grounded)
INHA	A14 B14		Strap
<b>B Cable Output Signals (1 set for each disc) disc0 = con.1 disc1 = con.2</b>			
WDL, N	B1, B2	B, A	Write Data Line (bit serial)
Ground	B5	D	
WRC, N	A11, A12	J, H	Write Clock
Ground	B11	E	
<b>B Cable Input Signals (1 set for each disc)</b>			
RCP, N	A1, A2	X, W	Read Clock Pulse
Ground	B3	Y	
RD, N	A3, A4	V, U	Read Data (bit serial from disc)
Ground	B4	T	
WCP, N	A9, A10	N, M	SERVO CLOCK, Write Clock Pulse
Ground	B10	K	
SKEND, N	A5, A6	CC, AA	Seek End
USL, N	A7, A8	BB, DD	Unit Selected
INHB	B6 B7		Strap

Table 17.1 CU - DEVICE INTERFACE

# 17.4 HARDWARE-SOFTWARE INTERFACE DETAILS

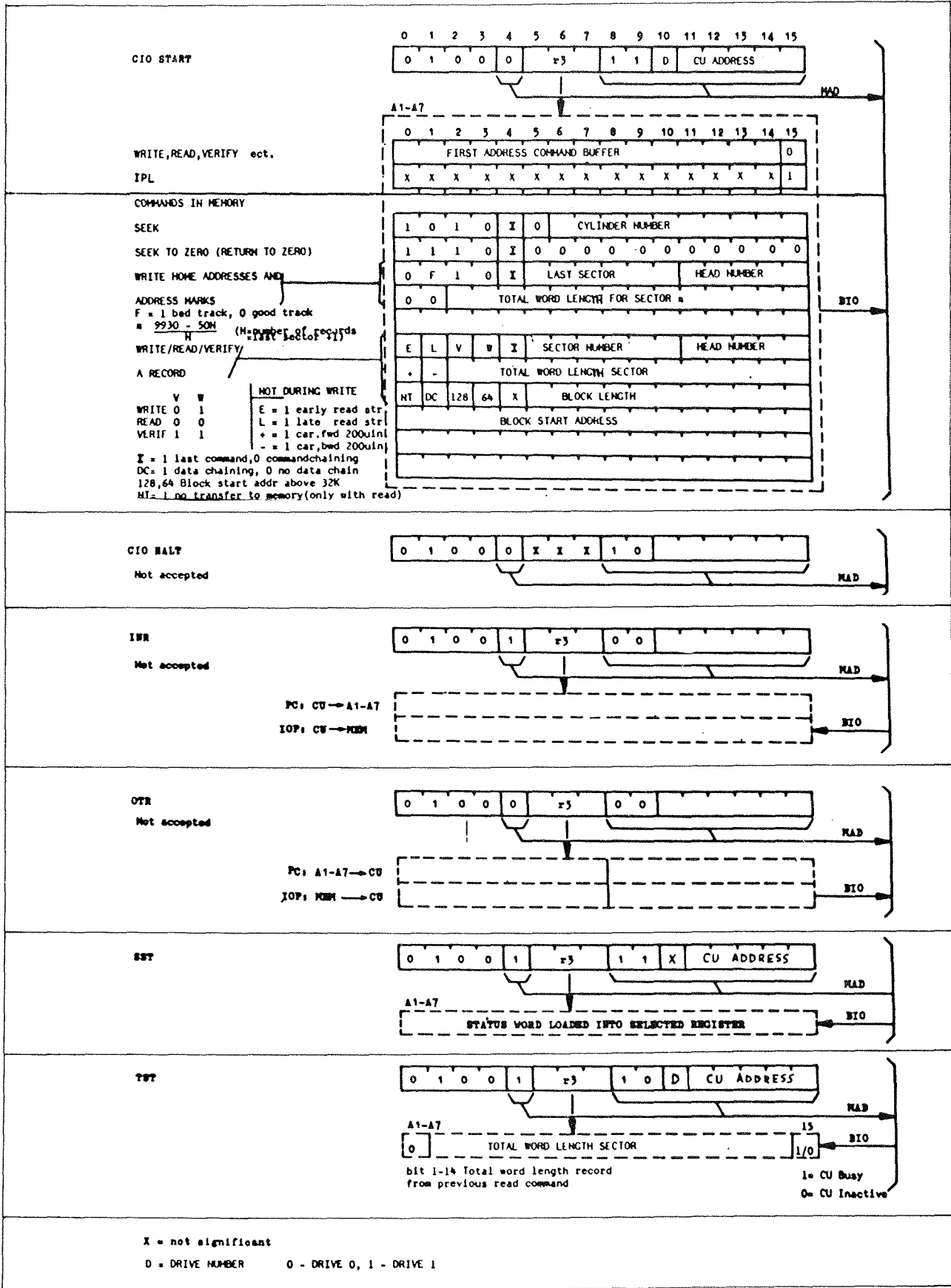
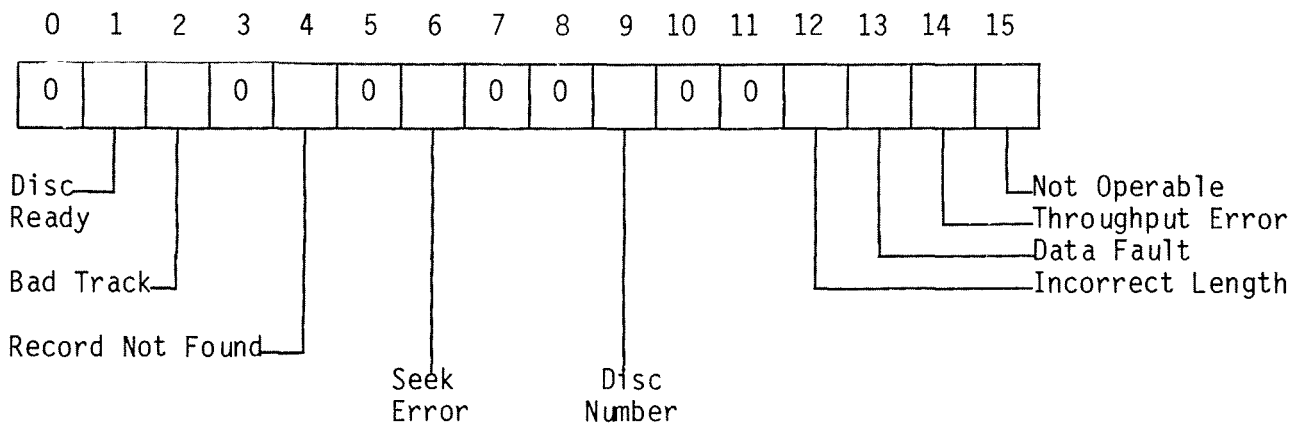


Figure 17.2 INSTRUCTION / COMMAND-WORD FORMATS

### 17.4.1 STATUS WORD



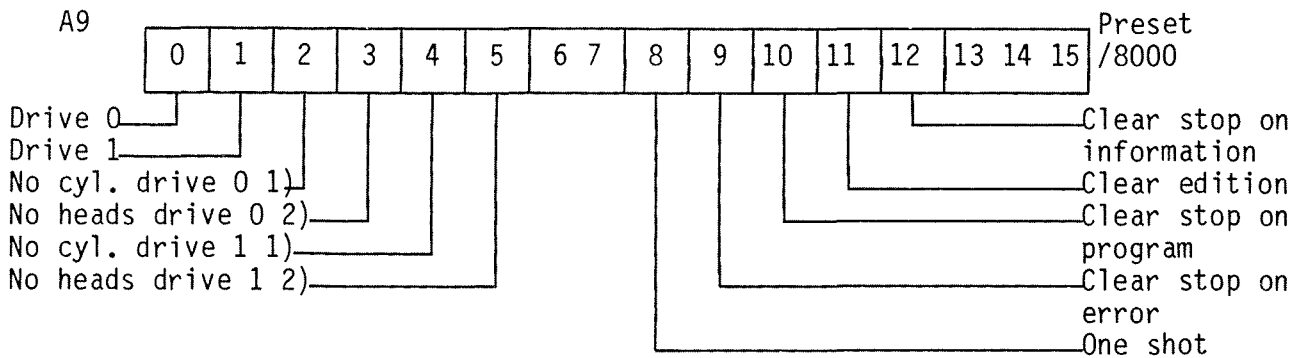
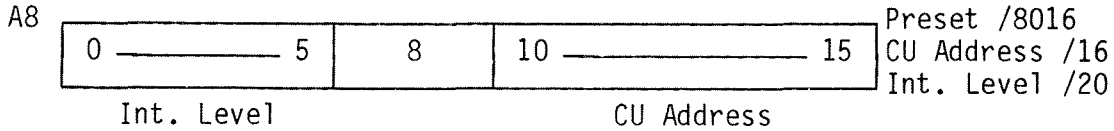
- Bit 15: Command attempted on a not operable disc drive.
- Bit 14: Throughput error; the CU could not access the memory within 100 usec., during WRITE/READ or VERIFY Command.
- Bit 13: Data fault; CRC check incorrect or during a VERIFY command a word does not compare.
- Bit 12: Incorrect length; specified record length differs from the actual length or READ/WRITE not finished before end of track (next index-pulse).
- Bit 9 : Disc drive number 0 = drive 0, 1 = drive 1.
- Bit 6 : Seek error: The drive cannot reach the addressed cylinder or a cylinder number read from the Home Address does not compare at the end of the seek command.
- Bit 4 : Record not found, during a WRITE/READ or VERIFY-command.
- Bit 2 : Bad track; bad track bit is set in the home address of the accessed track.
- Bit 1 : Drive became ready after being not operable (ready interrupt).

17.5 SHORT DESCRIPTION TESTPROGRAM

TESTPROGRAM BCDC2 32K 0.7 USEC.

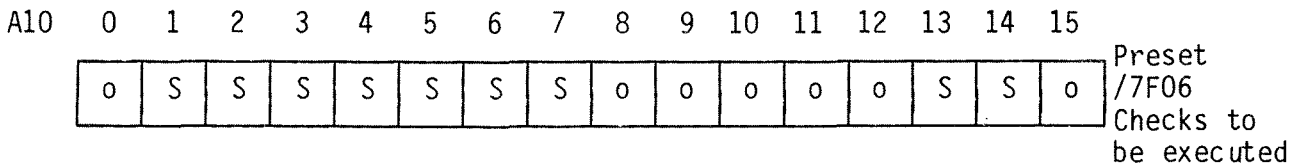
1. IPL  
Program stops at /700 (= restart address and normal end).
2. Switch on RTC (PF/AR also possible).  
Load a scratch dispack on the drive to be tested.

3.



Note 1): Bit 2,4: 0=411 cylinders, 40Mb/150Mb  
              1=823 cylinders, 80Mb/300Mb

Note 2): Bit 3,5: 0=5 heads, 40Mb/80Mb  
              1=19 heads, 150Mb/300Mb



S = Standard setting  
o = Optional

4. Depress MC, RUN

Error stop at /5F0  
Restart after power/off :/6EE  
Interrupts return: /700  
Information stop: /5E0

For more information see detailed description of testprogram.

# 17.6 SHORT ROUTINES

```

PAGE 1    DATE 82-03-06    IDENT  BIGD1

0000          IDENT  BIGD1
0001
0002          *      SMALL PROGRAM FOR WRITE,SEEK,WRITE HOME ADDR. AND VERIFY
0003
0004          *      A1          START ADDRESS COMMAND BUFFER, PRESET FOR SEEK
0005          *      DATA BUFFER START ADDRESS IS /0100
0006
0007          AORG    /80
0008 0080 FFFF          DATA  /FFFF
0009 0082 0000          DATA  0
0010 0084 0194          LDK    A1,/94          COMMAND BUFFER FOR SEEK
0011 0086 207F          START  HLT          AFTER RUN CHECK STATUS IN REG A4
0012 0088 20BF          INH
0013 008A 41D6          CIO    A1,1,/16          START CONTROLLER
0014 008C 5C04          RB(4) *-2
0015 008E 4CD6          SST    A4,/16          GET STATUS
0016 0090 5C04          RB(4) *-2
0017 0092 5F0E          RB    START
0018
0019          * COMMAND BUFFER
0020
0021 0094 A000          SEEK   DATA  /A000          SEEK TO CYLINDER 0
0022 0096 A850          DATA  /A850          SEEK TO CYLINDER 80
0023 0098 A000          WHAWVE DATA  /A000          SEEK CYL. 0
0024 009A 27E0          DATA  /27E0          WRITE HOME ADDRESSES 64 SECTORS
0025 009C 0040          DATA  /0040
0026 009E 1000          DATA  /1000          WRITE A SECTOR
0027 00A0 0040 0040          DATA  /0040,/0040
0028 00A4 0100          DATA  /0100          MEMORY BUFFER
0029 00A6 3800          DATA  /3800          VERIFY WRITTEN SECTOR
0030 00A8 0040 0040          DATA  /0040,/0040,/0100
0031 00AC 0100
0032          END    START

```

## SYMBOL TABLE

```
SEEK  0094 A  START  0086 A  WHAWVE 0098 A
```

```
ASS.ERR. 0000
```

```
:EOF
```

```
PROG ELAPSED TIME: 00H-00M-09S-260MS-
```

```
ASM BIGD2
```

```
DATE 82 /03 /06    TIME 09H-10M-59S-
```

```
LABEL = GERRIT1    DATE = 21 02 78    PACK NBR = 000    BASIC
```

```
2-PASS ASSEMBLER - NAT LAB - VERSION 7.2 16/11/78
```

```

PAGE 1    DATE 82-03-06    IDENT  BIGD2

0000          IDENT  BIGD2
0001
0002          * SMALL PROGRAM TO PREMARK SURFACE 0
0003          * WITH 64 SECTORS PER TRACK
0004          AORG    /80
0005 0080 FFFF 0000          DATA  /FFFF,0
0006 0084 207F          HLT
0007 0086 20BF          START  INH
0008 0088 B120 00AC          LDKL  A1,COBUF          COMMAND BUFFER ADDRESS
0009 008C 41D6          CIO    A1,1,/16
0010 008E 4CD6          SST    A4,/16          GET STATUS
0011 0090 5C04          RB(4) *-2
0012 0092 9041 00AC          IM    COBUF          NEXT CYL.
0013 0096 B340 00AC          LB    A3,COBUF
0014 009A EB20 A336          CHK  A3,/A336          IS IT THE LAST CYL.
0015 009E 5D14          RB(5) CIO          NO, THEN THE NEXT
0016 00A0 207F          HLT          YES, CHECK STATUS IN A4
0017 00A2 B320 A000          AGAIN  LDKL  A3,/A000
0018 00A6 B341 00AC          ST    A3,COBUF          REPAIR COMMAND
0019 00AA 5F26          RB    START
0020
0021          * COMMAND BUFFER
0022
0023 00AC A000 2FE0          COBUF  DATA  /A000,/2FE0,/0040          SEEK, WHA FOR 64 SECTORS
0024 00B0 0040
0025          END    START

```

## SYMBOL TABLE

```
AGAIN 00A2 A  CIO    008C A  COBUF  00AC A  START  0086 A
```

```
ASS.ERR. 0000
```

```
:EOF
```

```
PROG ELAPSED TIME: 00H-00M-08S-460MS-
```



```

0000 IDENT BIGD4N
0001 PROGRAM FOR HEAD ADJUSTMENT FOR 80M DISC
0002 *
0003 *
0004
0005 - OPERATING BIGD4 ADJUSTMENT PROGRAM
0006 - LOAD PROGRAM FROM CASSETTE,DISC OR FLEXIBLE DISC
0007 R- AFTER LOADING PROGRAM STOPS AT /86
0008 - PUSH NOW MC AND RUN
0009 - FOR ABOUT 30 SECONDS A CONTINUOUS SEEK IS DONE
0010 - FROM 230 TO 235
0011 - THEN THE HEADS ARE AT CYL 4 FOR MEASURING SERVO OFFSET
0012 - OPERATE SW 2 ON A05 FROM LOCAL TO REMOTE AND BACK
0013 - THEN HEADS POSITIONED AT TRACK 5 FOR MEASURING
0014 - OPERATE SW 2 AGAIN
0015 A- PROGRAM STOPS AT /CE, LOAD HEAD NUMBER IN A2,THEN PUSH
0016 - IF A2 GREATER THEN 4 PROGRAM CONTINUES WITH B
0017 - NOW HEAD IS SELECTED(SEE REGISTER A2)
0018 - AND POSITIONED AT CYL 4
0019 - ADJUST THE HEAD , CHECK THE HEAD AND FIX IT
0020 - OPERATE SW 2 AGAIN
0021 - PROGRAM STOPS AT /CE,GOTO A
0022 B- A2>4 PROGRAM DOES CONTINUOUS SEEK
0023 - FROM 230 TO 235 AGAIN
0024 C- PROGRAM STOPS AT /CE, LOAD HEAD NUMBER IN A2,THEN PUSH
0025 - IF A2 GREATER THEN 4 PROGRAM RESTARTS AT R
0026 - NOW HEAD IS SELECTED(SEE REGISTER A2)
0027 - AND POSITIONED AT CYL 245
0028 - CHECK THE HEAD
0029 - OPERATE SW 2 AGAIN
0030 - PROGRAM STOPS AT /CE,GOTO C
0031
0032
0033 EJECT
0034 0000 RES /40
0035 0080 FFFF 0000 DATA /FFFF,0
0036 0084 207F START HLT
0037 0086 0600 LDK A6,0 RESET RETRY FLAG
0038 0088 86A0 A804 LDKL A14,/A804
0039 008C 86C1 0136 R ST A14,SEK245 CHANGE TO SEEK TO CYL4
0040 0090 86A0 0122 R LDKL A14,EOS STACKPOINTER
0041 0094 20BF INH NO INTERRUPT HANDLING
0042 0096 0700 LDK A7,0 FLAG FIRST TIME
0043 0098 0098 EQU *
0044 0098 80A0 03FF LDKL A8,/3FF FOR 30 SECONDS SEEK
0045 009C 85A0 00FE R LDKL A13,CIOSST SUBROUTINE ADDRESS
0046 * CONTINUOUS SEEK FROM 230 TO 235
0047
0048
0049 00A0 8120 0124 R SEEK LDKL A1,CSEEK COMMAND BUFFER ADDRESS
0050 00A4 F697 CONT CFR A14,A13 SEEK FROM 230 TO 235
0051 00A6 1102 ADK A1,2 COMMAND BUFFER ADDRESS
0052 00A8 F697 CFR A14,A13 SEEK TO 235
0053 00AA 98A0 0001 SUKL A8,1 TIME OVER?
0054 00AE 5910 RB(P) SEEK
0055 00B0 871C LDR A7,A7 IS IT THE FIRST TIME?
0056 00B2 5118 RF(P) SK245
0057 * SEEK TO CYLINDER 4
0058 00B4 8120 0128 R LDKL A1,SEEK4 COMMAND BUFFER ADDRESS
0059
0060
0061 00BB F697 CFR A14,A13 SEEK TO CYL 4
0062 * SEEK TO CYLINDER 5
0063
0064
0065 00BA 8120 0138 R LDKL A1,SEEK0 COMMAND BUFFER
0066 00BE F697 CFR A14,A13 PERFORM SEEK 0
0067 00C0 8120 012A R LDKL A1,SEEK5 COMMAND BUFFER ADDRESS
0068 00C4 F697 CFR A14,A13 SEEK TO CYL 5
0069 00C6 8120 0138 R LDKL A1,SEEK0 SEEK TO ZERO
0070 00CA F697 CFR A14,A13 PERFORM SEEK TO ZERO
0071 * SEEK TO CYLINDER 4 OR 245 FOR THE SEVERAL HEADS
0072
0073 00CC 207F SK245 HLT STOP PUT HEAD NR IN A2 AND PUSH RUN
0074 00CE EA20 0004 CWK A2,4 CHECK IF CONT
0075 00D2 5118 RF(G) CHECK CONTINUE WITH SECOND PART
0076 00D4 E241 012D R SC A2,HSEL+1 TO START WITH HEAD 0
0077 00D8 8120 0138 R NEXT LDKL A1,SEEK0 COMMAND BUFFER ADDRESS
0078 00DC F697 CFR A14,A13 SEEK TO 0
0079 00DE 8120 012C R LDKL A1,HSEL SELECT HEAD
0080 00E2 F697 CFR A14,A13 DO HEAD SELECT
0081 00E4 8120 0136 R LDKL A1,SEK245 COMMAND BUFFER ADDRESS
0082 00E8 F697 CFR A14,A13 SEEK 245
0083 00EA 5F20 RB SK245
0084 00EC 00EC CHECK EQU *
0085 00EC 1701 ADK A7,1 SET FLAG 2 ND TIME
0086 00EE EF20 0002 CWK A7,2 IS TI THE SECOND TIME?
0087 00F2 5870 RB(E) START

```



DATE 82-06-23 IDENT BIGD4N

```

0088 00F4 84A0 ABF5          LDKL    A12,/ABF5          SEEK TO 245
0089 00F8 84C1 0136 R        ST      A12,SEK245        CHANGE TO SEEK TO 245
0090 00FC 5F66                RB      SECOND            FOR CONTUNUOUS SEEK AGAIN
0091                            *
0092                            *      SUBROUTINE
0093
0094 00FE 41D6          CIOSST  CIO    A1,1,/16          START OPERATION
0095 0100 4CD6          SST      A4,/16          ASK FOR STATUS
0096 0102 5C04          RB(NA) *-2
0097 0104 2401          ANK     A4,1          CHECK IF NOT OPERABLE
0098 0106 5104          RF(P)  CHRETRY        CHECK IF RETRY
0099 0108 0600          LDK    A6,0          CLEAR RETRY FLAG
0100 010A F03A          RTN     A14
0101 010C 8618          CHRETRY LDR    A6,A6          RETRY OR NOT
0102 010E 5C12          RB(NZ) CIOSST        DO RETRY
0103 0110 0601          NORETRY LDK    A6,1          SET RETRY FLAG FOR NEXT COMMAND
0104 0112 F03A          RTN     A14
0105                            *      STACK AREA
0106
0107 0114                RES     7
0108 0122          EOS     RES     1
0109                            *      COMMAND BUFFERS
0110
0111 0124 ABE6          CSEEK  DATA  /ABE6          SEEK TO 230
0112 0126 ABE8          DATA  /ABE8          SEEK TO 235
0113
0114 0128 AB04          SEEK4   DATA  /AB04          SEEK TO 4
0115
0116 012A AB05          SEEK5   DATA  /AB05          SEEK TO 5
0117
0118          012C          HSEL    EQU    *
0119 012C 0800          DATA  /0800          READ WITH HEAD X
0120 012E 0040 0040          DATA  /0040,/0040
0121 0132 0000 0000          BUFL   DATA  0,0
0122 0136 ABF5          SEK245  DATA  /ABF5          SEEK TO CYL 245
0123
0124 0138 EB00          SEEK0   DATA  /EB00          RETURN TO CYL 0
0125
0126                END      START

```

SYMBOL TABLE

```

BUFL   0132 R   CHECK  00EC R   CHRETR  010C R   CIOSST  00FE R
CONT   00A4 R   CSEEK  0124 R   EOS     0122 R   HSEL   012C R
NEXT   00DB R   NORETR 0110 R   SECOND 0098 R   SEEK   00A0 R
SEEK0  0138 R   SEEK4   0128 R   SEEK5   012A R   SEK245 0136 R
SK245  00CC R   START  0084 R

```

ASS.ERR. 0000

:EOF  
PROG ELAPSED TIME: 00H-00M-00S-000MS-



18 DISC CONTROL UNIT - P824-040 (DCCU)

SECTION	18.1	DISC CONTROL UNIT - IDENTIFICATIONS	PAGE 18-2
	18.2	INSTALLATION DETAILS	18-3
	18.3	INTERFACE CONNECTIONS	18-4
	18.4	HARDWARE-SOFTWARE INTERFACE DETAILS	18-5
	18.4.1	Status Word	18-6
	18.5	SHORT DESCRIPTION TESTPROGRAM	18-7
	18.6	SHORT ROUTINES	18-8

LIST OF ILLUSTRATIONS

FIGURE	18.1	ADDRESS AND INTERRUPT ENCODERS	18-3
	18.2	INSTRUCTION / COMMAND-WORD FORMATS	18-5

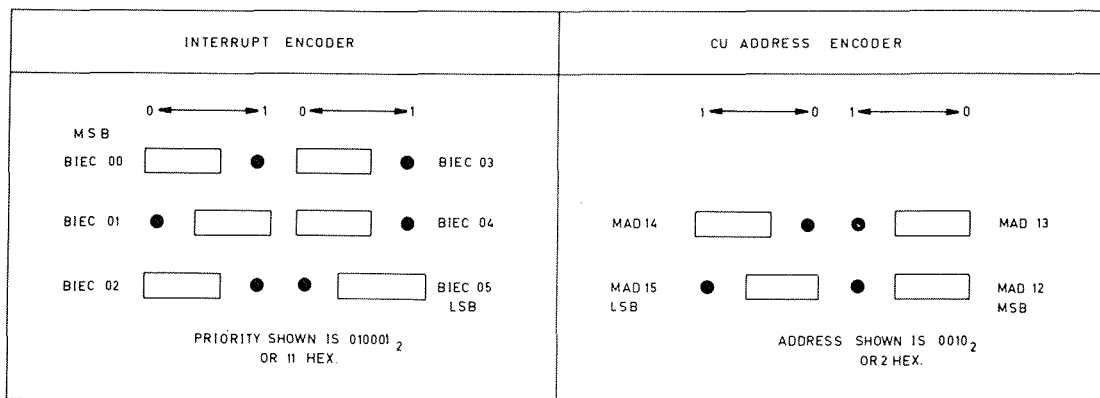
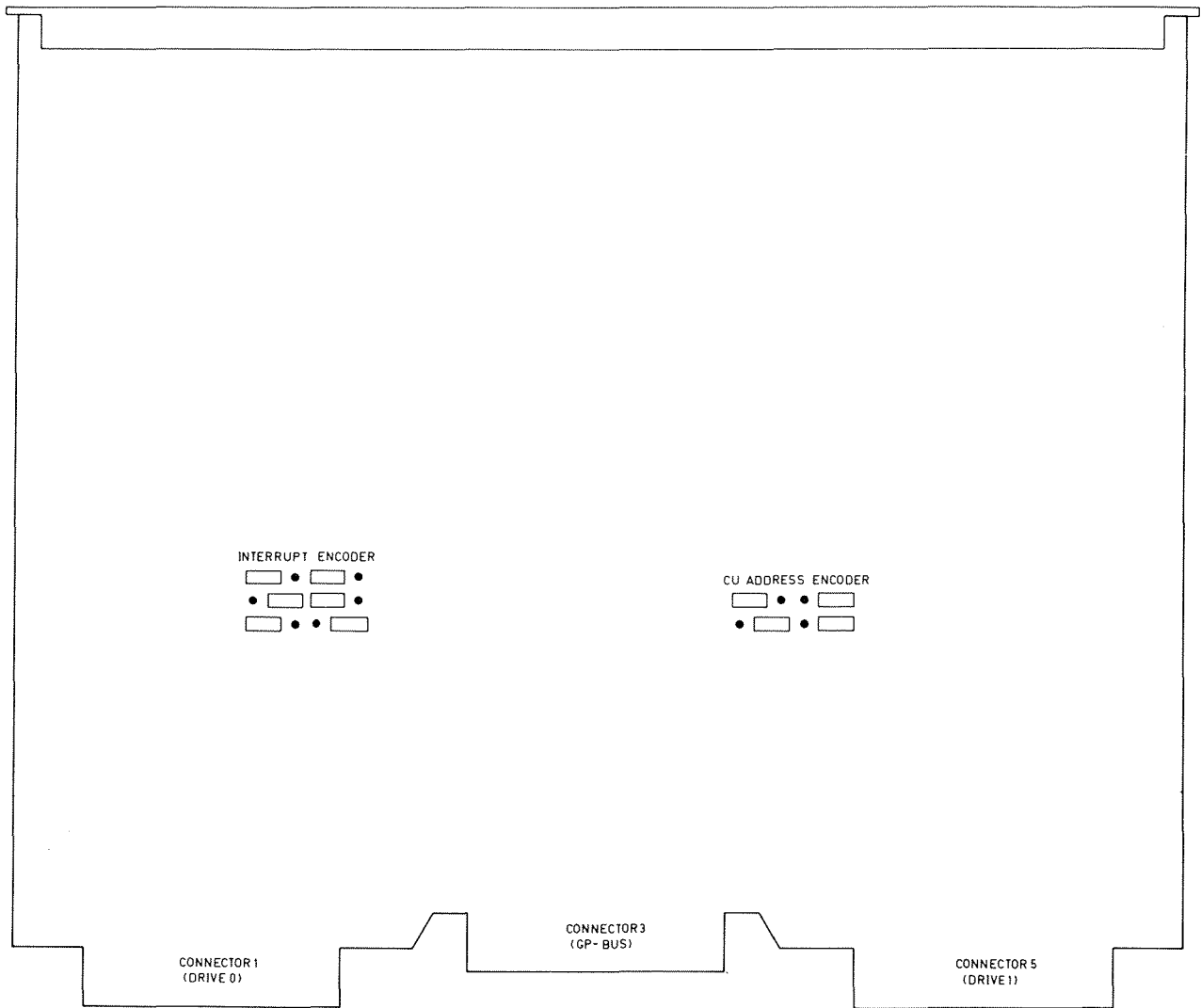
LIST OF TABLES

TABLE	18.1	INTERFACE CONNECTIONS	18-4
-------	------	-----------------------	------

## 18.1 DISC CONTROL UNIT IDENTIFICATIONS

Type Number : P824-040  
Testprogram : X1215: BCDD1  
              : X1216: BX1216  
Channel : Hardware Channel MIOP, IOP  
Break Connection : 3A43  
Interrupt Connections: ....  
Devices : 2x X1215 (2.7 Mb) - P824-012  
          : 2x X1216 (5.4 Mb) - P824-014  
Power Consumption : 5 Volt, 4 Amp.

# 18.2 INSTALLATION DETAILS



02485

Figure 18.1 ADDRESS AND INTERRUPT ENCODERS

### 18.3 INTERFACE CONNECTIONS

CONTROL UNIT		DISK DRIVE	
SIGNAL NAME	CONNECTOR PIN	SIGNAL NAME	CONNECTOR PIN
BUS # 0H	A 25	A B 0	48
SIGNAL GROUND	B 25		51
BUS # 1H	A 26	A B 1	47
SIGNAL GROUND	B 26		50
BUS # 2H	A 27	A B 2	46
SIGNAL GROUND	B 27		49
BUS # 3H	A 13	A B 3	54
SIGNAL GROUND	B 13		57
BUS # 4H	A 12	A B 4	53
SIGNAL GROUND	B 12		56
BUS # 5H	A 11	A B 5	52
SIGNAL GROUND	B 11		55
BUS # 6H	A 35	A B 6	60
SIGNAL GROUND	B 35		64
BUS # 7H	A 34	A B 7	59
SIGNAL GROUND	B 34		63
BUS # 8H	A 10	A B 8	40
SIGNAL GROUND	B 10		43
SEL # H	A 07	USL	36
SIGNAL GROUND	B 07		39
FTCYL # H	A 04	C S	10
SIGNAL GROUND	B 04		13
FTH # H	A 05	H S	11
SIGNAL GROUND	B 05		14
FCONT # H	A 33	CTS	17
SIGNAL GROUND	B 33		21
WDL # H	A 37	WRDA	08
SIGNAL GROUND	B 37		12
UNSAFE # H	A 03	U S A 2	34
SIGNAL GROUND	B 03		37
RER # H	A 02	U S A 1	03
SIGNAL GROUND	B 02		07
SEC # 0H	A 06	S P C	23
SIGNAL GROUND	B 06		26
SEC # 1H	A 29	S P F	30
SIGNAL GROUND	B 29		33
IND # 0H	A 08	I P C	24
SIGNAL GROUND	B 08		27
IND # 1H	A 30	I P F	35
SIGNAL GROUND	B 30		38
RDY # H	A 31	U R	02
SIGNAL GROUND	B 31		05
ONCIL # H	A 32	C O N	29
SIGNAL GROUND	B 32		32
RDL # H	A 36	RDDA	01
SIGNAL GROUND	B 36		04
SEL # N	A 07	CUAS	58
SIGNAL GROUND	B 07		62
KEY TO SIGNAL NAME: # CONTROL UNIT CONNECTOR		DRIVE 0	DRIVE 1
		0	1
		1	5

Lines for

cylinder number, CS  
head selection, HS  
commands, CTS

unit select

cylinder select

head select

control select

write data line

unit unsafe 2

unit unsafe 1 (rer)

sector puls cartr.

sector puls fixed

index puls cartr.

index puls fixed

unit ready

on cylinder

read data line

controller absent

CONTROL UNIT to DISK DRIVE INTERFACE CONNECTIONS

Table 18.1 INTERFACE CONNECTIONS

# 18.4 HARDWARE-SOFTWARE INTERFACE DETAILS

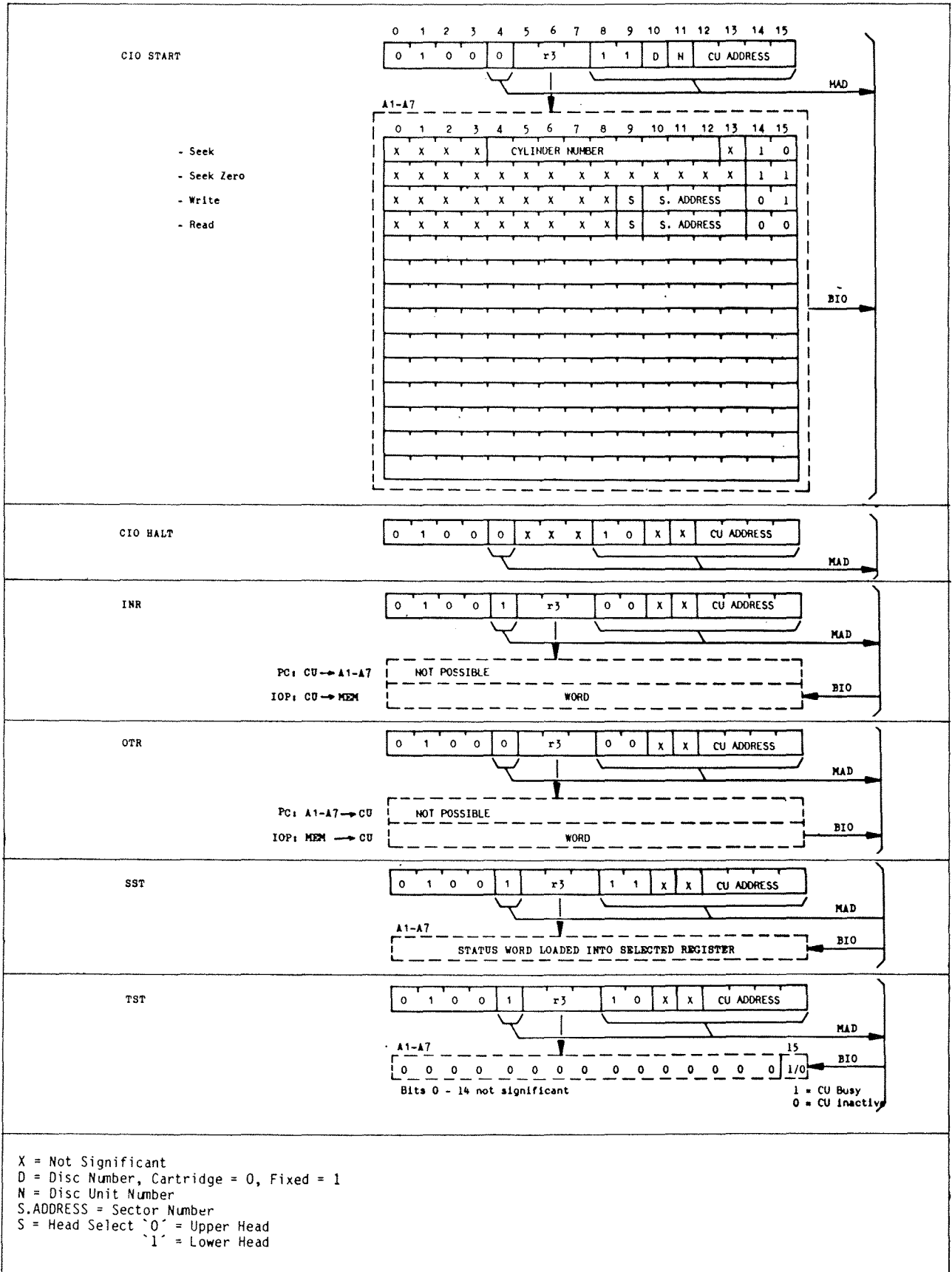
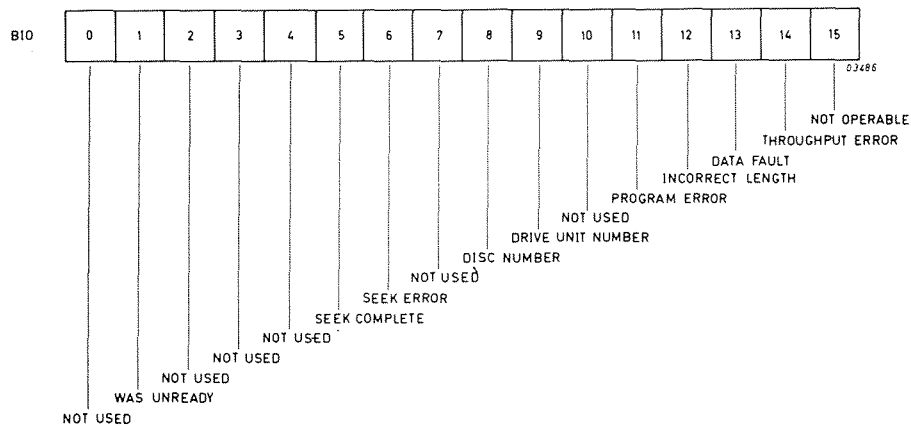


Figure 18.2 INSTRUCTION / COMMAND-WORD FORMATS

## 18.4.1 STATUS WORD



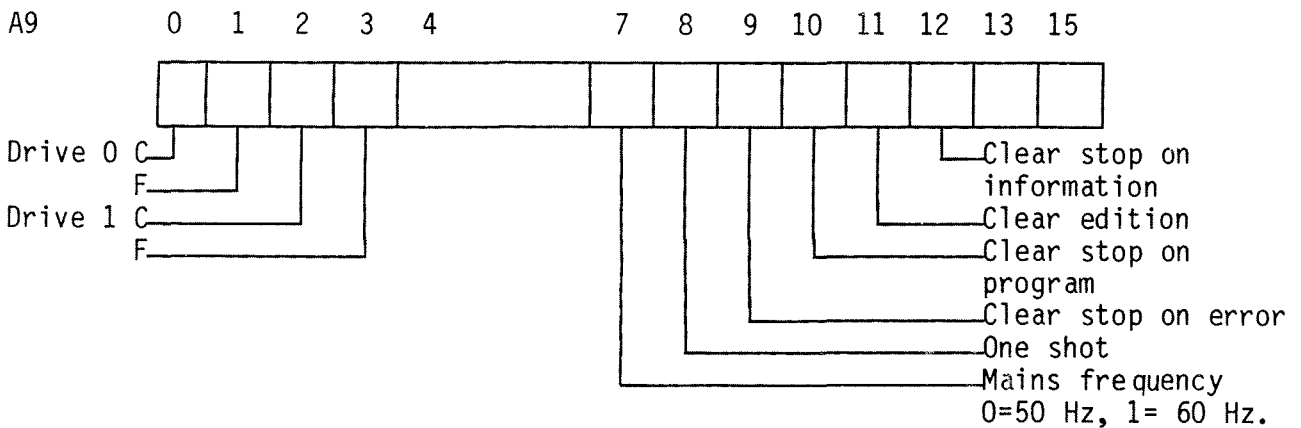
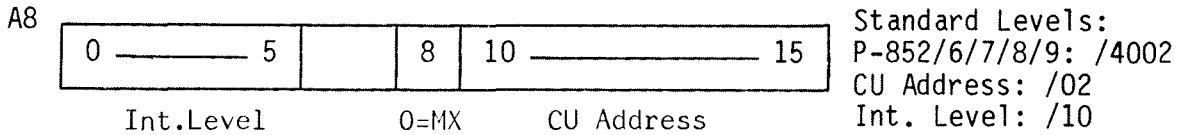
- Bit 15 Not operable - is set if the drive (indicated in bit 9) is not operable.
- Bit 14 Throughput Error - is set during a write operation if both words in the Input Data Buffer have been written to disc and serialization of the current word is completed before the IOP has answered the exchange data request with an OTR. It is set during a read operation if neither word in the Read Data Buffer have been transferred to memory and deserialization of the current word has ended before the IOP has answered the exchange data request with an INR.
- Bit 13 Data Fault - is set when the LRC check fails at the end of a read operation.
- Bit 12 Incorrect Length - is set if a read or write operation is incomplete when the start of the next physical sector is detected, by means of the sector pulse.
- Bit 11 Program Error - is set if the CU receives an OTR command during a read operation or an INR during a write operation.
- Bit 9 Drive Unit Number - is set for drive number 1.
- Bit 8 Disc Number - is set for the fixed disc. The disc number is valid only after a read or write operation, after a seek or ready interrupt bit 8 will always be zero.
- Bit 6 Seek Error - is set if an error has been detected or the drive becomes inoperable during a seek operation.
- Bit 5 Seek Complete - is set if the seek operation is complete whether or not errors were detected.
- Bit 1 Was Unready - is set if during scanning a change of status has occurred from not operable to operable.



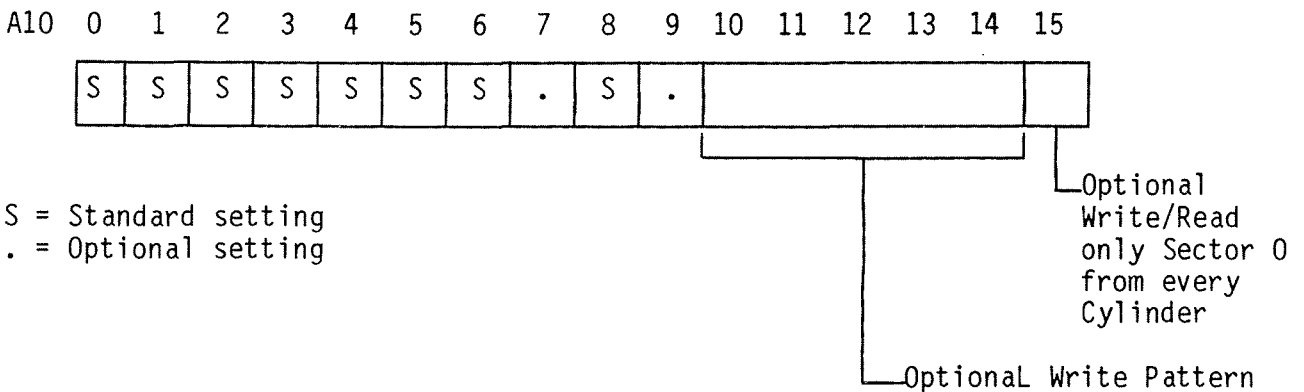
## 18.5 SHORT DESCRIPTION TESTPROGRAM

TESTPROGRAM            BCDD1 8K            X1215 Disc Drive  
                          BX1216            X1216 Disc Drive

1. IPL  
    Program stops at /700 (= restart address and normal end).
2. Switch on RTC (PF/AR) also possible). Load a SCRATCH cartridge.
- 3.



C = Cartridge  
F = Fixed



4. Depress MC, RUN  
    Error stop at /5F0  
    Restart after power/off at /6EE  
    Interrupts return to /700  
    Information at /5E0

For more information see official description of testprogram.

## 18.6 SHORT ROUTINES

```

DATE 80-03-13      IDENT  SEEK

00000              IDENT  SEEK
00001      * PROGRAM USABLE INSTEAD OF AN EXERSISER
00002
00003      *      LOAD START CYLINDER IN REG A1
00004      *      LOAD LAST CYLINDER IN REG A2
00005      *      LOAD STEPPING INCREMENT IN REG A3
00006      *      LOAD TIME DELAY IN REG A6
00007      *      DISC DRIVE 0 IS ADDRESSED OTHERWISE CHAGE DEVICE ADDRESSES
00008
00009              AORG      /80
00010 0080 FFFF      DATA  /FFFF
00011 0082 0000      DATA  0
00012 0084 207F      START  HLT
00013 0086 20BF              INH
00014 0088 8404      CIO    LDR      A4,A1
00015 008A 3C43      CIO1   SLL      A4,3
00016 008C 1402              ADK      A4,2
00017 008E 44C2      CIO    A4,1,2
00018 0090 4DC2              SST      A5,2
00019 0092 5C04              RB(4)   *-2
00020 0094 E718              ECR      A7,A6
00021 0096 1F01              SUK      A7,1
00022 0098 5E04              RB(6)   *-2
00023 009A ED20              CWK      A5,/400
00024 009E 5002              RF(0)   CONT
00025 00A0 207F              HLT
00026 00A2 3C63      CONT   SRL      A4,3
00027 00A4 940C              ADR      A4,A3
00028 00A6 EC08              CWR      A4,A2
00029 00AB 5922              RB(1)   CIO
00030 00AA 5F22              RB      CIO1
00031
00032              EJECT
00033      *EXAMPLE
00034      *FOR CERTAIN ADJUSTMENTS SEEK FROM 0 TO 64 IN LOOP
00035      *LOAD THE REGISTERS AS FOLLOWS:
00036      *      LOAD A1 WITH 0
00037      *      LOAD A2 WITH 64 DEC = /40
00038      *      LOAD A3 WITH 64 DEC = /40
00039      *      LOAD A6 WITH /40 ( MAX VALUE IN A6 = /80)
00040      *      (/40= 64 DEC IS ABOUT A DELAY OF 64 MSEC)
00041
00042      *      LOAD START ADDRESS IN A0
00043      *      PUSH MC AND RUN
00044
00045      *NOTE WITH INST YOU CAN STOP THE PROGRAM AND IT IS
00046      *      POSSIBLE TO CHANGE THE PARAMETERS, PUSH RUN AND
00047      *      THE PROGRAM WILL RUN FOR THE CHANGED PARAMETERS
00048
00049      END      START

```

```

00000          IDENT      DISCTS          FOR P800
00001          *PROGRAM FOR READING AND WRITING ON DISC
00002          *PUT THE PATTERN YOU WANT READ AND WRITE IN A5, BEFORE RUNNING THE PROGRAM
00003          *IF THE PROGRAM STOPS YOU FIND THE WRITTEN WORD IN A3 AND THE READ WORD IN A4
00004          *IN A2 IS THE POSITION OF THE WORDS IN THE DATA BUFFERS
00005          *AFTERWARDS YOU FIND THE STATUS IN A6.
00006          *
00007          *
00008          ADRG      /80
00009          DA      EQU      /02          DEVICE ADDR. DISC
00010          ER1     EQU      /04          FIRST EXTERNAL REGISTER
00011          ER2     EQU      /05          SECOND EXTERNAL REGISTER
00012          *
00013          *MAIN PROGRAM
00014          0080 FFFF          DATA      /FFFF
00015          0082 0000          DATA      0
00016          0084 207F          START     HLT
00017          0086 87A0          LDKL     A15,EOS          LOAD STACKPOINTER
00018          0088 0780          LDKL     A1,INTROU        ADDR. INTERRUPTROUTINE
00019          008C 00F4          ST      A1,/20
00020          0090 0020          LOAD    LDK      A2,0
00021          0092 0200          STORE  ST      A5,DATAIN,A2          WRITE BUFFER
00022          0094 8549          ADK     A2,2
00023          0096 00FA          CWK    A2,/19A
00024          0098 1202          RB(4)  STORE
00025          009A EA20          LDKL   A1,/COCD          WER CONTROL WORD 1
00026          009C 019A          WER    A1,ER1
00027          009E 5C0C          LDKL   A1,DATAIN        WER CONTROL WORD 2
00028          00A0 8120          WER    A1,ER2
00029          00A2 C0CD          LDK    A1,1
00030          00A4 7104          CIO    A1,1,DA          START WRITE
00031          00A6 8120          RB(4) *-2
00032          00AB 00FA          WAIT   TST      A7,DA
00033          00AC 0101          CWK    A7,0
00034          00AD 41C2          RB(4)  WAIT
00035          00AE 5C04          LDKL   A1,/BOCD          WER CONTROL WORD 1
00036          00B0 0000          WER    A1,ER1
00037          00B2 4FB2          LDKL   A1,DATAOT        WER CONTROL WORD 2
00038          00B4 EF20          WER    A1,ER2
00039          00B6 0000          LDK    A1,0
00040          00B8 5C08          CIO    A1,1,DA          START READ
00041          00BA 8120          RB(4) *-2
00042          00BC 80CD          WAITAG TST      A7,DA
00043          00BE 7104          CWK    A7,0
00044          00C0 043A          RB(4)  WAITAG
00045          00C2 043A          LDK    A2,0
00046          00C4 7105          TEST   LD      A3,DATAIN,A2          COMPARE WRITE AND
00047          00C6 0100          LD     A4,DATAOT,A2          READ BUFFER
00048          00C8 41C2          CHR    A3,A4          OK?
00049          00CA 5C04          RF(4)  HALT          NO STOP
00050          00CB 41C2          ADK    A2,2          YES GO ON
00051          00CC 4FB2          CWK    A2,/19A
00052          00CE EF20          RB(4)  TEST
00053          00D0 0000          ABL(7) LOAD
00054          00D2 5C08          HALT   HLT          DATA ERROR
00055          00D4 0200          ABL(7) LOAD
00056          00D6 8348          *
00057          00D8 00FA          *INTERRUPT ROUTINE
00058          00DA 8448          INTROU SST      A6,DA          AFTERWARDS STATUS IN A6
00059          00DC 043A          RB(4) *-2
00060          00DE EB10          RTN    A15
00061          00E0 540C          DATAIN RES     /1A0
00062          00E2 1202          DATAOT RES     /1A0
00063          00E4 EA20          STACK  RES     3
00064          00E6 019A          EOS    RES     1
00065          00E8 5C14          END    START

```

DATE 80-03-13 IDENT DKPROG

```
00000 IDENT DKPROG
00001
00002 * THIS PROGRAM TESTS READING AND WRITING ON DISC IN
00003 * PROGRAMMED CHANNEL
00004
00005 *****TAKE OFF BREAKLINE*****
00006
00007
00008 * LOAD WORD TO WRITE IN REGISTER A2
00009 * LOAD START ADDRESS (/0086) IN A0 AND PUSH RUN
00010
00011 AORG /80
00012
00013 0080 FFFF DATA /FFFF
00014 0082 0000 DATA 0
00015 * WRITE ROUTINE
00016
00017 0084 207F START HLT
00018 0086 20BF INH
00019 0088 0101 LDK A1,1 WRITE COMMAND ON SECTOR ZERO
00020 008A 41C2 CIO A1,1,2 START CONTROLLER
00021 008C 4202 OTR A2,0,2 WRITE A2 CONTENTS ON DISC
00022 008E 5C04 RB(4) *-2
00023 0090 4182 CIO A1,0,2 STOP CONTROLLER
00024 0092 4CC2 SST A4,2 GET STATUS
00025 0094 5C04 RB(4) *-2
00026 0096 207F HLT CHECK STATUS IN A4
00027 * SOMETIMES THROUGHPUT ERROR IS GIVEN
00028 * BECAUSE CIO HALT WAS JUST TO LATE
00029
00030
00031 * READ ROUTINE
00032 0098 20BF INH
00033 009A 0100 LDK A1,0 READ COMMAND ON SECTOR ZERO
00034 009C 41C2 CIO A1,1,2 START CONTROLLER
00035 009E 4B02 INR A3,0,2 READ WORD
00036 00A0 5C04 RB(4) *-2
00037 00A2 4182 CIO A1,0,2 STOP CONTROLLER
00038 00A4 4CC2 SST A4,2 GET STATUS
00039 00A6 5C04 RB(4) *-2
00040 00A8 207F HLT STATUS IN A4
00041 READ WORD IN A3
00042 00AA 5F28 RB START
00043
00044
00045 END START
```

SECTION	19.1	MAGNETIC TAPE CONTROL UNIT - IDENTIFICATIONS	PAGE 19-2
	19.2	INSTALLATION DETAILS	19-3
	19.3	INTERFACE CONNECTIONS	19-5
	19.4	HARDWARE-SOFTWARE INTERFACE DETAILS	19-9
	19.4.1	Status Word	19-10
	19.5	SHORT DESCRIPTION TESTPROGRAM	19-13
	19.6	SHORT ROUTINES	19-14

## LIST OF ILLUSTRATIONS

FIGURE	19.1	FORMATTER TRANSPORT SYSTEM CONFIGURATION	19-3
	19.2	CARD LAYOUT	19-4
	19.3	MTA SYSTEM DIAGRAM	19-5
	19.4	MTA CABLE ASSEMBLY	19-5
	19.5	INSTRUCTION / COMMAND-WORD FORMATS	19-9

## LIST OF TABLES

TABLE	19.1	DEVICE INTERFACE - CONNECTOR 1	19-6
	19.2	DEVICE INTERFACE - CONNECTOR 5	19-6
	19.3	READ SIGNALS, TRANSPORT TO FORMATTER VIA MTA II	19-7
	19.4	WRITE SIGNALS, TRANSPORT TO FORMATTER VIA MTA II	19-7
	19.5	CONTROL SIGNALS, TRANSPORT / MTA II / FORMATTER	19-8

## 19.1 MAGNETIC TAPE CONTROL UNIT - IDENTIFICATIONS

Type Number : P-831-060  
Testprogram : BMAGT2  
Channel : Hardware Channel (IOP, MIOP, IOPZR)  
Break Connection 3A41

Devices :  
FORMATTER:

P831-010 - F849-20/13.9  
P831-020 - F849-36/25.02  
P831-030 - F649-60.30.5/1600

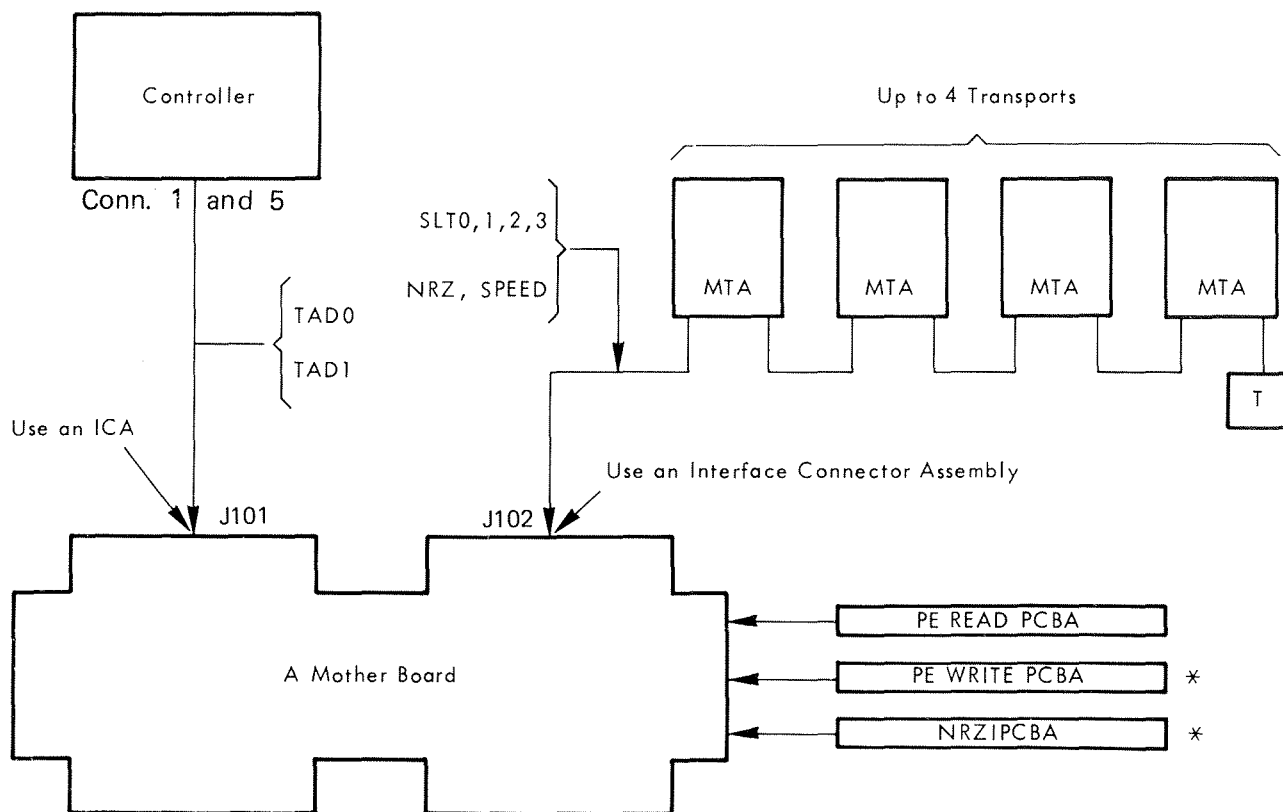
DRIVES:

P-831-002 - 6840/9/25 ips, NRZ  
P-831-004 - 6840/9/45 ips, NRZ  
P-831-006 - 6640/9/37.5 ips, PE

It is possible to use the units Pertec 8000 and 7000, but they are not mentioned in the catalogue.

Power Consumption: 5 Volt, 2.7 Amp.

## 19.2 INSTALLATION DETAILS



\* Note: Switch on PCB always to "0".

Figure 19.1 FORMATTER / TRANSPORT SYSTEM CONFIGURATION





### 19.3 INTERFACE CONNECTIONS

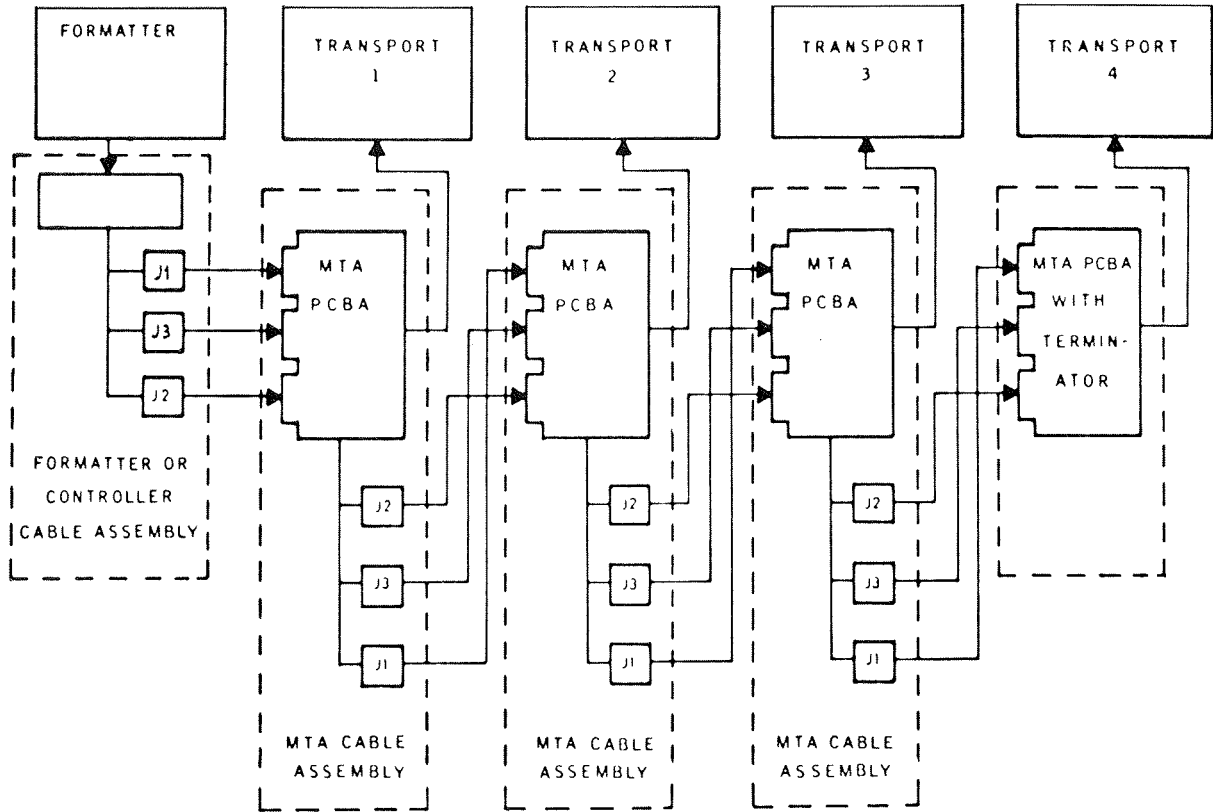


Figure 19.3 MTA SYSTEM DIAGRAM

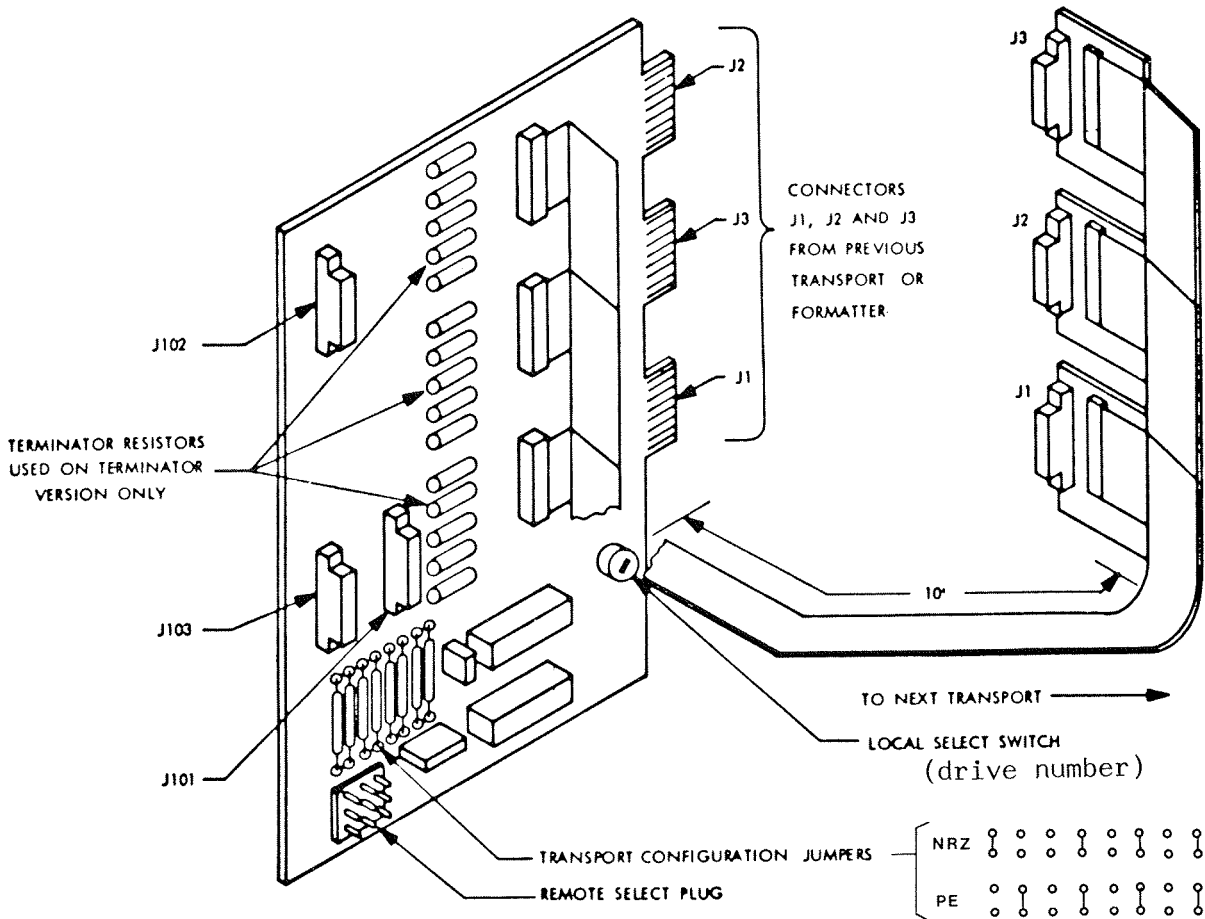


Figure 19.4 MTA CABLE ASSEMBLY

Formatter mating connector: 2VH50 - 1JV5  
 Controller mating connector

NRZ:checkchar's

CU Connector 1		Signal	Formatter Card Connector J101		
Live Pin	Ground Pin		Live Pin	Ground Pin	
B01	B03	IFPTN ←	A28	A29	file protected on line ready NRZ drive formatter busy corrected error (only PE) hard error file mark read read strobe Data busy PE: identification burst end of tape load point write strobe go load on line command off-line command rewind command erase command reverse/forwards write file mark comm. write/read parity write identif. burst last word formatter enable
A01	A03	IONLN ←	A27	A26	
A02	A03	IRDYN ←	B27	B26	
B02	B03	INRZN ←	A31	A32	
B04	B05	IFBYN ←	B22	B23	
B06	B07	ICERN ←	B25	B26	
B08	B09	IHERN ←	A24	A23	
B10	B11	IFMKN ←	A25	A26	
B12	B13	IRSTRN ←	B36	B35	
A05	A04	IDBYN ←	A22	A23	
A07	A06	ICCGIDTN ←	B24	B23	
A09	A08	IEOTN ←	A30	A29	
A11	A10	ILDPN ←	B30	B29	
A13	A12	IWSTRN ←	A34	A35	
B25	B26	IGON →	A03	A02	
A27	A26	ILOLN →	A10	B15	
B28	B29	IOFLN →	A12	A11	
A29	A28	IREWN →	B12	B11	
B30	B31	IERASEN →	B07	B08	
A31	A30	IREVN →	B04	B05	
B32	B33	IWFMN →	B06	B05	
A33	A32	IWRN →	A04	A05	
B34	B35	IPARN →	B10	B11	
A35	A34	IDENTN →	A09	A08	
B36	B37	ILWDN →	B13	B14	
A37	A36	IFEN →	A13	A14	

Table 19.1 DEVICE INTERFACE, CONNECTOR 1

CU Connector 5		Signal	Formatter Card Connector J101			
Live Pin	Ground Pin		Live Pin	Ground Pin		
5A33	5A34	ITADIN →	B03	B02	transport address	
B34	B33	ITADON →	A01	A02		
B32	B31	IW7N →	A21	A20		
A31	A32	IW6N →	B21	B20	write data lines	
B30	B29	IW5N →	A19	A20		
A29	A30	IW4N →	B19	B20		
B28	B27	IW3N →	A18	A17		
A27	A28	IW2N →	B18	B17		
B26	B25	IW1N →	A16	A17		
A25	A26	IW0N →	B16	B17		
B13	B12	IR8N ←	A36	A35		read data lines
A12	A13	IR7N ←	A42	A41		
B11	B10	IR6N ←	B42	B41		
A10	A11	IR5N ←	A40	A41		
B09	B08	IR4N ←	B40	B41		
A08	A09	IR3N ←	A39	A38		
B07	B06	IR2N ←	B39	B38		
A06	A07	IR1N ←	A37	A38		
B05	B04	IRDN ←	B37	B38		

Table 19.2 DEVICE INTERFACE, CONNECTOR 5

Transport J103		MTA II J3*		Formatter J102		Signal		
Live	Ret	Live	Ret	Live	Ret			
1	A	→	1	A	→	B1	B2	READ DATA PARITY (IRD <sub>P</sub> )
2	B	→	2	B	→	A1	A2	READ DATA STROBE (IRDS)**
3	C	→	3	C	→	B3	B2	READ DATA 0 (IRD <sub>0</sub> )
4	D	→	4	D	→	A3	A2	READ DATA 1 (IRD <sub>1</sub> )
8	J	→	8	J	→	A6	A5	READ DATA 2 (IRD <sub>2</sub> )
9	K	→	9	K	→	B7	A8	READ DATA 3 (IRD <sub>3</sub> )
10	L	→	10	L	→	A7	A8	NRZI (INRZ)
11	M	→	11	M	→	B9	B8	7-, 9-TRACK (I7TR/I9TR)**
12	N	→	12	N	→	A9	A8	SINGLE (ISGL)
13	P	→	13	P	→	B10	B11	SPEED (ISPD)
14	R	→	14	R	→	A10	A11	READ DATA 4 (IRD <sub>4</sub> )
15	S	→	15	S	→	B12	B11	READ DATA 5 (IRD <sub>5</sub> )
17	U	→	17	U	→	B13	B14	READ DATA 6 (IRD <sub>6</sub> )
18	V	→	18	V	→	A13	A14	READ DATA 7 (IRD <sub>7</sub> )
<p>Note: The following pins provide +5v and ground from the Formatter to the MTA assemblies.</p>								
			5	E	←	A48	B48	
			6	F	←	A49	B49	
			7	H	←	A50	B50	
<p>* Read signals applied to J3 are also applied in parallel to J10 for application to other MTA II PCBAs in the daisy-chain. Refer to Schematic No. 103914.</p>								
<p>** Relevant to NRZI Operation Only.</p>								

Table 19.3 READ SIGNALS, TRANSPORT TO FORMATTER VIA MTA II

Formatter J102		MTA II J2*		Transport J102		Signal		
Live	Ret	Live	Ret	Live	Ret			
B15	B14	→	A	1	→	A	1	WRITE DATA STROBE (IWDS)
B16	B17	→	C	3	→	C	3	WRITE AMPLIFIER RESET (IWARS)
B18	B17	→	E	5	→	E	5	READ THRESHOLD 1 (IRTH1)
A18	A17	→	F	6	→	F	6	READ THRESHOLD 2 (IRTH2)
A21	A20	→	L	10	→	L	10	WRITE DATA PARITY (IWDP)
B22	B23	→	M	11	→	M	11	WRITE DATA 0 (IWD <sub>0</sub> )
A22	A23	→	N	12	→	N	12	WRITE DATA 1 (IWD <sub>1</sub> )
B24	B23	→	P	13	→	P	13	WRITE DATA 2 (IWD <sub>2</sub> )
A24	A23	→	R	14	→	R	14	WRITE DATA 3 (IWD <sub>3</sub> )
B25	B26	→	S	15	→	S	15	WRITE DATA 4 (IWD <sub>4</sub> )
A25	A26	→	T	16	→	T	16	WRITE DATA 5 (IWD <sub>5</sub> )
B26	B26	→	U	17	→	U	17	WRITE DATA 6 (IWD <sub>6</sub> )
A27	A26	→	V	18	→	V	18	WRITE DATA 7 (IWD <sub>7</sub> )
J101								
A42	A41	→	B	2	→	J	2	SELECT 1 (ISLT1)**
B43	B44	→	D	4	→	J	16	SELECT 2 (ISLT2)**
A43	A44	→	H	7	→	J	17	SELECT 3 (ISLT3)**
<p>* Write signals applied to J2 are also applied in parallel to J12 for application to other MTA II PCBAs in the daisy-chain. Refer to Schematic No. 103914.</p>								
<p>** Provided through Select Switch</p>								

Table 19.4 WRITE SIGNALS, FORMATTER TO TRANSPORT VIA MTA II

Formatter J102		MTA II J1*		Transport J101		Signal
Live	Ret	Live	Ret	Live	Ret	
A28	A29	→	B 2	→	B 2	OVERWRITE (IOVW)
B30	B29	→	C 3	→	C 3	SYNCHRONOUS FORWARD Command (ISFC)
A30	A29	→	D 4	→	D 4	DATA DENSITY SELECT (IDDS)**
B31	B32	→	E 5	→	E 5	SYNCHRONOUS REVERSE Command (ISRC)
A31	A32	←	F 6	←	F 6	DATA DENSITY INDICATOR (IDDI)*
B33	B32	→	H 7	→	H 7	REWIND Command (IRWC)
B34	B35	→	K 9	→	K 9	SET WRITE STATUS (ISWS)
A34	A35	→	L 10	→	L 10	OFF-LINE Command (IOFC)/REWIND UNLOAD (IRWU)***
B36	B35	←	M 11	←	M 11	ON-LINE (IONL)
A36	A35	←	N 12	←	N 12	REWIND (IRWD)
B37	B38	←	P 13	←	P 13	FILE PROTECT (IFPT)
A37	A38	←	R 14	←	R 14	LOAD POINT (ILDLP)
A39	A38	←	T 16	←	T 16	READY (IRDY)
B40	B41	←	U 17	←	U 17	END OF TAPE (IEOT)
B42	B41	→	J 8	→	J 8	SELECT 0 (ISLT0)****

\* Control signals applied to J1 are also applied in parallel to J11 for application to other MTA II PCBAs in the daisy-chain. Refer to Schematic No. 103914.

\*\* Relevant to NRZI Operation Only.

\*\*\* REWIND UNLOAD operation applies to T9000 series transports only.

\*\*\*\* Provided through Select Switch.

Table 19.5 CONTROL SIGNALS, TRANSPORT/MTA II/FORMATTER

# 19.4 HARDWARE-SOFTWARE INTERFACE DETAILS

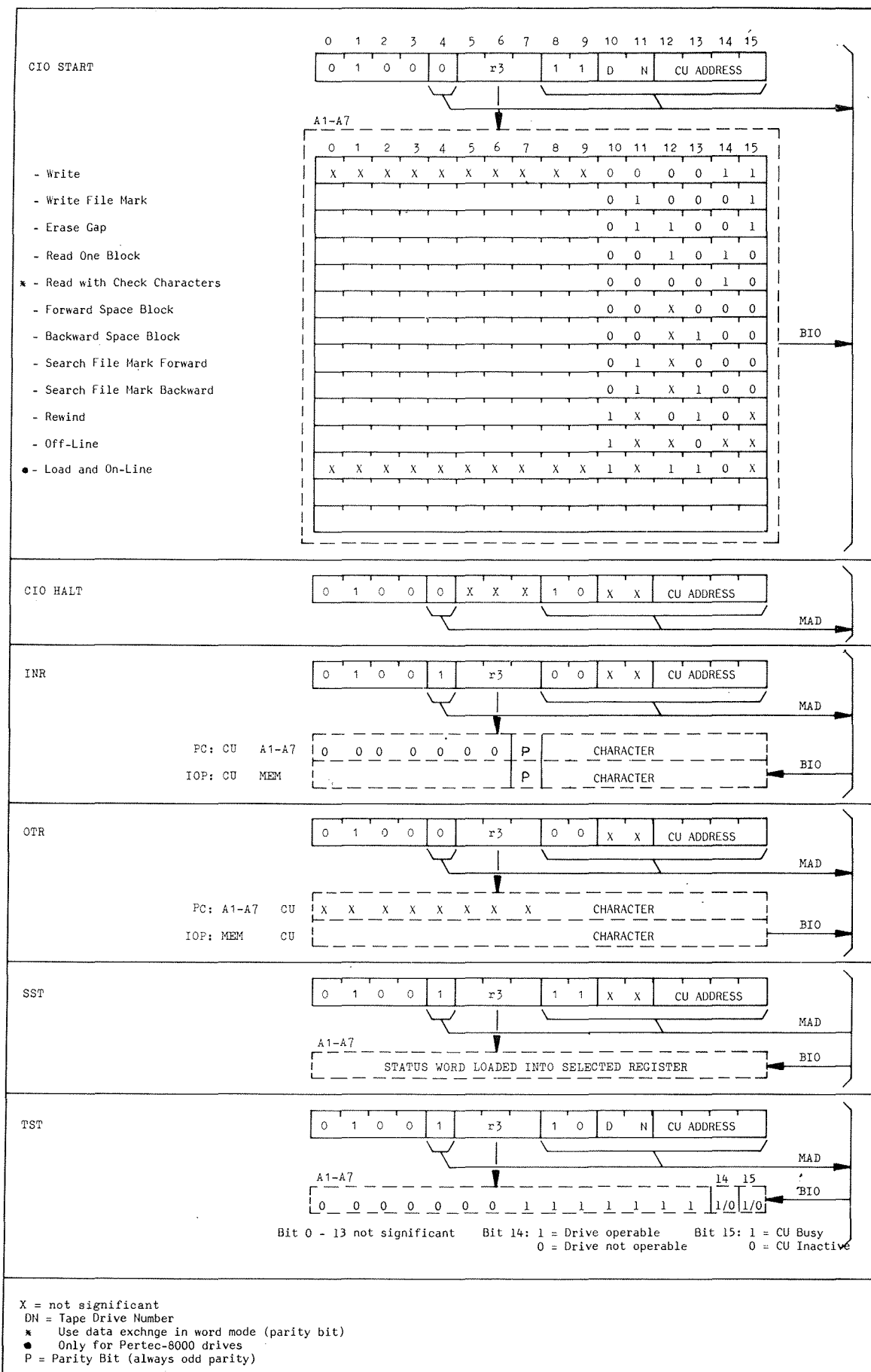
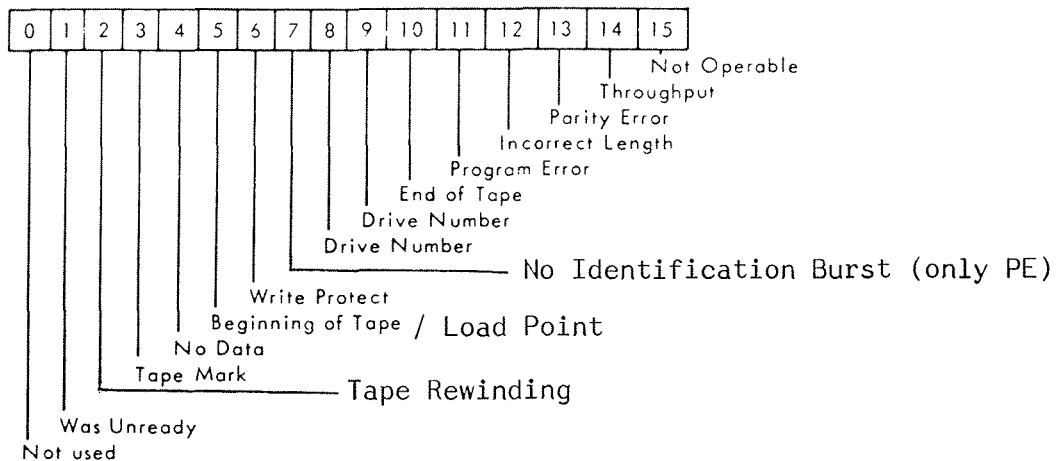


Figure 19.5 INSTRUCTION / COMMAND-WORD FORMATS

### 19.4.1 STATUS WORD



--15 Not Operable is set if the transport or formatter are not ready to receive a command. Some possible causes of this status are:

- Interlocks are not made
- Initial load is not complete
- The transport is not on line
- The formatter power is off

--14 Throughput Error is set during Read or Write commands if the channel does not respond to a data request (BR) within the allowed time. The THRF flip-flop (logic f) is set if the data strobe (WSTR/RSTR) for a new character is received from the formatter while the CU is still in Exchange state to transfer the previous character.

--13 Data Fault is set during a Read, Write or Search command if a read error is detected by the formatter for any of the following reasons:

#### NRZI Mode

- Vertical parity error on data character
- Longitudinal parity error
- CRC parity error (detected during read forward commands only)

#### PE Mode

- False preamble detection
- False postamble detected
- Buffer overflow
- Multichannel dropout (with WRITE also single channel dropout)
- Parity error without associated channel dropout

--12 The Incorrect Length is set during a Read command with data transfer if the block length on the tape is different from the specified block length.

--11 Program Error

- An INR command is received from the channel during a Write data operation:
- An OTR command is received from the channel during a Read data operation:
- An invalid command code is received on BIO10-15 during a CIO-Start command:

BIOF	10	11	12	13	14	15	
0	-	1	1	1	1	1	INVALID CODES
0	0	-	-	0	1		
0	-	-	1	-	1		
0	1	-	-	1	-		
0	-	-	1	1	1		

--10 End of Tape is set if the EOT mark is detected during any CIO-Start command in the forward direction.

If the EOF is set during a forward Search File Mark command, the HALTF flip-flop is set and the operation stops.

--8,9 Tape Unit Address indicate the current tape transport address.

MAD	10-11	Tape Unit
TADF	1-0	
Status BIO	8-9	
	0 0	0
	0 1	1
	1 0	2
	1 1	3

--7 No Identification Burst is set if the identification burst is not detected during a forward command from the load point on a phase-encoded transport.

--6 File Protected/Write Unable is set whenever the CU receives a Write, Write File Mark or Erase Gap command for a transport that is file protected.

--5 Load Point is set if the transport is at load point when any backward command is received.  
Search or Space backward, Rewind, Load-and-On-Line).

--4 No Data if no data is detected within 20 seconds after sending the command to the transport. Note: No Data, is also set if blocks are written or read, which are longer than 20 seconds in time.

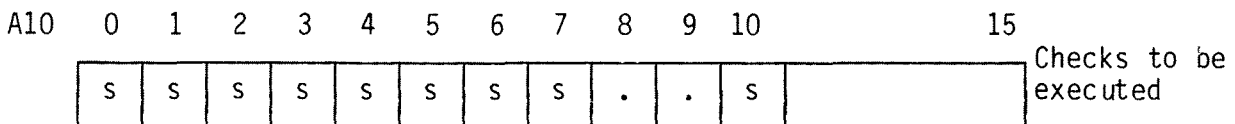
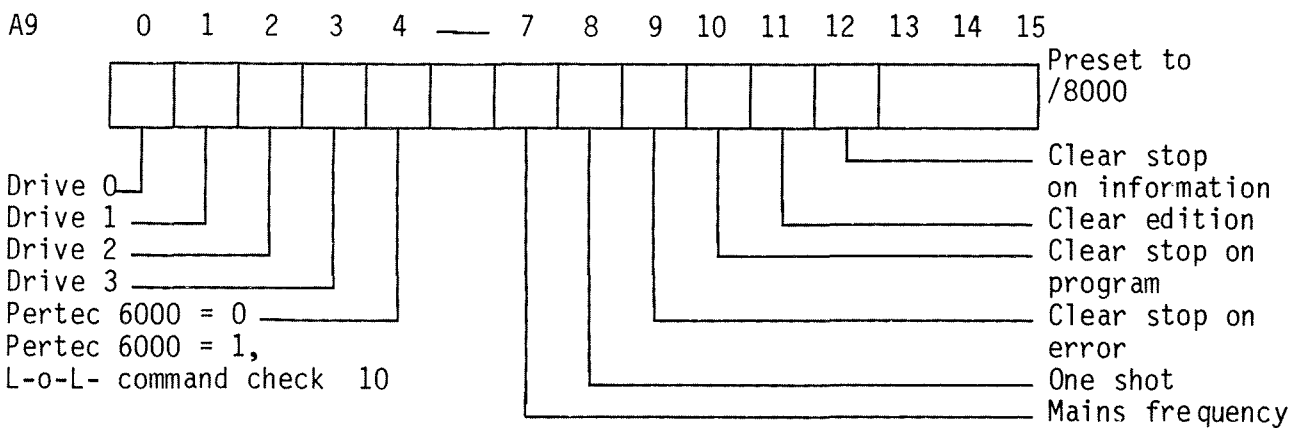
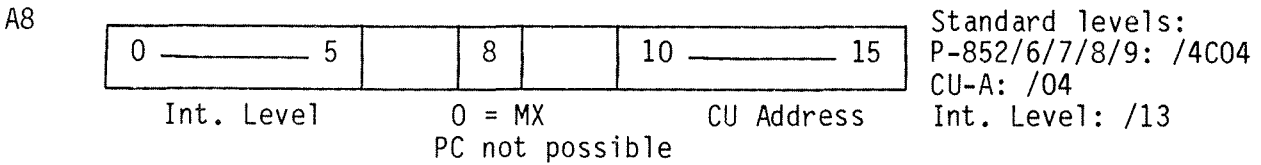
- 3 File Mark is set if a File Mark is detected during any Read, Space, Block or Search File Mark command.
  - For NRZI-tapes, if an error is detected in the first character, and this character is followed by one other character only, the CU terminates the operation at the end of the first block, and sets bit 3 (File Mark) and bit 13 (Data Fault).
- 2 Tape Rewinding. This status bit is set if the selected tape transport is executing a Rewind command.
- 1 Tape was Not Ready is set when the tape transport changes from not-ready state of the completion of a Rewind operation or when an in-operable unit becomes operable.



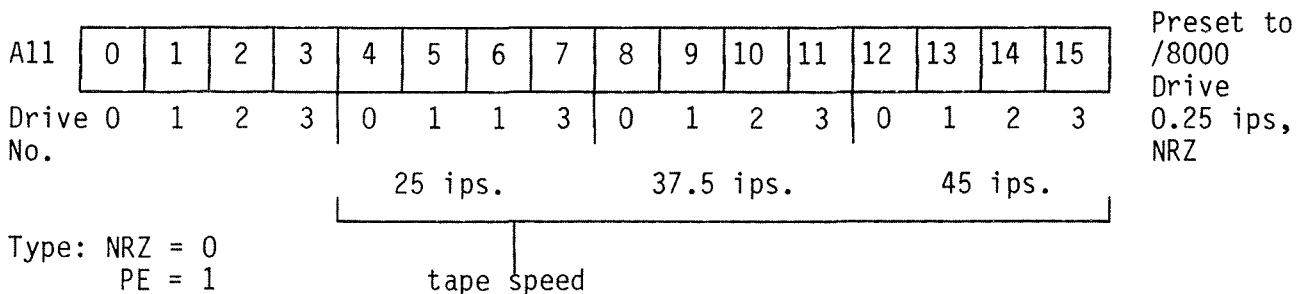
19.5 SHORT DESCRIPTION TESTPROGRAM

TESTPROGRAM BMAGT2 8K

1. IPL  
The program stops at /700 (restart address and normal end).
2. Switch on RTC (PF/AR also possible).
- 3.



S = Standard setting  
 . = Optional setting



4. Depress MC, RUN  
 Error stop at /5F0  
 Restart after power-off at /6EA  
 Interrupts return to /700  
 Information stop at /5E0

For more information see official description of the testprogram.

# 19.6 SHORT ROUTINES

```

DATE 80-03-13      IDENT  WRITE

00000              IDENT  WRITE
00001              *
00002              *
00003      0000    BEGIN  EQU      *
00004              RORG    BEGIN+/80
00005              *
00006              *
00007              *    LOAD THE TEST PATTERN IN REGISTER A8
00008              *
00009              *    LOAD THE WER PARAMETERS FOR THE WRITE ROUTINE IN REGISTER A7
00010              *
00011      0080    FFFF    DATA    /FFFF
00012      0082    0000    DATA    0
00013      0084    207F    START   HLT
00014      0086    20BF    INH
00015              *
00016              *    THIS ROUTINE LOADS THE OUTPUT BUFFER WITH THE TEST PATTERN
00017              *
00018      0088    8620    LDKL     A6,WRTBUF    LOAD THE BUFFER ADDRESS IN A6
00019      008A    00B6    R
00019      008C    80B9    STPAT   STR      A8,A6    STORE TEST PATTERN
00020      008E    1602    ADK     A6,2    UPDATE BUFFER ADDRESS AND
00021      0090    EE20    CWK     A6,/121A  COMPARE FOR BUFFER FULL
00021      0092    121A
00022      0094    5C0A    RB(NE)  STPAT    IF NOT FULL CONTINUE LOADING
00023              *
00024              *    THIS ROUTINE WRITES BLOCKS OF DATA ON TAPE
00025              *
00026      0096    7708    WRITE1  WER     A7,/8    SEND WRITE CODE TO IOP
00027      0098    8620    LDKL     A6,WRTBUF  LOAD BUFFER ADDRESS AND
00027      009A    00B6    R
00028      009C    7609    WER     A6,/9    SEND TO IOP
00029      009E    0603    WRITE2  LDK     A6,3    LOAD WRITE A BLOCK COMMAND
00030      00A0    46C4    CIO     A6,1,/4  AND SEND TO MAG TAPE "1"
00031      00A2    5C04    RB(NA)  *-2
00032      00A4    4CC4    SST     A4,/4    GET STATUS AFTER TRANSFER
00033      00A6    5C04    RB(NA)  *-2
00034      00AB    A420    ANKL    A4,/7F3F  SAVE BITS SET
00034      00AA    7F3F
00035      00AC    EC20    CWK     A4,0    AND CHECK FOR ANY BITS SET
00035      00AE    0000
00036      00B0    5002    RF(E)   **4    IF NO CONTINUE
00037      00B2    207F    HLT
00038      00B4    5F20    RB      WRITE1  IF YES HALT STATUS IN A4
00039              *
00040      00B6    WRTBUF  RES     2050    WRITE BUFFER
00041              END     START

```



```

00000          IDENT  MTTEST          ON PROGRAMMED CHANNEL
00001          *TEST FOR ALL TAPEDRIVES
00002
00003          *REPLACE HLTS AS FOLLOWS AND THE PROGRAM HIL
00004          *WRITE DO BACKSPACE AND READ THE SAME BLOCK
00005          *      HLT      ON ADDR. /009E      BY/0104
00006          *      HLT      ON ADDR. /00A8      BY/5700
00007
00008          *FOR RUNNING IN LOOP REPLACE ALSO
00009          *      HLT      ON ADDR. /00CE      BY/5700
00010
00011
00012          *WRITE TEST
00013          ADRG      /80
00014          00B0  FFFF      DATA      /FFFF
00015          00B2  0000      DATA      0
00016          00B4  20BF      START
00017          00B6  8320      LDKL      A3,/FF      NUMBER OF CHARACTERS 256
00018          00B8  00FF
00019          00BA  02FF      LDK      A2,/FF      CHAR. ALL ONES
00020          00BC  0103      LDK      A1,3      WRITE COMMAND
00021          00BE  41C4      CIO      A1,1,4      START CONTR. DRIVE 0
00022          0090  4204      OTR      A2,0,4      WRITE CHAR.
00023          0092  5C04      RB(4)   *-2
00024          0094  1B01      SUK      A3,1      UPD. CHAR COUNTER
00025          0096  5C08      RB(4)   *-6      NEXT OTR
00026          0098  4184      CIO      A1,0,4      STOP CONTROLLER
00027          009A  4CC4      SST      A4,4      STATUS TO A4
00028          009C  5C04      RB(4)   *-2
00029          009E  207F      HLT
00030          STATUS IN A4
00031
00032          *TAPE COMMANDS ROUTINE:
00033          *LOAD REGISTER A1 WITH:
00034          *      REWIND  /0024
00035          *      ERASE   /0019
00036          *      WFM     /0011
00037          *      FWD SPACE /0000
00038          *      BWD SPACE /0004
00039          *      SFM FWD  /0010
00040          *      SFM BWD  /0014
00041          *      OFF LINE /0020
00042          00A0  20BF      TCR      INH
00043          00A2  41C4      CIO      A1,1,4      START FOR DRIVE 0
00044          00A4  4CC4      SST      A4,4      STATUS TO A4
00045          00A6  5C04      RB(4)   *-2
00046          00A8  207F      HLT
00047          STATUS IN A4
00048
00049          *READ TEST ONLY TO EXECUTE AFTER WRITE TEST
00050
00051          00AA  20BF      RT      INH
00052          00AC  0300      LDK      A3,0      RESET CHARACTER COUNTER
00053          00AE  0500      LDK      A5,0      RESET READ REGISTER
00054          00B0  8220      LDKL     A2,/1FF     EXPECTED CHAR WITH PARITY
00055          00B2  01FF
00056          00B4  010A      LDK      A1,/A      READ COMMAND
00057          00B6  41C4      CIO      A1,1,4      START CONTR DRIVE 0
00058          00BB  4B04      INR      INR      A5,0,4      READ CHAR
00059          00BA  5C04      RB(4)   *-2
00060          00BC  ED08      CWR      A5,A2      CHARACTER SAME?
00061          00BE  5412      RF(4)   DATAF      NO GO TO FAULT
00062          00C0  1301      ADK      A3,1      INCREMENT CHARACTER COUNTER
00063          00C2  EB20      CWK      A3,/FF      ARE THERE 256 ALREADY?
00064          00C4  00FF
00065          00C6  5C10      RB(4)   INR      NEXT CHAR.
00066          00C8  4184      CIO      A1,0,4      STOP CONTROLLER
00067          00CA  4CC4      SST      A4,4      STATUS TO A4
00068          00CC  5C04      RB(4)   *-2
00069          00CE  207F      HLT
00070          00D0  5F4E      RB      START      STATUS IN A4
00071          00D2  207F      DATAF   HLT      TO WRITE TEST
00072          00D4  5F0C      RB      SST      RECEIVED CHAR IN A5,
00073          EXPECTED IN A2, FOR STATUS PUSH RUN
00074
00075          *IF PROGRAM LOOPS ON INR; LESS CHARACTERS IN THE BLOCK THAN EXPECTED
00076          *NUMBER OF CHARACTERS IN A3
00077          END      START

```

LINE PRINTER CONTROL UNIT P840-003 (MCU2)  
CARD READER

SECTION	20.1	MCU2 - IDENTIFICATIONS	PAGE 20-2
	20.2	INSTALLATION DETAILS	20-3
	20.3	INTERFACE CONNECTIONS	20-4
	20.4	HARDWARE-SOFTWARE INTERFACE DETAILS	20-5
	20.4.1	Status Words	20-8
	20.5	SHORT DESCRIPTION TESTPROGRAMS	20-9
	20.6	SHORT ROUTINES	20-11
		LIST OF ILLUSTRATIONS	
FIGURE	20.1	STRAPSETTING	20-3
	20.2	INSTRUCTION / COMMAND-WORD FORMATS	20-5
	20.3	CONTROL AND CHARACTER CODES	20-6
	20.4	CARD DATA FORMAT	20-7
		LIST OF TABLES	
TABLE	20.1	CU TO LINE PRINTER CONNECTIONS	20-4
	20.2	CU TO CARD READER CONNECTIONS	20-4

## 20.1 MCU2 - IDENTIFICATIONS

Type Number : P-840-003  
Testprograms : Line printer: BLP1  
                  Card reader : BCR1  
Channel : Normally IOP,MIOP (Hardware Channel). PC is possible.  
Break Connections : LP: 3A43  
                  CR: 3A41

Devices : LP-CU

Data Products Interface

X-1415, 200 lpm, matric line printer - P-809-002

X-1425, 400 lpm, matrix line printer - P-809-004

CR-CU

Documation M300, 300 cards/min. - P-806-102

Power Consumption : +5 Volt, 1.7 Amp.

20.2 INSTALLATION DETAILS

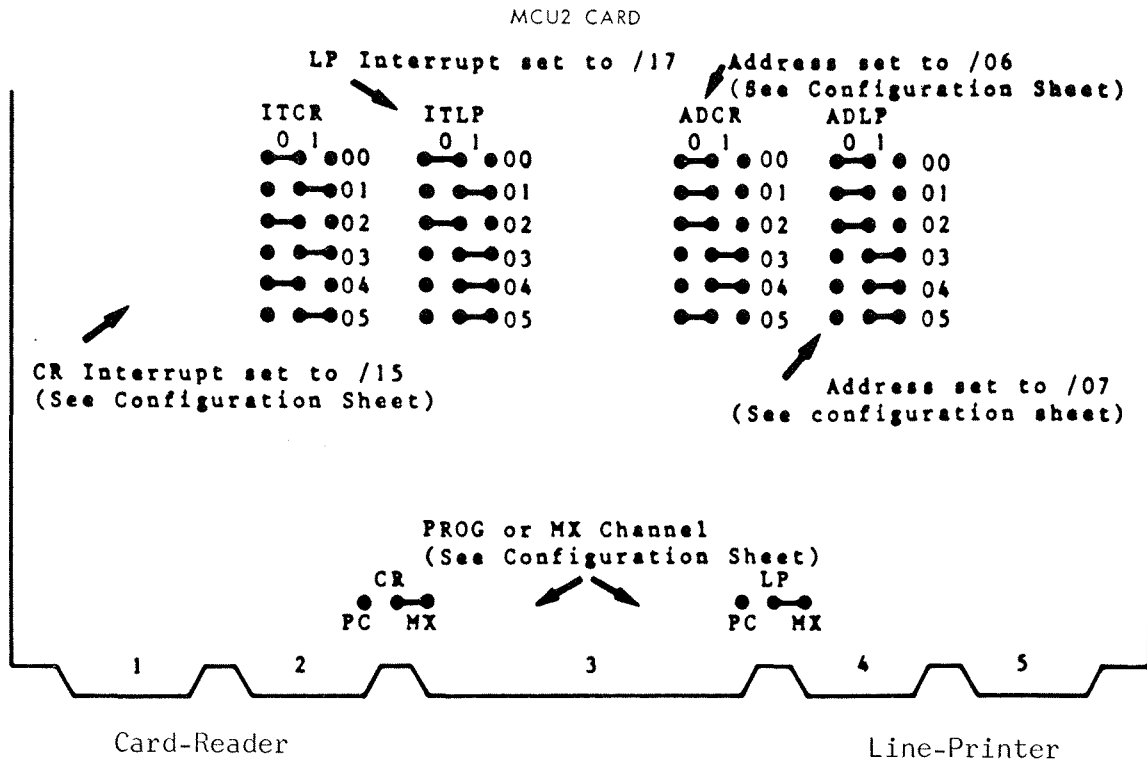


Figure 20.1 STRAPSETTING

## 20.3 INTERFACE CONNECTIONS

Signal Name	CU Connector	Line Printer Connector
DATA 1	4A06	B
Signal Ground	4B06	D
DATA 2	4A07	F
Signal Ground	4B07	J
DATA 3	4A08	L
Signal Ground	4B08	N
DATA 4	4A09	R
Signal Ground	4B09	T
DATA 5	4A10	V
Signal Ground	4B10	X
DATA 6	4A11	Z
Signal Ground	4B11	b
DATA 7	4A12	n
Signal Ground	4B12	k
PI	4A13	p
Signal Ground	4B13	s
STROBE	5A01	i
Signal Ground	5B01	m
DEMAND	5A11	E
Signal Ground	5B11	C
ONLINE	5A13	y
Signal Ground	5B13	AA

Signal Name	CU Connector	Device Connector
ICL01N	1A10	D
Signal Ground	1B10	J
ICL02N	1A11	K
Signal Ground	1B11	P
ICL03N	1A12	L
Signal Ground	1B12	R
ICL04N	1A13	M
Signal Ground	1B13	S
ICL05N	2A01	N
Signal Ground	2B01	T
ICL06N	2A02	U
Signal Ground	2B02	W
ICL07N	2A03	V
Signal Ground	2B03	X
ICL08N	2A04	Y
Signal Ground	2B04	CC
ICL09N	2A05	Z
Signal Ground	2B05	DD
ICL00N	2A06	C
Signal Ground	2B06	H
ICL11N	2A07	B
Signal Ground	2B07	F
ICL12N	2A08	A
Signal Ground	2B08	E
IDSN	1A04	AA
Signal Ground	1B04	EE
ITRN	1A05	HH
Signal Ground	1B05	NN
IHESFN	1A03	JJ
Signal Ground	1B03	PP
IPFN	1A02	KK
Signal Ground	1B02	RR
IRCN	2A11	LL
Signal Ground	2B11	SS
ICIRN	1A01	MM
Signal Ground	1B01	TT

Table 20.1 CU TO LINE PRINTER CONNECTIONS

Table 20.2 CU TO CARD READER CONNECTIONS



## 20.4 HARDWARE-SOFTWARE INTERFACE DETAILS

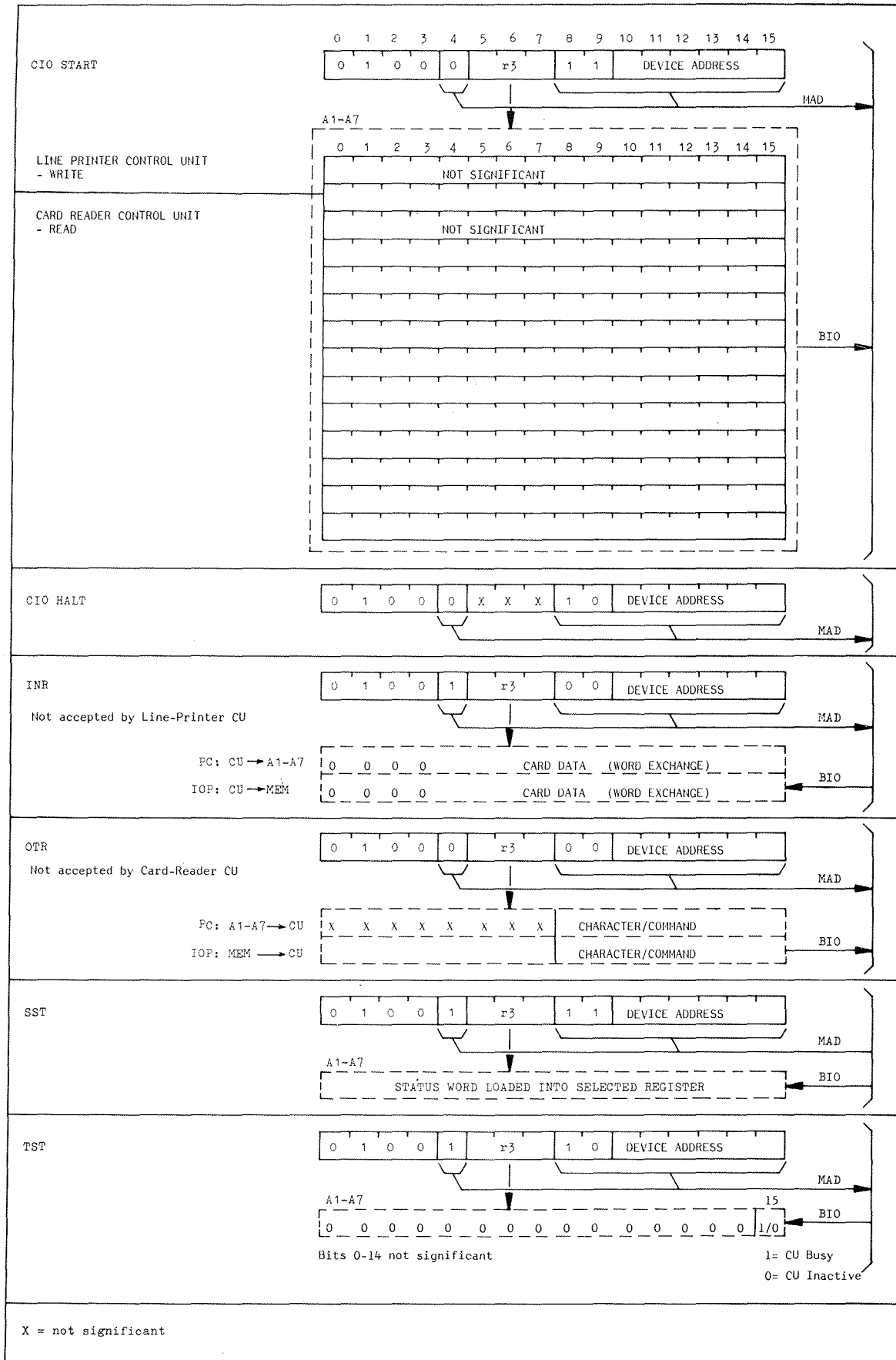


Figure 20.2 INSTRUCTION / COMMAND-WORD FORMATS

DATA and PRINT CONTROL CHARACTER CODE

BIO Lines	08	09	10	11	12	13	14	15
Code Bit Number	PI	7	6	5	4	3	2	1

When the value of PI is 0 the other seven bits represent either a printable character or a format control character.

VERTICAL FORMAT CONTROL CODE

BIO Lines	08	09	10	11	12	13	14	15
Code Bit Number	PI	7	6	5	4	3	2	1
Logic Value	1	1	X	0	0	Channel Number		

where --

- X is not significant.
- Channel Number, indicates the channel number in the paper tape control loop.

BIO Lines	08	09	10	11	12	13	14	15
Code Bit Number	PI	7	6	5	4	3	2	1
Logic Value	1	1	X	1	Number of Lines			

where --

- X is not significant.
- Number of Lines indicates the number of lines to be skipped from 0 to 15.

CHARACTER CODE

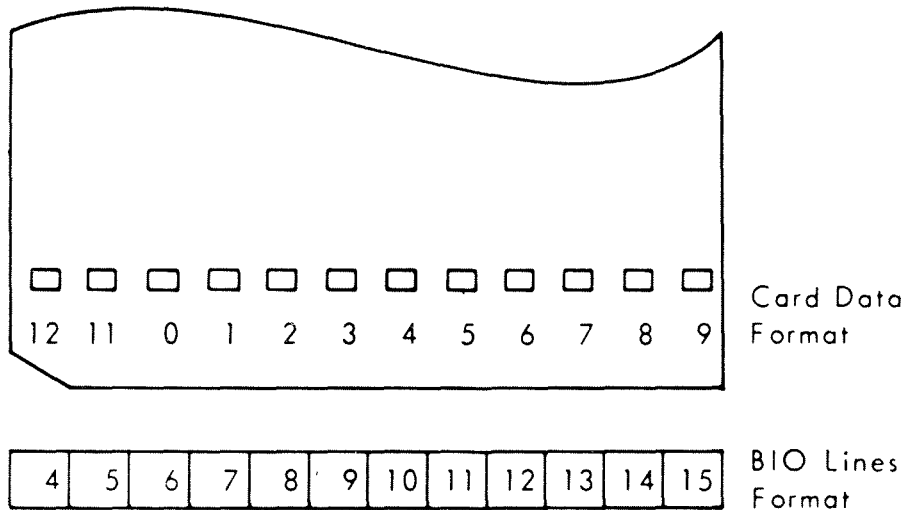
			b7	0	0	0	1	1
			b6	0	1	1	0	0
			b5	0	0	1	0	1
b4	b3	b2	b1					
0	0	0	0		Space	∅		P
0	0	0	1		:	1	A	Q
0	0	1	0		"	2	B	R
0	0	1	1		#	3	C	S
0	1	0	0		\$	4	D	T
0	1	0	1		%	5	E	U
0	1	1	0		€	6	F	V
0	1	1	1		'	7	G	W
1	0	0	0		(	8	H	X
1	0	0	1		)	9	I	Y
1	0	1	0	PF	*	:	J	Z
1	0	1	1		+	;	K	[
1	1	0	0	FF	,	<	L	◇
1	1	0	1	CR	-	=	M	]
1	1	1	0		.	>	N	~
1	1	1	1		/	?	O	♥

- PF Paper Feed: advances the paper one line and prints buffer-contents
- FF Form Feed : advances the paper to the top of the next sheet of paper and prints the buffer-contents
- CR Carriage Return: prints buffer-contents

Figure 20.3 CONTROL AND CHARACTER CODES

MCU2 - CARD READER CU.

DATA FORMAT



Note: A hole is a "1".

Figure 20.4 CARD DATA FORMAT

## 20.4.1 STATUS WORD

LPC-CU

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Not  
Operable

CR-CU

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0		0		0		

Not  
Operable  
Throughput  
Error  
Incorrect  
Length  
Hopper Empty/  
Stacker Full

### NOT OPERABLE

Bit 15 is set:

- If the Line Printer is inoperable, due to Switched-off/ not On-Line or Paper-Fault.
- If Card Reader is inoperable, due to Switched-off/ not On-Line or Pick-error / Stacker Full / Hopper-Empty.

### THROUGHPUT ERROR

Bit 14 is set:

- If a new character is read and the CPU/IOP did not yet answer the data-request Interrupt/Break.

### INCORRECT LENGTH

Bit 12 is set:

- If the number of data exchanges by CPU or IOP differs from the number of characters on the card.

### HOPPER EMPTY / STACKER FULL

Bit 10 is set:

- If either of these conditions is true.

20.5 SHORT DESCRIPTION TESTPROGRAMS

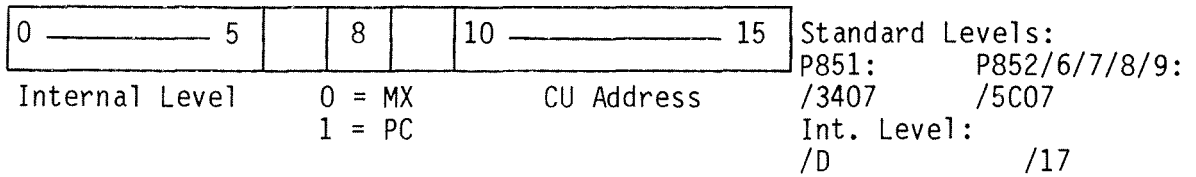
TESTPROGRAM BLP1 4K

1. IPL

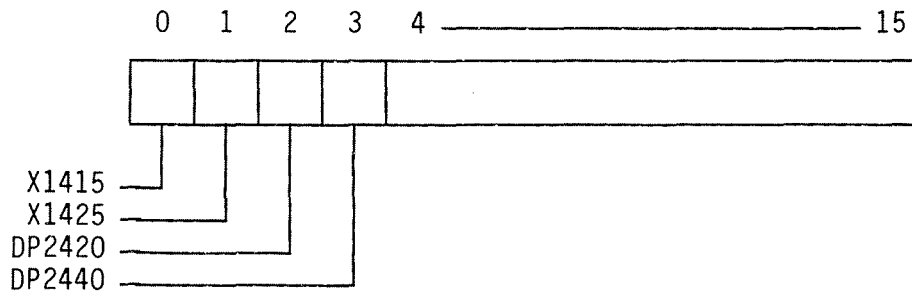
Program stops at /700 (restart address and normal end).

2. Switch on RTC (PF/AR also possible) P851: after program runs.

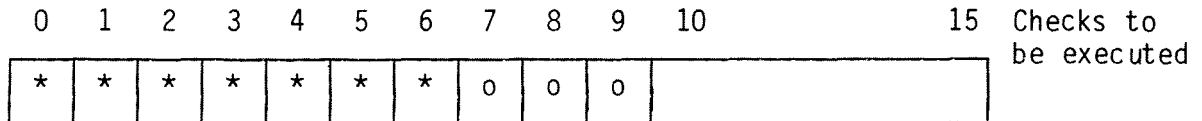
3. A8



A9



A10



\* = Standard  
o = Optional

Setting (X1415/25)

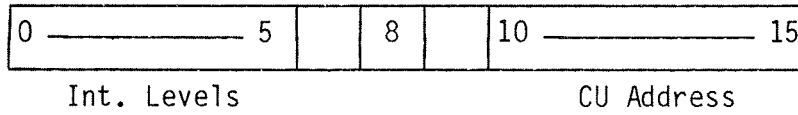
4. Depress MC, RUN

Error stop at address /5F0  
Restart after power/off at /6EE  
Interrupts return to /700

For more information see official description of testprogram.

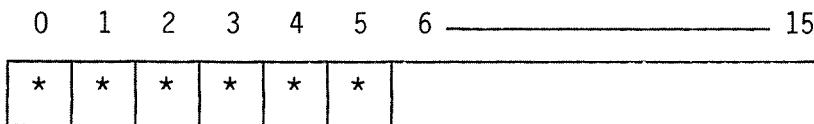
1. IPL  
Program stops at /700 (restart address and normal end).  
Set of special cards on the cardreader.
2. Switch on RTC (PF/AR also possible) P851: after program runs.
- 3.

A8



Standard Levels:  
 P851      P852/6/7/8/9  
 /3006    /5406  
 Int. Levels:  
 /C-      /15

A10



Checks to be executed

\* = Standard

4. Depress MC, RUN

Error stop at /5F0  
 Restart after power-off /6EE  
 Interrupt returns to address /700

For more information see official description of testprogram.

## 20.6 SHORT ROUTINES

### LINE PRINTER

This program is written for Programmed Channel operation so if the printer is normally used on the IOP Channel the CU must be connected to operate on the Programmed Channel. The program can be loaded either with the IPL routine or by hand using the switches on the control panel. Once loaded the following routine should be used:

- Load register A6 with the ASCII character to be printed.
- Load register A7 with number of times you want the character printed on each line.
- Load register A0 with the Start address.
- Push the RUN button.

To stop the program push the INST button.

Program LINELP

Memory Address	Data	Program Instructions	
0080	FFFF	Data	/FFFF
0082	0000	Data	0
0084	207F	Start	HLT
0086	20BF		INH
0088	0200		LDK A2,0
008A	4BC7		SST A3,/07
008C	42C7		CIO A2,1,/07
008E	5C04		RB(NA) * -2
0090	050A	OUTLF	LDK A5,/0A
0092	4507		OTR A5,0,/07
0094	5C04		RB(NA) * -2
0096	4607	OUTCH	OTR A6,0,/07
0098	5C04		RB(NA) * -2
009A	1201		ADK A2,1
009C	EA1C		CWR A2,A
009E	5C0A		RB(NE) OUTCH
00A0	0200		LDK A2,0
00A2	5F14		RB OUTLF

```

DATE 80-03-13          IDENT  LPIOP

00000          IDENT  LPIOP
00001          *
00002          *
00003          *   THIS PROGRAM STORES TWO SELECTED CHARACTERS INTO A BUFFER
00004          *   THEN PRINTS THEM AND STOPS WAITING NEW CHARACTERS TO BE SELECTED
00005          *
00006          *
00007          0000  BEGIN  EQU      *
00008          RORG  BEGIN+80
00009          *
00010          *
00011          *   LOAD THE TWO CHARACTERS TO BE PRINTED IN REGISTER A3
00012          *
00013          *   PUSH THE RUN BUTTON
00014          *
00015  0080  FFFF          DATA  /FFFF
00016  0082  0000          DATA  0
00017  0084  207F          START  HLT
00018  0086  20BF          INH
00019  0088  850C          LDR    A5,A3          LOAD DATA INTO A5
00020  008A  0100          LDK   A1,0          CLEAR CHAR COUNTER
00021  008C  8545          REPT   ST    A5,LPBUF,A1      STORE THE CONTENTS OF A5 INTO LPBUF
00022  0090  1102          R      ADK   A1,2          UPDATE LPBUF ADDRESS
00023  0092  E920          CWK   A1,78         AND CHECK IF LINE FULL
00024  0094  004E
00024  0096  5C0C          RB(NE) REPT
00025  0098  8520          LDKL  A5,/0D0A      LOAD CARRIAGE RETURN LINE FEED CHARS
00026  009A  0D0A          ST    A5,LPBUF,A1  AND STORE IN LPBUF
00027  009C  8545          R      LDKL  A1,/4050  LOAD PARAMS FOR FIRST WER
00028  00A0  8120          WER   A1,/E        AND SEND TO IOP
00029  00A2  4050          LDKL  A1,LPBUF     LOAD FIRST ADDRESS OF LPBUF
00030  00A4  710E          WER   A1,/F        AND SEND TO IOP
00031  00A6  8120          LDK   A6,0
00032  00A8  00B8          CIO   A6,1,/7     SEND START COMMAND TO PRINTER
00033  00AA  710F          RB(NA) *-2        TRY AGAIN IF NOT ACCEPTED
00034  00AC  0600          SST   A4,7        GET STATUS
00035  00AE  46C7          RB(NA) *-2
00036  00B0  5C04          RB    START       GO AND WAIT FOR NEW DATA
00037  00B2  4CC7
00038  00B4  5C04          *
00039  00B6  5F34          LPBUF RES 80      OUTPUT BUFFER
00038          END   START

```



DATE 82-05-05 IDENT CRPROG

```
0000 IDENT CRPROG
0001 *
0002 *
0003 * THIS PROGRAM READS A CARD VIA THE PROGRAMMED CHANNEL AND STOPS SO THAT
0004 * CONTENTS OF THE BUFFER CAN BE CHECKED AGAINST THE PUNCHED HOLES IN THE
0005 * CARD
0006 *
0007 0000 * BEGIN EQU *
0008 * RORG BEGIN+/80
0009 *
0010 *
0011 * LOAD THE CARD(S) TO BE READ INTO THE CARDREADER
0012 * AND START THE CARD READER
0013 *
0014 * LOAD START ADDRESS(/0086) IN A0 AND PUSH THE RUN BUTTON
0015 *
0016 0080 FFFF DATA /FFFF
0017 0082 0000 DATA 0
0018 0084 207F START HLT
0019 0086 20BF INH
0020 0088 0200 LDK A2,0 LOAD ZERO IN A2
0021 008A 0100 LDK A1,0 CLEAR WORD COUNTER
0022 008C 8245 00BB R STORE ST A2,BUFF,A1 STORE ZERO INTO BUFF ADDRESS
0023 0090 1102 ADK A1,2 UPDATE WORD COUNT OF BUFF ADDRESS
0024 0092 E920 002A CWK A1,42 CHECK IF LAST WORD IS REACHED
0025 0096 5C0C RB(NE) STORE NO? GO AND STORE THE NEXT WORD
0026 0098 0100 LDK A1,0 CLEAR CHARACTER COUNTER
0027 009A 0601 LDK A6,1
0028 009C 46C6 CIO A6,1,6 SEND CIO START COMMAND TO THE CARDREADER
0029 009E 5C04 RB(NA) *-2
0030 00A0 4D06 READ INR A5,0,6 GET CHARACTER FROM CU
0031 00A2 5C04 RB(NA) *-2
0032 00A4 8545 00BB R ST A5,BUFF,A1 AND STORE IN BUFFER
0033 00A8 1102 ADK A1,2 UPDATE BUFFER ADDRESS
0034 00AA E920 00A0 CWK A1,/A0 CHECK IF LAST COLUMN READ
0035 00AE 5C10 RB(NE) READ NO? GO AND READ NEXT COLUMN
0036 00B0 4686 CIO A6,0,6 SEND STOP COMMAND TO CU
0037 00B2 4CC6 SST A4,6 GET STATUS FROM CU
0038 00B4 5C04 RB(NA) *-2
0039 00B6 5F34 RB START GO AND WAIT FOR NEXT RUN
0040 *
0041 00BB * BUFF RES 42 READ BUFFER
0042 * END START
```

SYMBOL TABLE

```
BEGIN 0000 R BUFF 00BB R READ 00A0 R START 0084 R
STORE 008C R
```

ASS.ERR. 0000

!EOF  
PROG ELAPSED TIME: 00H-00M-10S-980MS-

CARD READER

This program is written to use the IOP channel. If the Card Reader normally operates on the Programmed Channel it will be necessary to connect the Break Request line on the CU. The program will read one card and stop; the data on the card can be checked by displaying the contents of the program buffer, BUFF. Once the program has been loaded either by the IPL routine or by hand using the control panel switches, it is only necessary to load the start address into register A0 and push the RUN button.

Program CRTEST

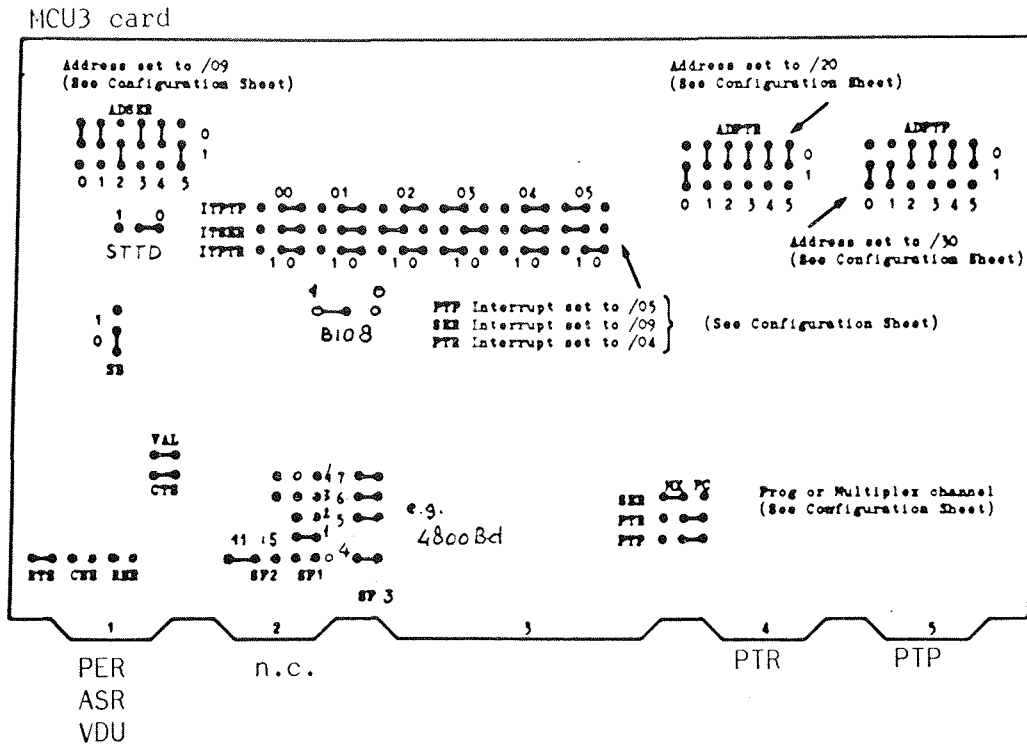
Memory Address	Data	Program Instructions	
0080	FFFF	Data	/FFFF
0082	0000	Data	0
0084	207F	Start	HLT
0086	20BF		INH
0088	8120		LDKL A1,/8050
008A	8050		
008C	710C		WER A1,/0C
008E	8220		LDKI A2,BUFF
0090	009E		
0092	720D		WER A2,/0D
0094	43C6		CIO A3,1,/06
0096	5C04		RB(NA * -2
0098	4CC6		SST A4,/06
009A	5C04		RB(NA) * -2
009C	5F1A		RB Start
009E		BUFF	

21 PAPER TAPE READER CONTROL UNIT P840-002 (MCU3)  
 PAPER TAPE PUNCH CONTROL UNIT P840-002 (MCU3)  
 SERIAL CONTROL UNIT P840-002 (MCU3)

SECTION	21.1	MCU3 - IDENTIFICATIONS	PAGE 21-2
	21.2	INSTALLATION DETAILS	21-3
	21.3	INTERFACE CONNECTIONS	21-4
	21.4	HARDWARE-SOFTWARE INTERFACE DETAILS	21-7
	21.4.1	Status Word	21-8
	21.5	SHORT DESCRIPTION OF TESTPROGRAMS	21-10
	21.6	SHORT ROUTINES	21-16
		LIST OF ILLUSTRATIONS	
FIGURE	21.1	STRAPSETTING MCU3	21-3
	21.2	INSTRUCTION / COMMAND-WORD FORMATS	21-7
		LIST OF TABLES	
TABLE	21.1	CU / DEVICE INTERFACE CONNECTIONS PAPER TAPE READER	21-4
	21.2	CU TO PAPER TAPE PUNCH CONNECTIONS	21-5
	21.3	CONTROL UNIT TO DEVICE CONNECTIONS	21-6



## 21.2 INSTALLATION DETAILS



	P-852/6/7 MCU3 Strap Position
Line "data terminal ready" controlled (108-2)	CHS open
Line "data terminal ready" not controlled	CHS closed
Line "Request to Send" controlled (105)	RTS open
Line "Request to Send" not controlled	RTS closed
Line "Ready for Receiving" controlled (PER-3100) (133)	RfR open
Line "Ready for Receiving" not controlled (VDU)	RfR closed
CU does not receive input-characters in the output-mode	STTD 0
CU accepts input-characters during output-mode (CU in WST)	STTD 1 (=Break Detection for HD)
Full Duplex mode (preferable Echo mode)	VAL closed
	CTS closed
Half Duplex	VAL open
	CTS open
No parity (7-bit data)	BI008 closed =1 #1)
Even parity	BI008 open =0 #2)
Odd parity	BI008 open #2)
One stop bit	SB 1
Two stop bits	SB 0

Notes: #1) Parity bit forced to zero  
#2) Software controlled

### SPEED:

Speed: Baud.:	P-852/6/7 MCU3		
	SF1	SF2	SF3
110	3	15	5,7
150	3	11	5,7
200	3	11	4,5,7
300	3	11	6,7
600	3	11	5
1200	4	11	not used
2400	8	11	not used
8800	1	11	not used
9600	0	11	not used

Figure 21.1 STRAPSETTING MCU3

## 21.3 INTERFACE CONNECTIONS

### MCU3 - Paper-tape Reader Control Unit

Tape Track	8	7	6	5	4	3	2	1
BIO Lines	08	09	10	11	12	13	14	15

Signal Name	CU Connector	Digitronics Connector	
RCH1	4A01	D	} data lines
Signal Ground	4B01	4	
RCH2	4A02	E	
Signal Ground	4B02	5	
RCH3	4A03	F	
Signal Ground	4B03	6	
RCH4	4A04	H	
Signal Ground	4B04	7	
RCH5	4A05	J	
Signal Ground	4B05	8	
RCH6	4A06	K	} end of tape
Signal Ground	4B06	9	
RCH7	4A07	L	} power on
Signal Ground	4B07	10	
RCH8	4A08	M	} sprocket hole(data strobe)
Signal Ground	4B08	11	
REOT	4A09	AA	} stop reader(cio halt)
Signal Ground	4B09	23	
READY	4A10	W	} start reader(cio start)
Signal Ground	4B10	A	
RSPKTB	4A11	N	} load lever
Signal Ground	4B10	12	
STOP	4A12	20	
Signal Ground	4B12	10	
FWD	4B13	18	
Signal Ground	4A13	9	
RLTL	4B11	CC	
Signal Ground	4B12	25	

Table 21.1 CU / DEVICE INTERFACE CONNECTIONS PAPER TAPE READER

TAPE TRACK/BIO LINE CHARACTERISTICS

Tape Track	8	7	6	5	4	3	2	1
BIO Lines	08	09	10	11	12	13	14	15

Signal Name	CU Connector	Facit 4070 Connector	Facit signals	
PCH1	5A01 →	1	CH1	} data lines
Signal Ground	5B01			
PCH2	5A02	2	CH2	
Signal Ground	5B02			
PCH3	5A03	3	CH3	
Signal Ground	5B03			
PCH4	5A04	4	CH4	
Signal Ground	5B04			
PCH5	5A05	5	CH5	
Signal Ground	5B05			
PCH6	5A06	6	CH6	
Signal Ground	5B06			
PCH7	5A07	7	CH7	
Signal Ground	5B07			
PCH8	5A08 →	8	CH8	
Signal Ground	5B08			
POPE	5A10 ←	24	+6V	punch operable
Signal Ground	5B10			
PR	5A11 ←	12	PR	punch ready
Signal Ground	5B11			
PTL	5A12 ←	21	TL	tape low
Signal Ground	5B12			
PERR	5A13 ←	20	ERR1	error(broken tape)
Signal Ground	5B13			
PI	5A09 →	11	PI	punch command
Signal Ground	5B10			
PSD	5B09 →	10	SD	forwards enable
Signal Ground	5B11			
PCH9	5A09 →	9	CH9	sprocket hole
Signal Ground	5B08			

Table 21.2 CU TO PAPER TAPE PUNCH CONNECTIONS

V24	Signal Name	CU Connector	Device Connector
	Signal Ground	1B01	1
103	TTD	1A03	2
	Signal Ground	1B03	
104	SRRD	1A04	3
	Signal Ground	1B04	
105	RTS	1A05	4
	Signal Ground	1B05	
106	SCTS	1A06	5
	Signal Ground	1B06	
107	SOPE	1A07	6
	Signal Ground	1B07	
108/2	CNS	1A08	20
	Signal Ground	1B08	
109	SVAL	1A09	8
	Signal Ground	1B09	
133	RFR	1A12	25
	Signal Ground	1B12	

Table 21.3 CONTROL UNIT TO DEVICE CONNECTIONS



# 21.4 HARDWARE/SOFTWARE INTERFACE DETAILS

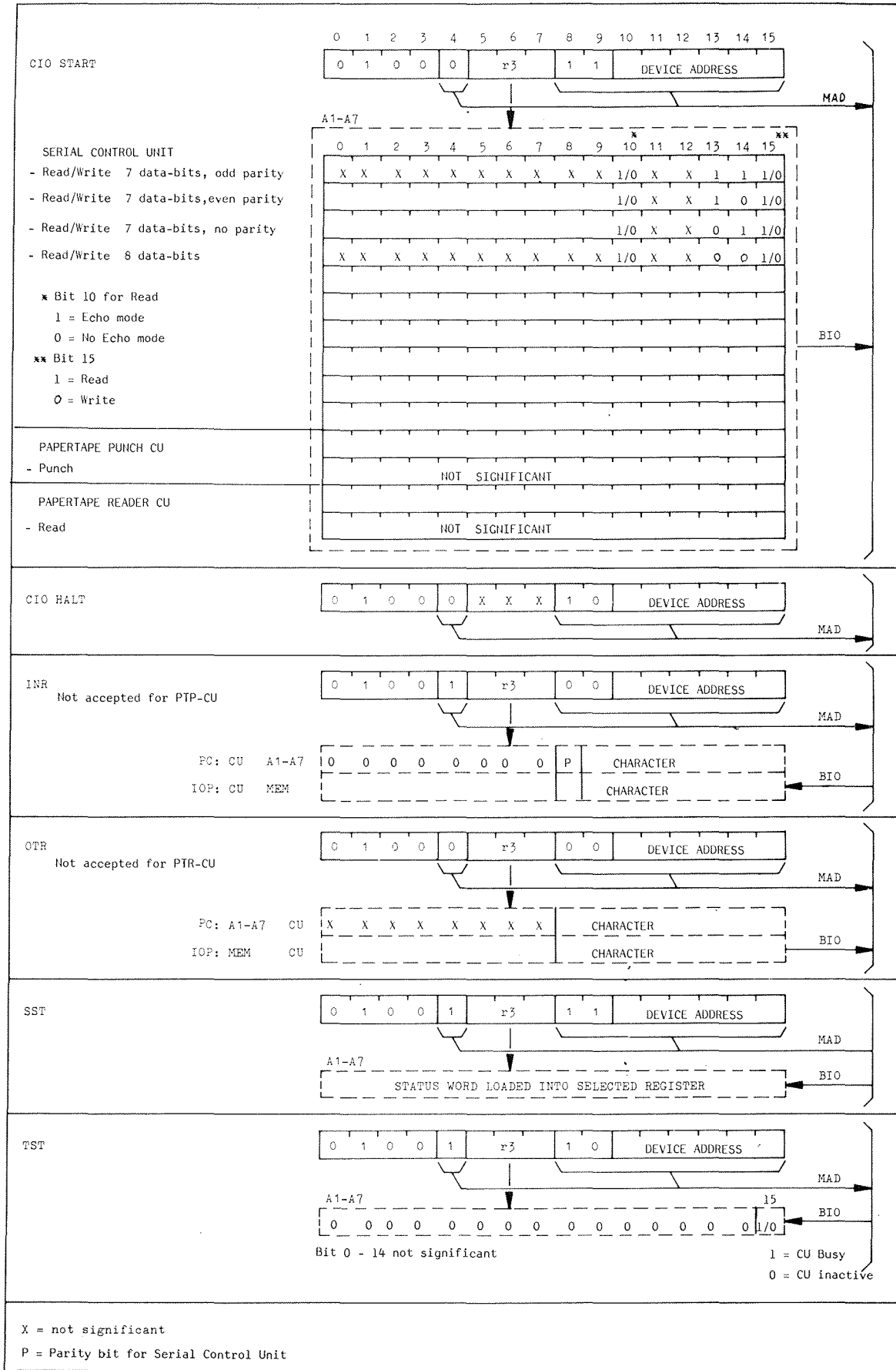
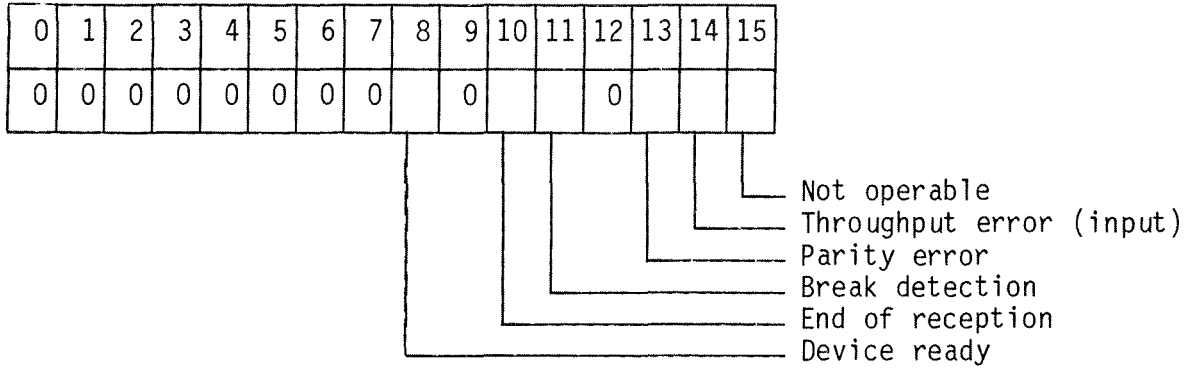


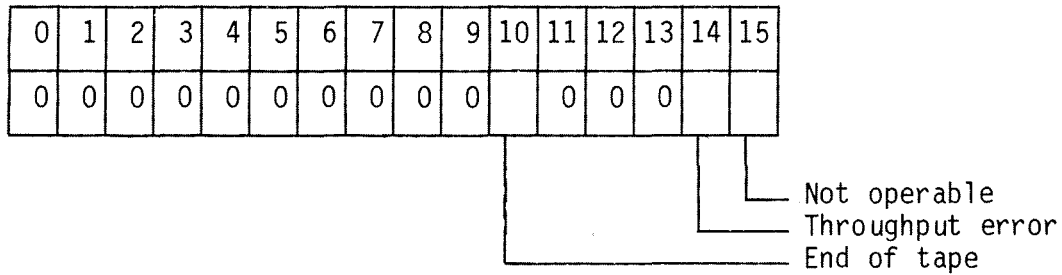
Figure 21.2 INSTRUCTION / COMMAND-WORD FORMATS

21.4.1 STATUS WORDS

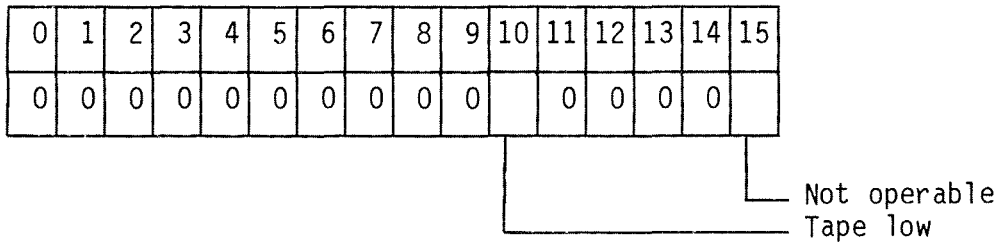
SER-CU:



PTR-CU:



PTP-CU:



NOT OPERABLE:

Bit 15 is set: if the command is accepted and the device is inoperable.

THROUGHPUT ERROR:

Bit 14 is set:

- on Serial CU if the previous character is not send to CPU and the next is detected.
- on Paper tape reader CU for same reason.

PARITY ERROR:

Bit 13 is set if the parity of the received character does not match the selected parity.

BREAK DETECTION:

Bit 11 is set if during output mode an input character is detected.

END OF RECEPTION / END OF TAPE / TAPE LOW:

Bit 10 is set:

- Serial CU : if a RTS (Request to Send) signal is received from the device.
- PTR-CU : if the end of the tape is detected by the End-of-Tape detector.
- PTR-CU : if the Tape-Low signal (PTL/TL) of the paper tape punch is active.

DEVICE READY:

Bit 8 is set if the signals CNS (data terminal ready) is activated when the device is switched on-line.

21.5 SHORT DESCRIPTION OF TESTPROGRAMS

TESTPROGRAM BPTR1 4K

1. IPL

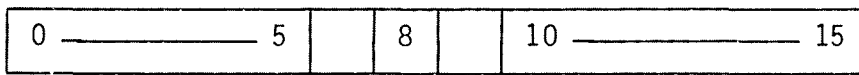
Program stops at address /700 (restart address and normal end)

2. Switch on RTC (PA/AR also possible) P-851: After program runs.

3. Load PTP-Reference Tape.

4.

A8



Int. Level

1 = PC  
0 = MX

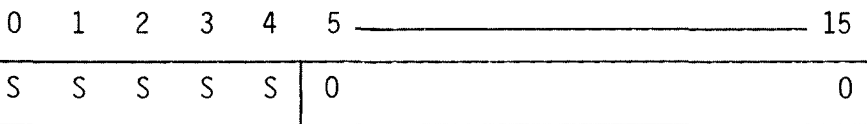
CU Address

Standard Levels:

P-851: P-852/6/7/8/9  
/24A0 /3CA0

Int. Levels:  
/9 /4

A10



Checks to be  
executed

S = Standard setting

5. Depress MC, RUN

Error stop at address /5F0, Reg. A1 indicates fault.

Restart after power/off at address /6EA.

Interrupts return to address /700.

For more information see official description of testprogram.

TESTPROGRAM BTP 1 4K

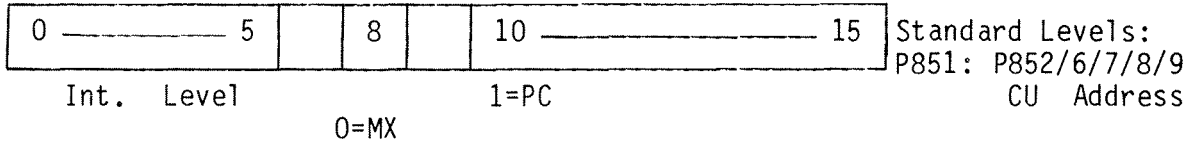
1. IPL

Program stops at address /700 (restart address and normal end).

2. Switch on RTC (PF/AR also possible) P-851: after program runs.

3. PTP

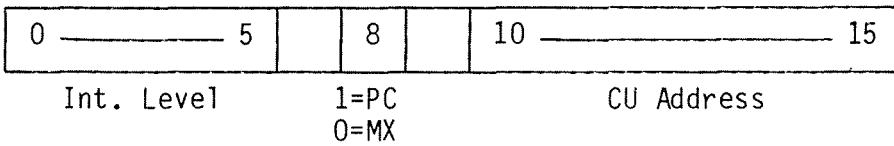
A8



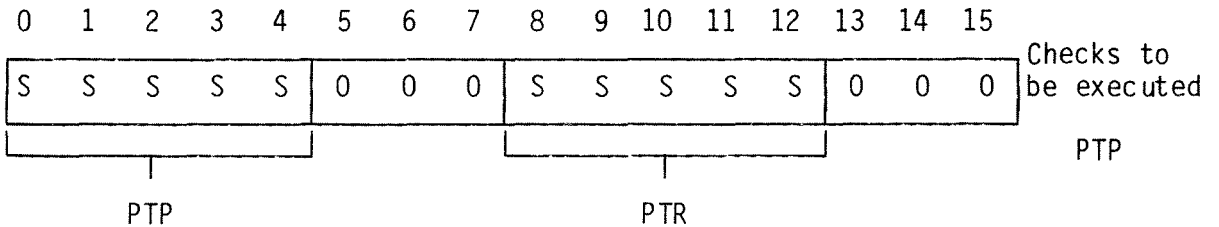
PTP	Int. Level	/28B0	/14B0
		/A	/5
PTR	Int. Level	/24A0	/10A0
		/9	/4

PTR

A12



A10



S = Standard setting

4. Depress MC, RUN

Tape will be punched, program will stop at address /5E0.

5. Load the punched reference tape in the Paper Tape Reader.

6. Depress RUN (RTC must be ON).

Error stop at address /5F0.

Restart after power-off at address /6E2.

Interrupts return to address /700.

For more information see official description of the testprogram.



TESTPROGRAM BDISPI 8K FOR VDU HAZELTINE (P818)

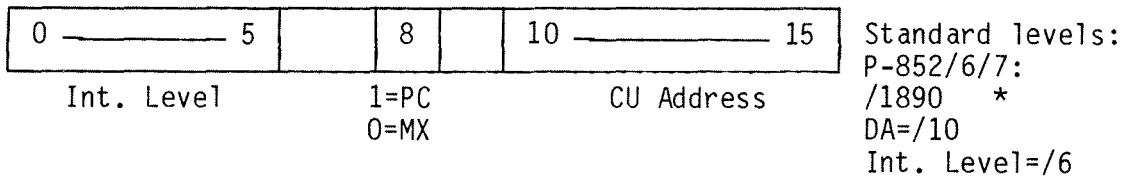
STRAPSETTING MCU3: see previous page

1. IPL

The program stops at /700 (= restart address and normal start).

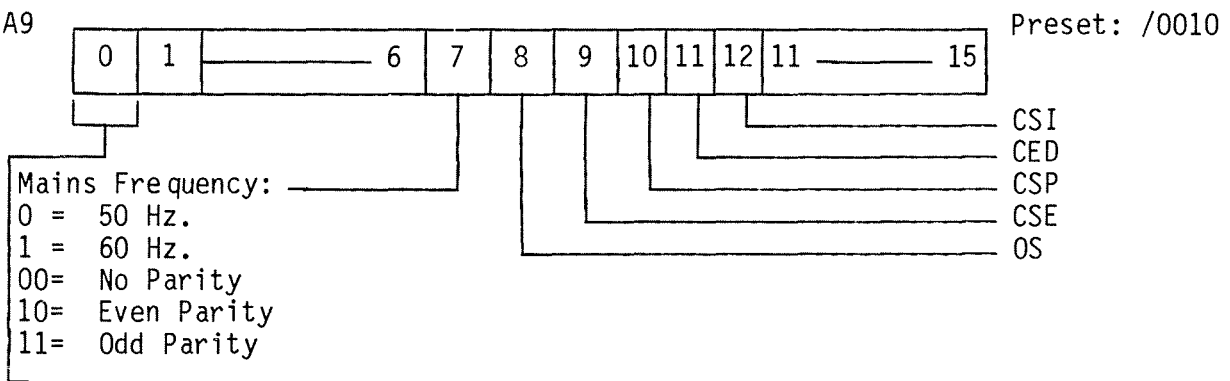
2. Switch on RTC (PF/AR also possible).

3. A8

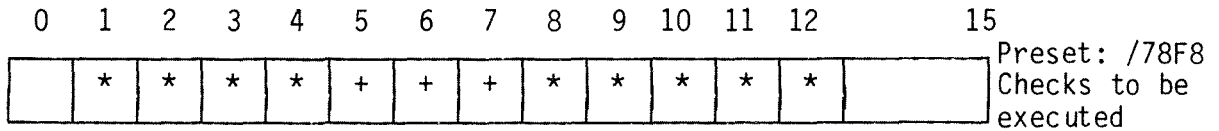


\* Note: P858/9 DA on MCU3 never equal to /10.

A9



A10



\* = Standard Setting  
+ = Optional

Clear bit 11 of A9: Check ident. will be displayed on Ops. Input/Output device.

4. Depress MC, RUN.

Error stop at /5F0  
Restart after power-off at /6EE  
Interrupts return to /700

Special operator actions

- IF0002 Type in character within 10 seconds
- IF0004 Type in LF, CR, characters and end with \$
- IF0005 Type in some characters, end with \$ after IF 0017
- IF0006 Type in two characters within 3 seconds

For more information: see official description of test-program.

## POSITIONING OF THE JUMPERS ON MCU3-CARD

Connections concerning V24/V21 interface:

CNS Without a jumper  
RTS Jumper  
RFR Without a jumper when using PER3100, V24 interface  
With jumper when using VDU  
With a jumper when using PER3100, V21 interface

## CONNECTIONS CONCERNING TRANSMISSION SPEED

When the program is being executed, if the printer is connected and no character is transmitted, check that the PER3100 speed is identical with the speed strapped with jumpers SF1, SF2, SF3 on MCU3-card.





## SPECIAL OPERATOR ACTIONS:

- IF0002 type in 1 character + \$
- IF0003 type in 1 character  
type in 1 character
- IF0004 try to type in character must not be successfull (bell rings)  
try to type in characters must be successfull end with \$
- IF0005 Put the display into blockmode (MB) then push RUN. Depress ETB (total 3 times).
  
- IF0005 Simultaneously depress CTL + ETB  
Depress CTL + FL.....F5  
Depress TAB, TAB+CTL exit with CTL+ETB  
Put the display back in Character Mode (MC) and push RUN

## 21.6 SHORT ROUTINES

For Serial Control Unit see the programs LINE and ECHO.  
Set the straps on the MCU3-card for 7 data-bits, no parity.

PAPER TAPE PUNCH

This program enables an area of memory (selected by the engineer) to be punched out on paper tape. The program can be loaded either by the IPL routine or by hand using the control panel switches. Once loaded the following routine should be used:

- Load the starting address to be punched into register A7.
- Load the ending address of the area into register A8.
- Push the FEED HOLES button on the Tape Punch to provide a leader for the tape.
- Load the starting address of the program into register A0. (/0086)
- Push the RUN button.

The program will stop on /86 when the required area has been punched, then:

- o Push the FEED HOLES button until 30cm of blank tape has been perforated.

Program PUNCH

Memory Address	Data	Program Instructions
0080	FFFF	DATA /FFFF
0082	0000	DATA 0
0084	207F	START HLT
0086	20BF	INH
0088	811C	LDR A1,A7
008A	8402	LDR A4,A8
008C	1402	ADK A4,2
008E	47F0	CIO A7,1,/30
0090	E524	CONT LCR A5,A1
0092	4530	OTR A5,0,/30
0094	5C04	RB(NA) * -2
0096	1101	ADK A1,1
0098	E910	CWR A1,A4
009A	5C0C	RB(NE) CONT
009C	42B0	CIO A2,0,/30
009E	4AF0	SST A2,/30
00A0	5C04	RB(NA) * -2
00A2	5F20	RB START

PAPER TAPE READER

This peripheral and CU can be checked with the aid of a simple program called PTR if the standard test program either cannot be loaded or will not run.

PTR .

This program enables the engineer to read 80 characters from any piece of paper tape and then verify the transfer by checking the contents of the buffer area against the holes punched in the tape. The program can be loaded either by the IPL routine or by hand using the switches on the control panel and it will ignore blank tape. Once loaded it is only necessary to load the Start address in (/0086) register A0 and push the RUN button. The program will then read 80 characters from the tape and stop. If you wish to read another 80 characters just push the RUN button.

Program PTR

Memory Address	Data	Program Instructions	
0080	FFFF		Data /FFFF
0082	0000		Data 0
0084	207F	Start	HLT
0086	208F		INH
0088	0750		LDK A7,80
008A	0600		LDK A6,0
008C	0501		LDK A5,1
008E	45E0	PTR1	CIO A5,1,/20
0090	5C04		RB(NA) * -2
0092	4C20		INR A4,0,/20
0094	5C04		RB(NA) * -2
0096	45A0		CIO A5,0,/20
0098	4BE0		SST A3,/20
009A	5C04		RB(NA) * -2
009C	EC21		CCK A4,0
009E	0000		
00A0	5814		RB(Z) PTR1
00A2	E459		SC A4,BUFF,A6
00A4	00AE		
00A6	1601		ADK A6,1
00A8	EF18		CWR A7,A6
00AA	5C1E		RB(4) PTR1
00AC	5F2A		RB Start
00AE		BUFF	Start Address of Buffer Area

ASR, PTS 3100, and DISPLAY

These peripherals and their CU's can be checked with the aid of two small programs called Line, and Echo, if the standard test program either cannot be loaded or if it will not run.

Program Line

Memory Address	Data	Program Instructions	
0080	FFFF	Data	/FFFF
0082	0000	Data	0
0084	207F	Start	HLT
0086	20BF		INH
0088	0200		LDK A2,0
008A	4BD0		SST A3,/10
008C	42D0		CIO A2,1,/10
008E	5C04		RB(NA) *-2
0090	8520	OUTCR	LDKL A5,/0A0D
0092	0A0D		
0094	4510	OUT	OTR A5,0,/10
0096	5C04		RB(NA) *-2
0098	3D68		SRL A5,8
009A	5C08		RB(NZ) OUT
009C	4610	OUTCH	OTR A6,0,/10
009E	5C04		RB(NA) *-2
00A0	1201		ADK A2,1
00A2	EA1C		CWR A2,A7
00A4	5C0A		RB(NE) OUTCH
00A6	0200		LDK A2,0
00A8	5F1A		RB OUTCR

- Load the ASCII character in register A6.
- Load the number of times you wish the character to be repeated into register A7.
- Load the start address of the program into register A0.
- Push the RUN button.

Program Echo

Memory Address	Data	Program Instructions	
0080	FFFF	Data	/FFFF
0082	0000	Data	0
0084	207F	Start	HLT
0086	20BF		INH
* 0088	0201	IN	LDK A2,1
008A	42D0		CIO A2,1,/10
008C	5C04		RB(NA) * -2
008E	4B10		INR A3,0,/10
0090	5C04		RB(NA) * -2
0092	4290		CIO A2,0,/10
0094	4CD0		SST A4,/10
0096	5C04		RB(NA) * -2
0098	0200		LDK A2,0
009A	42D0		CIO A2,1,/10
009C	5C04		RB(NA) * -2
009E	4310		O <del>T</del> R A3,0,/10
00A0	5C04		RB(NA) * -2
00A2	4290		CIO A2,0,/10
00A4	4CD0		SST A4,/10
00A6	5C04		RB(NA) * -2
00A8	5F24		RB IN

\* change to 0088 0221 in LDK A2,/21 for 856/7/8/9

Program echo:

Once loaded and started any input character from the keyboard will be printed, displayed or executed on the device.