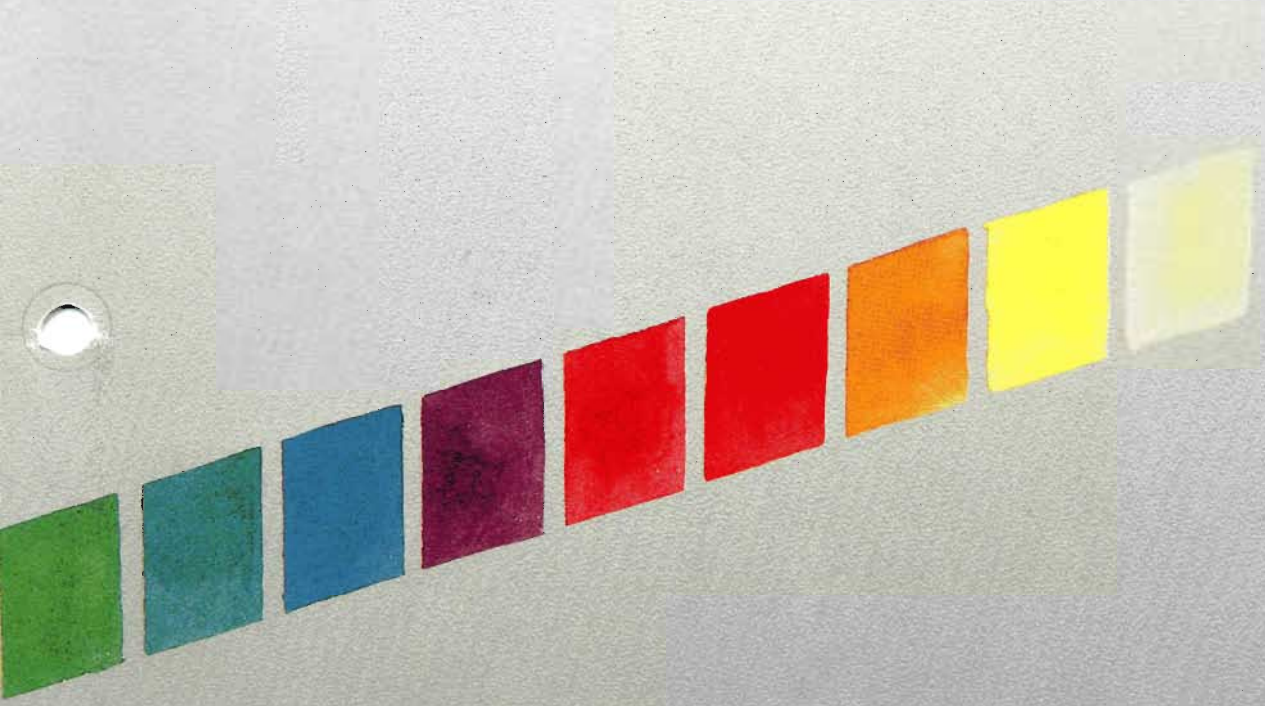
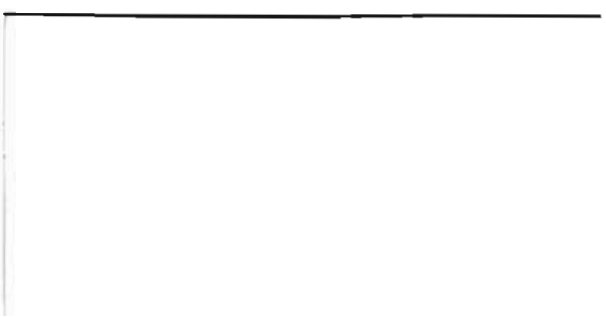


ND-100 Hardware Maintenance

ND-830008.3 EN

NorskData



ND-100 Hardware Maintenance

ND-830008.3 EN

The information in this manual is subject to change without notice.
Norsk Data A.S assumes no responsibility for any errors that may appear in this manual, or for the use or reliability of its software on equipment that is not furnished or supported by Norsk Data A.S.

The reader

This manual has been prepared for the Norsk Data Service Department field-service engineers and technical personnel directly involved in maintaining the ND-100 computer system.

Prerequisite knowledge

It is necessary to have a basic knowledge of the hardware in the ND-100 computer system. This can be obtained either by:

Attending the Norsk Data courses introducing the ND-100, or by carefully studying the following Norsk Data manuals:

- ND-100 Functional Description (ND-06.015)
- ND-100 Input/Output System (ND-06.016)

The manual

This manual covers the ND-100 computer, including test programs, switch-settings and troubleshooting diagrams.

Related manuals

ND-100 Functional Description (ND-06.015).
ND-110 Functional Description (ND-06.026).
ND-100/ND-110 Test Program Description (ND-30.005).
ND-100 Input/Output System (ND-06.016).

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Chapter 1 Technical description and physical layout

This section provides an overview of the ND-100 computer range:

- ND-100/CX Computer
  - External bus structure
  - ND-100 and MPM-4
  - ND-100 and MPM-5
  - ND-100 power distribution
- ND-100 COMPACT
- ND-100 SATELLITE

1.1 The ND-100/CX Computer

This cabinet may contain one or two 22-position card crates. The power supplies are located at the top of the cabinet.

The main card crate, located inside the front of the cabinet, may contain up to 21 cards, including the CPU. The card crate inside the back of the rack may contain input/output, multiport memory, etc.

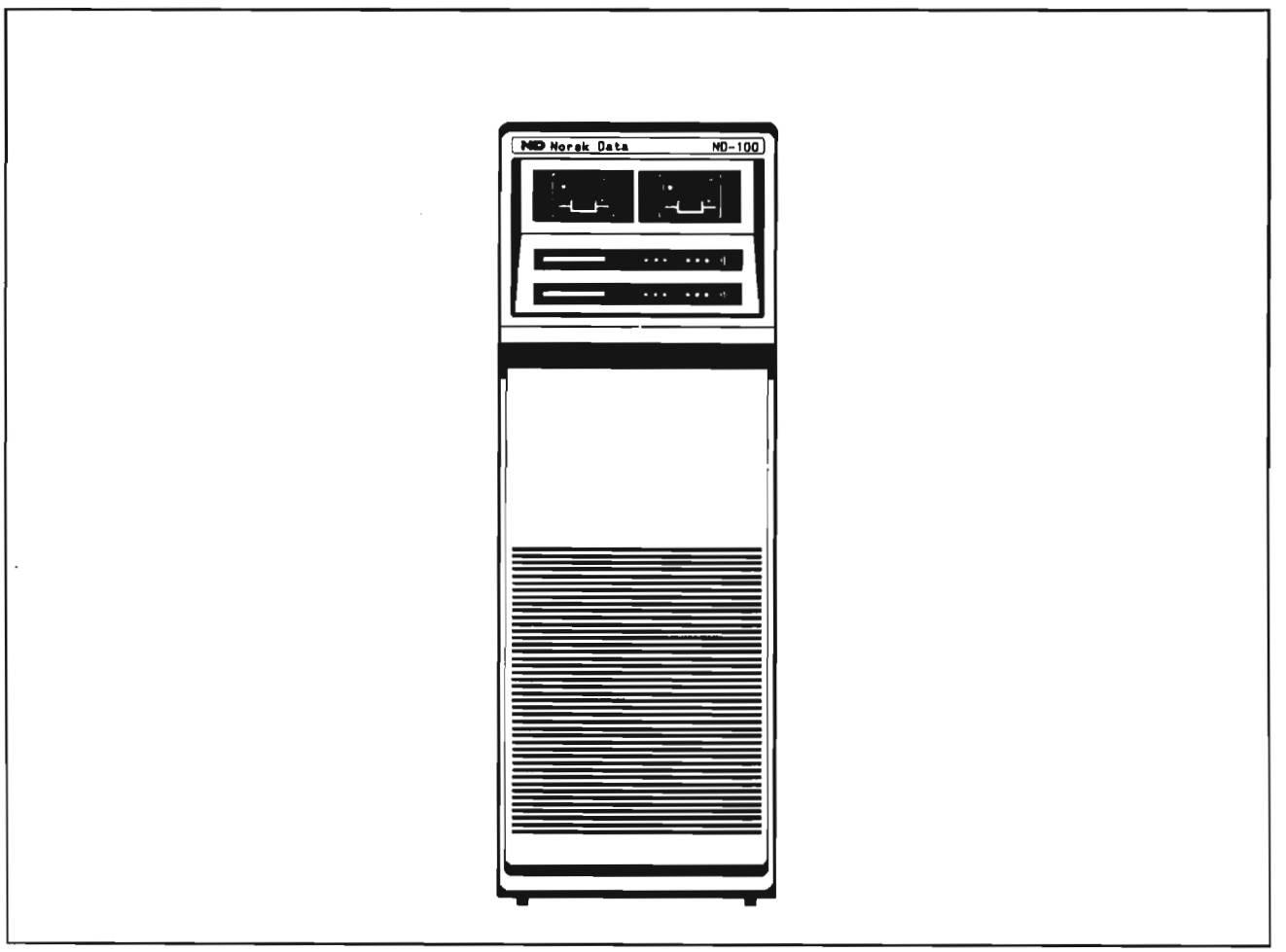


Figure 1. The ND-100/CX Cabinet

External Bus Structure

The figures in this section show the busses between ND-100, ND-500 and the multiport memory.

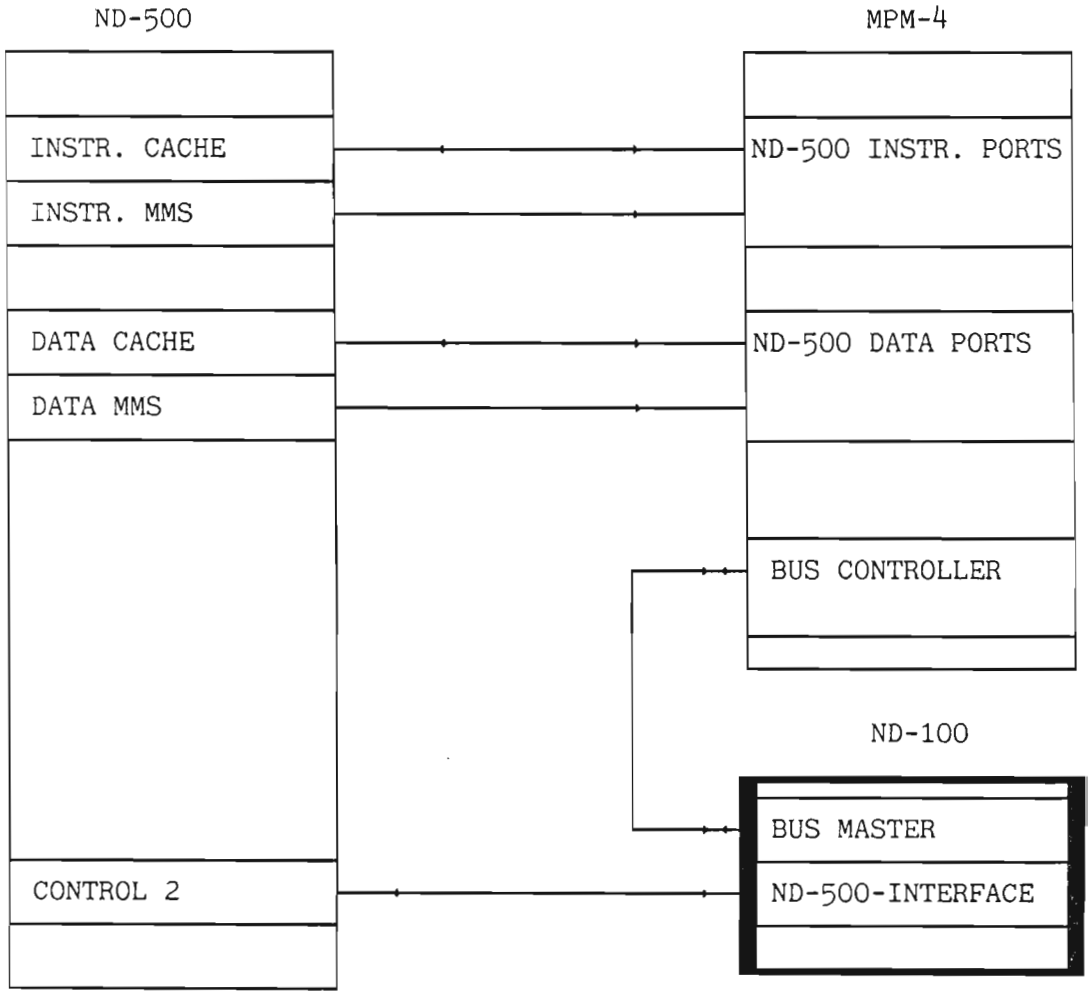


Figure 2. External Bus Structure w/MPM-4

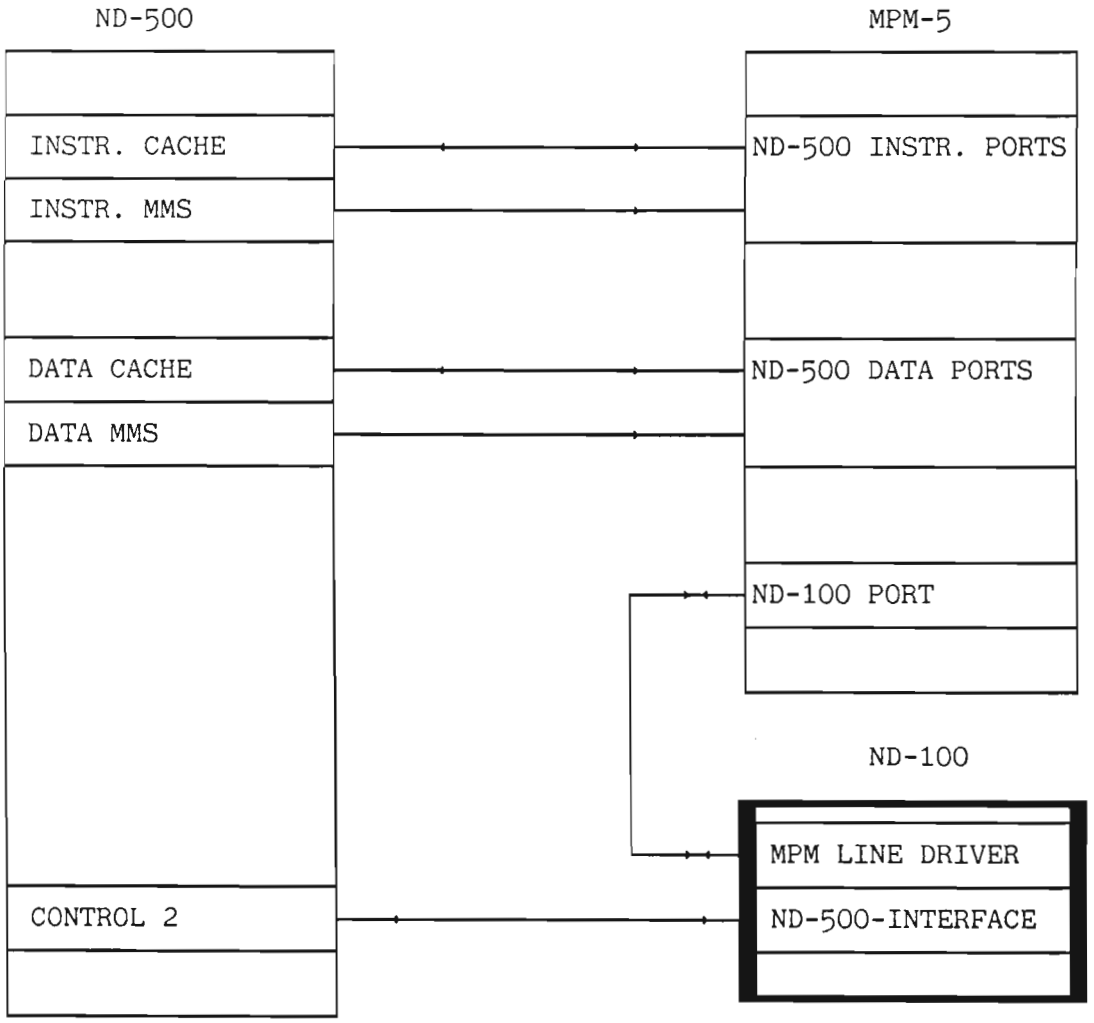


Figure 3. External Bus Structure w/ MPM-5

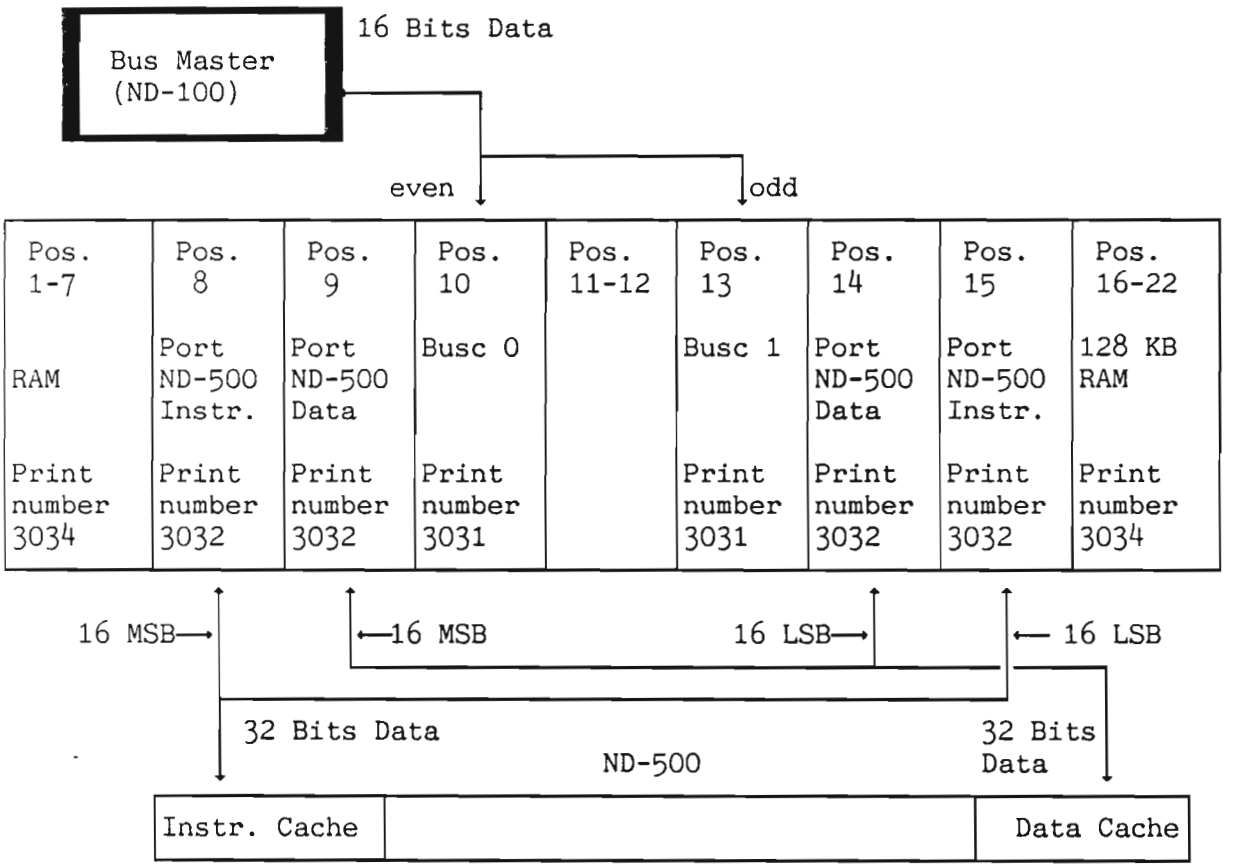


Figure 4. The MPM-4 Card Crate

The following figure shows the MPM-5 card crate:

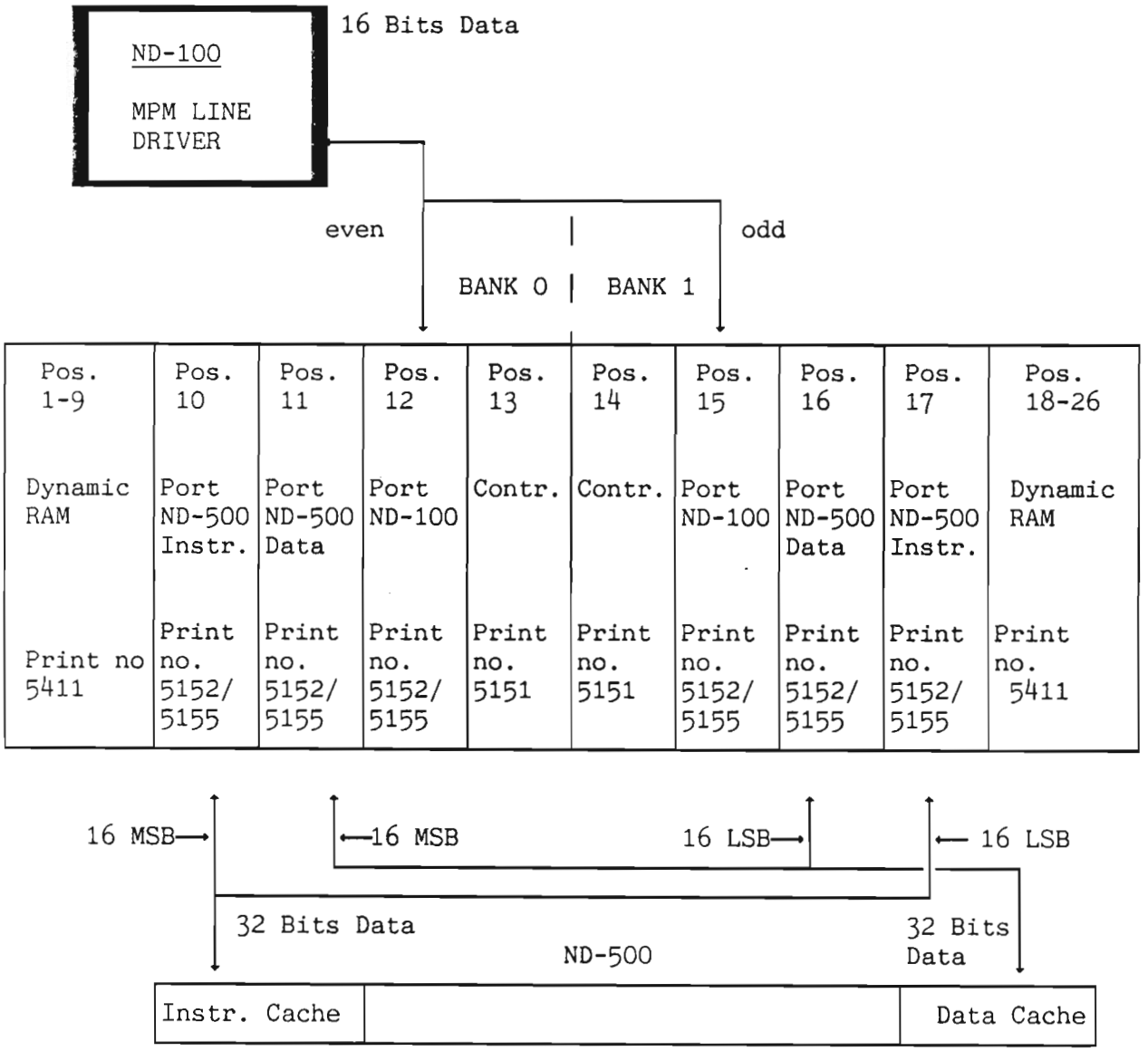


Figure 5. The MPM-5 Card Crate

MSB= Most Significant Bit
LSB= Least Significant Bit

ND-100 AC and DC power distribution

This section shows the internal AC and DC distribution in the ND-100 Cabinet.

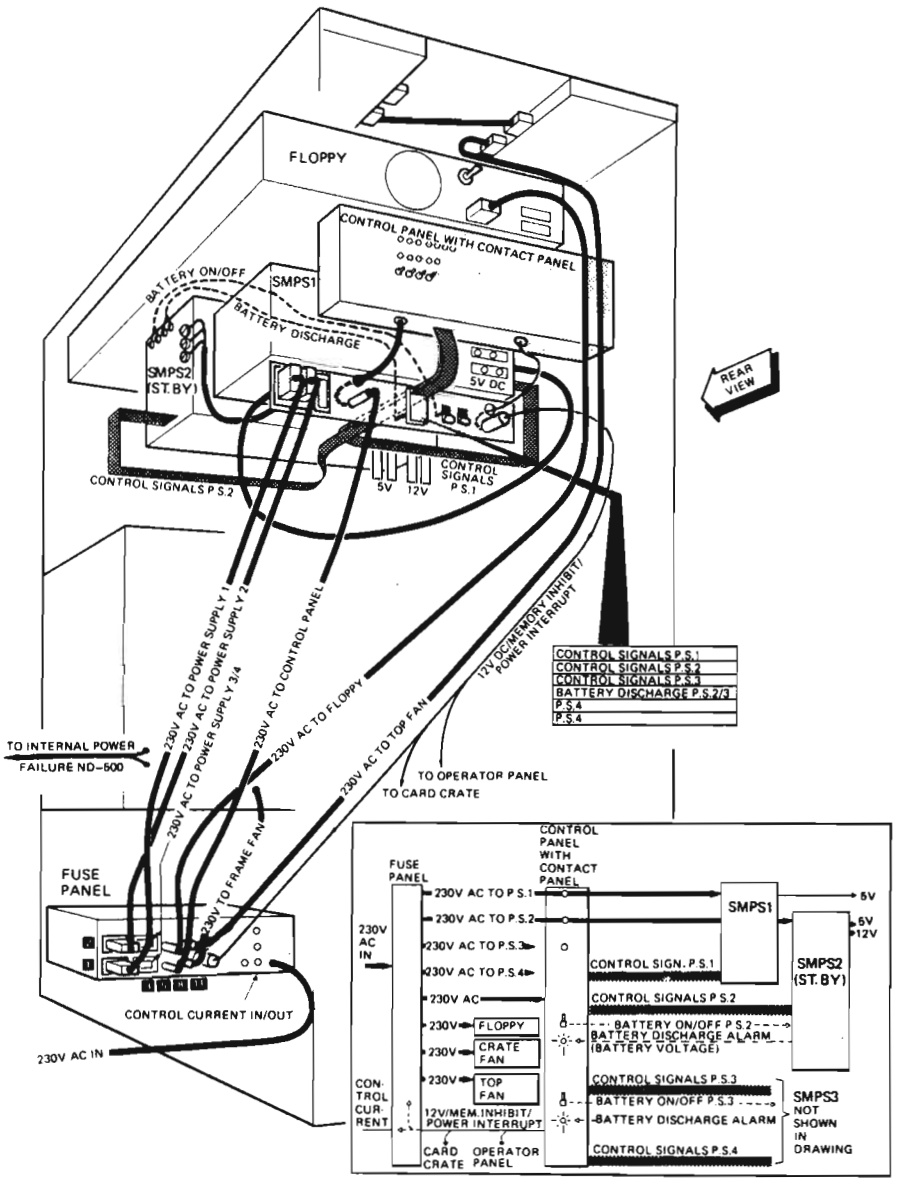


Figure 6. AC Distribution in the ND-100 Cabinet

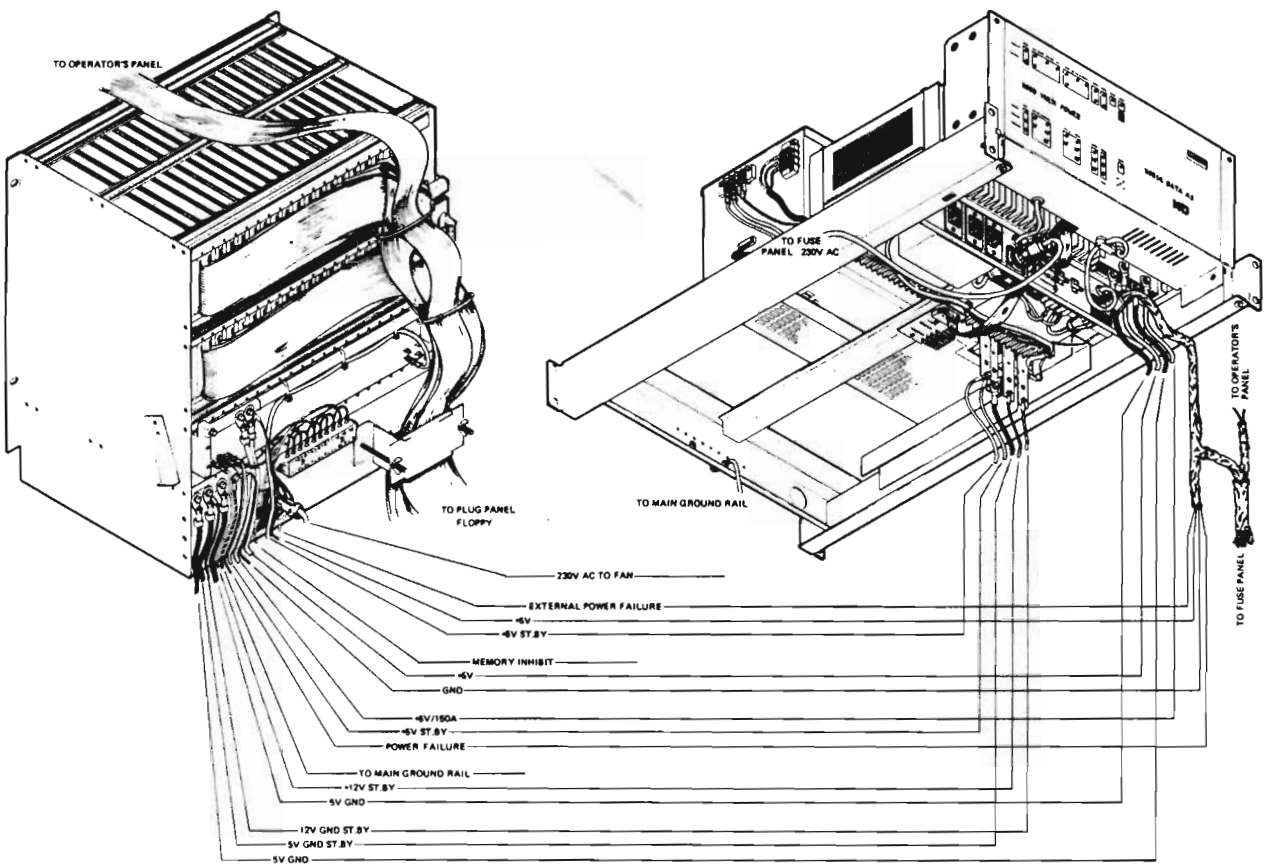
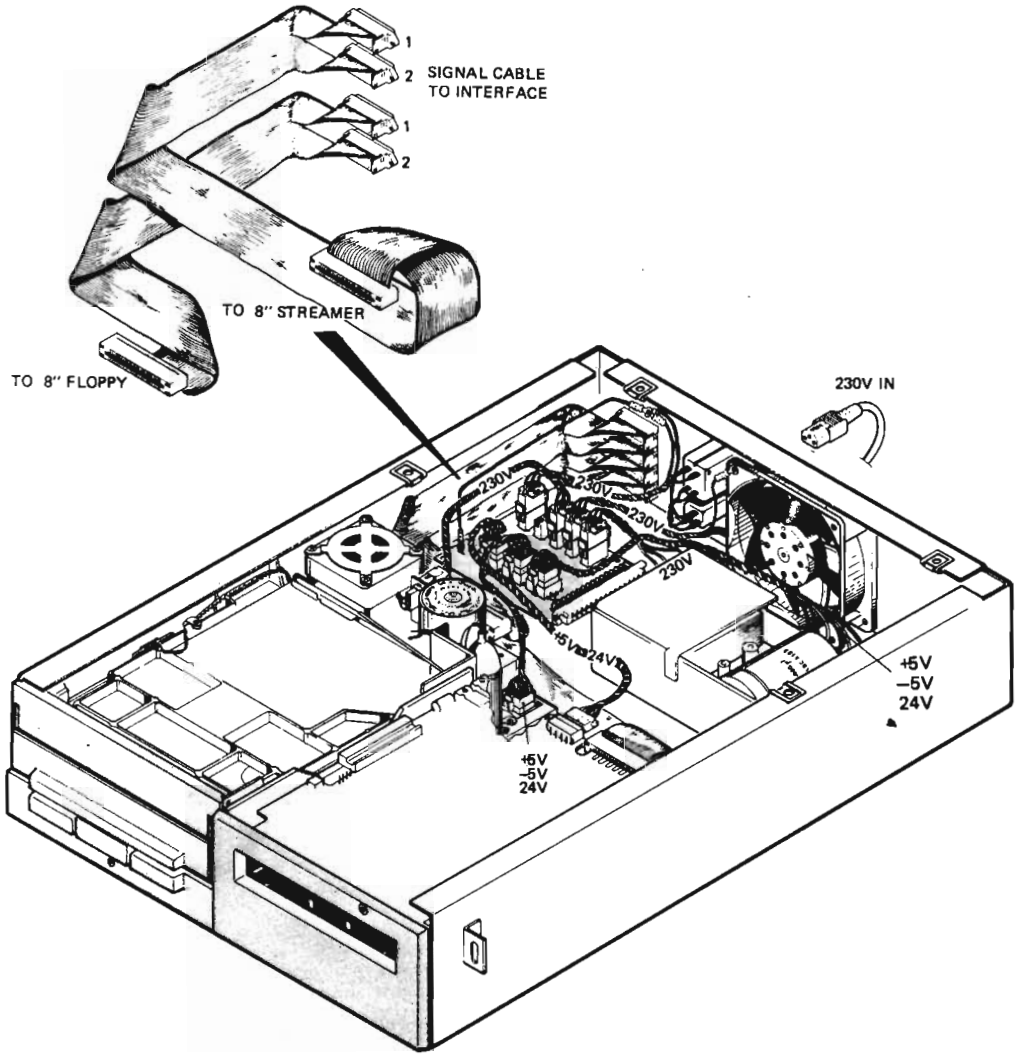


Figure 7. DC Distribution in the ND-100 Cabinet



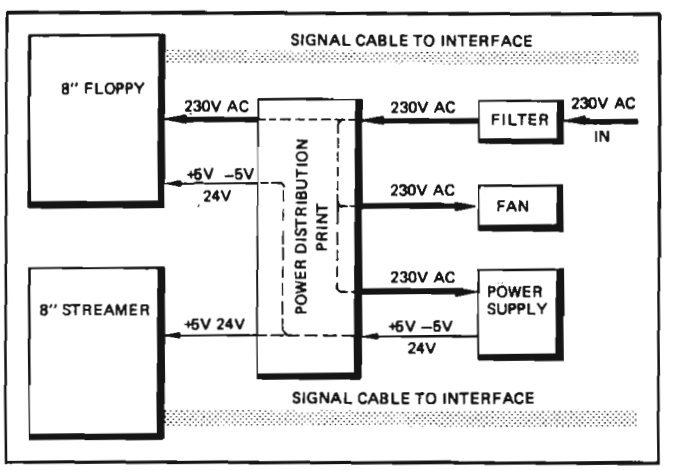


Figure 8. AC and DC Distribution for Floppy and Streamer Drive

1.2 The ND-100 Compact

This cabinet contains one 12-position card crate. The power supply is located directly in front of the card crate.

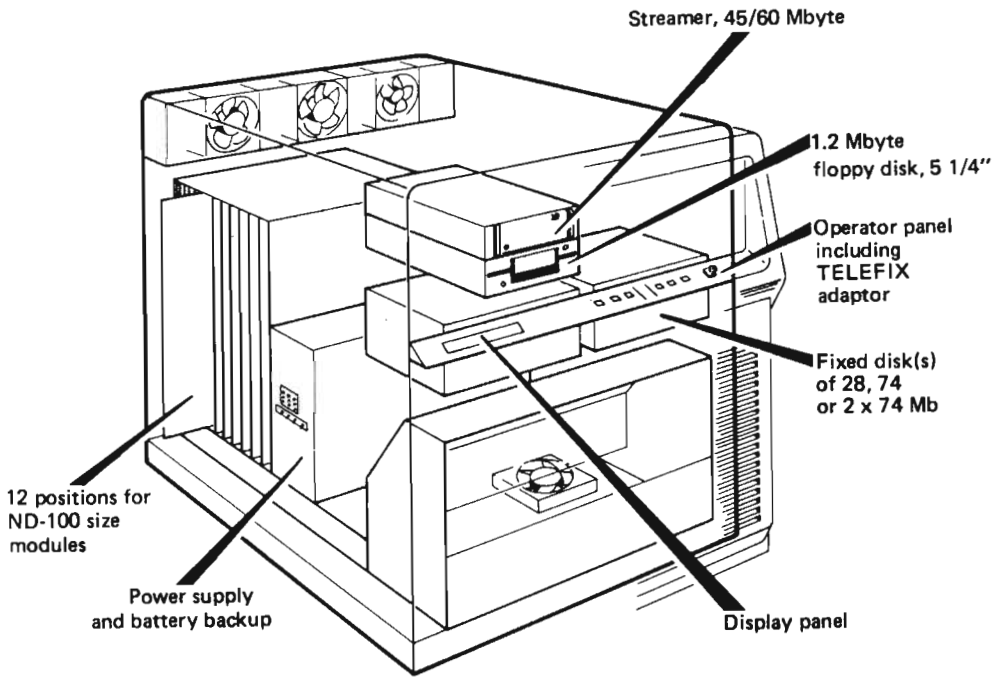


Figure 9. The ND-100 Compact Cabinet

1.3 The ND-100 Satellite

This cabinet contains one 7-position card crate. The power supply is located directly in front of the card crate.

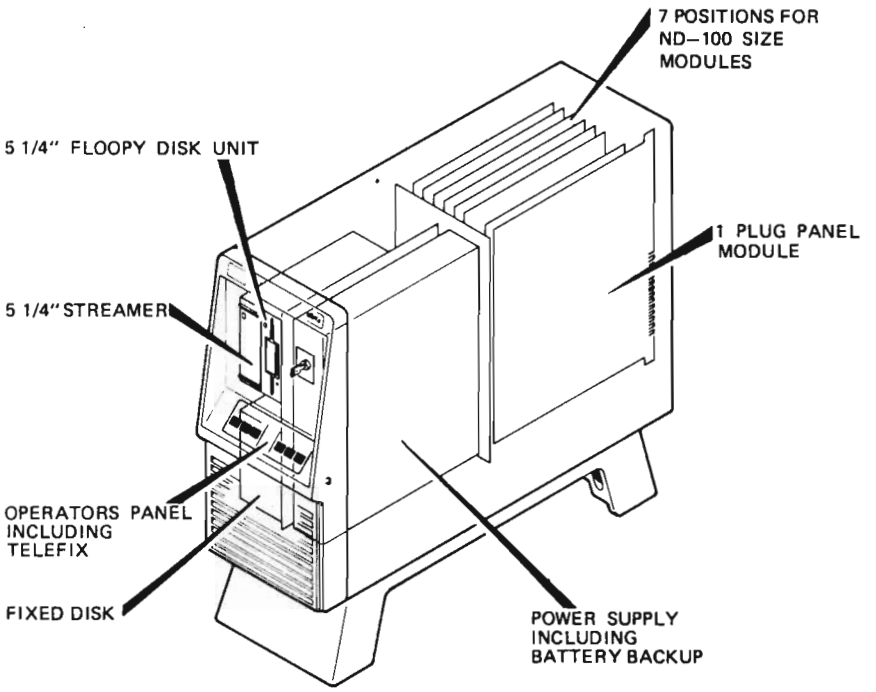


Figure 10. The ND–100 Satellite Cabinet

Chapter 2 Module substitution precautions

- Stop the disk and turn the power OFF before removing the disk controller cards.
- Stop the disk before removing or replacing a module in order to prevent loss of data stored on the customer's disk.
- Press the MASTER CLEAR button on the operator panel when removing or replacing a module.
- Ensure that the new module is on the correct ECO level, and that the switch settings are correct.
- If you have installed a new module after an error condition has been corrected/has occurred and the fault seems to have disappeared, you should try to install the old module again to see if you get the same error condition.

Chapter 3 Preventive maintenance

3.1 General

While the ND-100 Satellite/Compact can be installed in offices etc., the ND-100/CX must be installed in a data center.

The following environmental and procedural considerations within a data center are essential for the efficient and reliable operation of the ND-100:

TEMPERATURE

The temperature should be maintained at 22 degrees centigrade ± 4 degrees.

A temperature gradient of 2 degrees centigrade per hour should not be exceeded.

HUMIDITY

The relative humidity should be maintained at 55% ± 10%.

DUST

The site should be kept clean and dustfree. The air pressure in the computer room should be higher than the air pressure outside the room. Special demands are made on the air-conditioning unit's filter if the air includes corrosive gases, salts, conductive mineral particles or other unusual dust particles.

3.2 Routine maintenance tasks

One way of reducing downtime associated with unexpected system failure is to provide preventive maintenance services. During preventive maintenance scheduled visits, the field-service engineer should:

- Check the system to identify possible problem areas.
- Talk with the system supervisor and operators.
- Read through related documentation carefully.

QUARTERLY

The minimum maintenance to be done by the ND Service Department should include:

- Asking the system supervisor to stop the system.
- Observing that all the fans function properly.
- Cleaning the air filters.
- Checking the operator panel functions.
- Performing other preventive maintenance as described in vendor manuals for disks, magtapes, printers, floppies, streamers, etc.
- Activating the system and ensuring that everything is running properly.

ANNUALLY:

- Changing the air filter for the disk units and performing other preventive maintenance as described in the disk manual.
- Checking the power-supply output.
- Clean the computer. If necessary, cleaning the boards with a vacuum cleaner.
- Performing other preventive maintenance as described in vendor manuals for magtapes, printers, floppies, streamers etc.
- Activating the system and ensuring that everything is running properly.

Chapter 4 Error symptoms and troubleshooting procedures

4.1 General

This chapter outlines the error situations that occur when SINTRAN enters different error conditions, such as reporting errors, stops, hanging, etc.

In each of these error situations, a step-by-step troubleshooting procedure to correct the error or identify the failure is outlined. It is not possible to cover all situations and cases, but the intention is to put you on the right track.

The flow chart on the next page gives you references to the different sections within this chapter.

This flow-chart refers to the proper actions to be take when SINTRAN enters different error conditions.

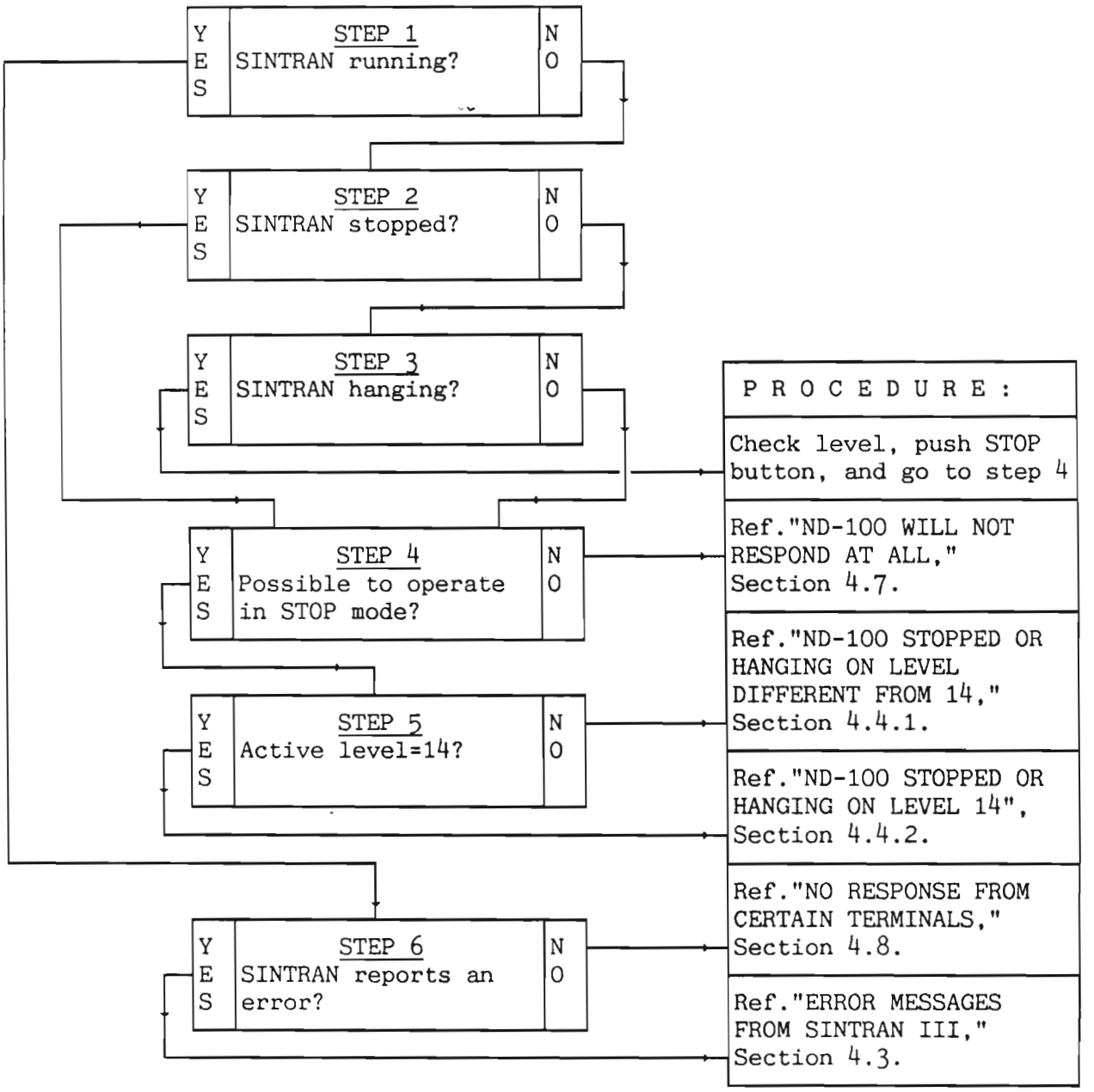


Figure 11. SINTRAN Enters Different Error Conditions

4.2 Some advice before starting

- Ask the System Supervisor for error messages or other information related to the error condition.
- Check which SINTRAN version is used.
- Check if the latest patch file is used.
- Check configuration and ECO-level.

NOTE

To stop the system, contact your System Supervisor.

4.3 Error messages from SINTRAN III

Error situations are usually detected through error messages from SINTRAN. These are classified as NON FATAL ERRORS and the error message will appear on the users terminal or on the error message terminal (usually the console terminal). These messages are listed together with suggested operator actions for the different messages in:

SINTRAN III System Supervisor, ND.30.003.

At runtime, errors may be detected by the system and written on the users terminal or on the console. Most of the errors will cause the current RT program to be aborted. The following error message will be displayed:

```
HH.MM.SS.  ERROR NN IN RR AT LL;  TTTT
XX YY
```

If the error occurs in a background program, the error message will be written on the corresponding terminal. For RT programs, the error message will be written on the console.

The parameters have the following meaning:

HH.MM.SS: Time when the error message was printed.

HH hours
MM minutes
SS seconds

NN: Error number. For further explanation, refer to the list on page 21.

RR: The RT program name or an octal address corresponding to an RT-program name.

LL: Octal address where the error occurred.

TTTT: Explanatory text.

XX, YY: Numbers carrying additional information about the error. One or both numbers can be omitted.

EXAMPLE: 06.43.32 ERROR 14 in BAK03 AT 114721 OUTSIDE SEGMENT BOUNDS

In the case of a transfer error, an additional message, TRANSF, will be given.

4.3.1 Summary of runtime error messages

The following runtime messages may occur.

The error messages that could be caused by hardware defects are printed in bold text, and will be explained in detail in section 4.3.2.

Note that some error codes are unused.

ERROR CODE	PROGRAM MEANING	XX	YY	ABORTED
00	Illegal monitor call			Yes
01	Bad RT program address			Yes
02	Wrong priority in PRIOR			Yes
03	**Bad memory page**	**Page no.**		
04	Internal interrupt on direct task level	Level	Bit no.	
06	Batch input error	Error no.		Yes
07	Batch output error	Error no.		
08	Batch system error	Error no.	L reg.	Yes
09	Illegal parameter in CLOCK			Yes
10	Illegal parameter in ABSET			Yes
11	Illegal parameter in UPDAT			Yes
12	Illegal time parameters			Yes
13	**Page fault for non DEMAND**	**Page no.**		**Yes**
14	**Outside segment bounds**	**Page no.**		**Yes**
15	Illegal segment number	Segment no.		Yes
16	Segment not loaded	Segment no.		Yes

ERROR CODE	PROGRAM MEANING	XX	YY	ABORTED
17	Fixing demand	Segment no.		Yes
18	Too many fixed pages	Segment no.		Yes
19	Too big segment	Segment no.		Yes
20	Disk transfer error	Hardware device no.	Unit	No (yes if segm. transfer)
21	Disk transfer error	Last 16 bits of sector address	Hardw. status	No
22	False interrupt	Level	Id. code	No
23	Device error	Hardware device no.	Hardw. status	No
25	Already fixed	Segment no.		Yes
26	Device time out	Hardware device no.		No
27	Illegal parameter in CONCT			Yes
28	Space not available	Segment no.		Yes
29	MON 64 and MON 65	Error no.	(See NORD File Sys. ND-60.122)	Yes
30	Divide by zero			Yes
31	Permit violation			Yes
32	Ring violation			Yes
33	HDLC driver, fatal error			Yes
34	Illegal instruction			Yes
35	Reentrant-FTN stack error			Yes
36	Privileged instruction			Yes
37	IOX error	Address	Level	No
38	Memory parity error	PEA register	PES reg.	Yes
39	Memory out of range	PEA register	PES reg.	Yes
40	Power fail			No

ERROR CODE	PROGRAM MEANING	XX	YY	ABORTED
41	Illegal error in ERMON			Yes
42	Overlapping segments	Segments		Yes
44	Corrected memory error	PEA register	PES reg.	No
45	Not demand segments			Yes
46	XMSG fatal error, internal error, or inconsistency	XMSG error code	Physical address	Yes
47	XMSG user error	Calling level		Yes
48	False BEX interrupt			
49	Remote power-fail interrupt			
50-69	User-defined error (MON 142)	Error no.	Suberror no.	No
70	BEX parity error			
71	False MPM4 interrupt	Busc no.	Hardw. STATUS	No
72	MPM4 power-fail interrupt	Busc no.		No
73	MPM4 memory out-of-range	Busc no.	Lower limit	No
74	MPM4 memory error	Local PES	Local PEA	No
75	MPM4 parity error	Busc no.	Lower limit	No
76	MPM4 write parity error	Busc no.	Port code	No
90	Fortran runtime error	Error no.		No
91	Fortran I/O error	Error no.		No
100	Fortran library error			

4.3.2 The runtime errors explained in detail

Only the error messages that could be caused by hardware defects are covered in this section.

03 BAD MEMORY PAGE <PAGE NO.>

EXPLANATION:

Parity error detected by a memory test routine in SINTRAN III during the start-up sequence.

PROCEDURE:

Verify the memory parity by running a memory test program; For example, run one of the stand-alone test programs such as:

MEMORY (see chapter 5 for additional information).

NOTES:

The system can still run after this error message. This is a good opportunity to take backup.

Do not run the memory test program MOVER under SINTRAN. The page containing the parity error is not used for swapping.

11 ILLEGAL PARAMETER IN UPDAT

EXPLANATION:

Occurs when the power has been turned OFF, or the CPU has been pulled out of the card crate.

PROCEDURE:

The clock must be updated.

13 PAGE FAULT FOR NON DEMAND

EXPLANATION:

An RT-program on a non-demand type segment is attempting to use an address outside the segment bounds.

Non-demand segment: Segments where all pages have to be present in memory before start up. This is probably a user error.

PROCEDURE:

Run tests:
MEMORY
PAGING
PARITY CHECK ON DISK/FILSYS
CPU TESTS
(see chapter 5)

14 OUTSIDE SEGMENT BOUNDS

EXPLANATION:

An RT-program on a demand segment tried to use an address outside the segment bounds.

- If the error message is from user RT-program:

  -Check the software

- If the error message is from system RT-program:

  -Check the hardware

PROCEDURE:

Run tests:
MEMORY
PAGING
PARITY CHECK ON DISK/FILSYS
CPU TESTS
(see chapter 5)

20 DISK TRANSFER ERROR
<HARDWARE DEVICE NO.> <UNIT>

21 DISK TRANSFER ERROR
<DISK ADDRESS> <STATUS>

EXPLANATION:

Error messages 20 and 21 will normally appear together and indicate a mass storage transfer error.

Sometimes, however, only a special error message TRANSF! is printed. This message is printed out when a transfer error occurs during a swapping operation on the disk.

This hardware error is probably due to a disk error, a disk controller error or a memory error.

PROCEDURE:

Run test:
DISC-TEMA
(see chapter 5)

22 FALSE INTERRUPT <LEVEL>

EXPLANATION:

Levels 10,11,12 or 13 were activated, but the IDENT instruction could not find a correct ident code for an input or output device.

The problem could be noise, or a hardware error.

The interrupt levels:

10 output devices

11 mass-storage devices

12 input devices

13 real-time clock, HDLC

PROCEDURE:

Run CONFIGURATION-INVESTIGATOR to check the state of the different device interfaces. (See chapter 5 for more information.)

23 DEVICE ERROR <DEVICE NO.>
<STATUS>

EXPLANATION:

All devices are run in test mode at start-up time. DEVICE ERROR will be printed if an error is found in the status word of the device.

The STATUS is the status word for the actual device, giving a more precise description of the error. See the status-word description for the specified device.

The cause could be that at START-UP time:

- The device is connected to a RS-232 interface, but not switched on, or it is not on line.

PROCEDURE:

Turn on the device and restart the system to see if the error message occurs again.

If it does, then:

- Run CONFIGURATION-INVESTIGATOR.
- Test the device reporting errors (see chapter 5 for additional information).

See the Service Handbook for ND-100 device numbers, ident codes and logical device numbers.

31 PERMIT VIOLATION

EXPLANATION:

The RT-program attempted to access a page with an illegal reference type. This is probably a programming error. Each individual segment may be protected against:

- read access
- write access
- instruction fetch access

PROCEDURE:

Run tests:
PAGING
CPU-TESTS
MEMORY
(see chapter 5)

32 RING VIOLATION

EXPLANATION:

The RT-program attempted to execute an instruction or to access data on another page with a higher ring status. This is probably a programming error.

PROCEDURE:

Run tests:
PAGING
CPU TESTS
MEMORY
(see chapter 5)

34 ILLEGAL INSTRUCTION

EXPLANATION:

The program attempted to execute an instruction which was not implemented.

PROCEDURE:

Check the version of the microprogram. It is NOT possible to run "extended" software on a machine without the microprogram for a "commercial extended"(CE) ND-100.

37 IOX ERROR <ADDRESS>

EXPLANATION:

This could mean no answer (BDRY) from an interface, or that an IDENT instruction is executed without an interrupt waiting. This could be either a hardware error on the interface or a software error, for example a user trying to access a nonexistent interface.

PROCEDURE:

Run CONFIGURATION-INVESTIGATOR to check the state of the different device interfaces (see chapter 5).

38 MEMORY PARITY <PEA> <PES>

EXPLANATION:

A memory parity error has occurred. It is probably a hardware error.

PROCEDURE:

Locate the failing memory module by the information found in:

- PEA, parity error address register
- PES, parity error status register

By using the contents of PES and PEA, a 24-bit address can be built in the following way:

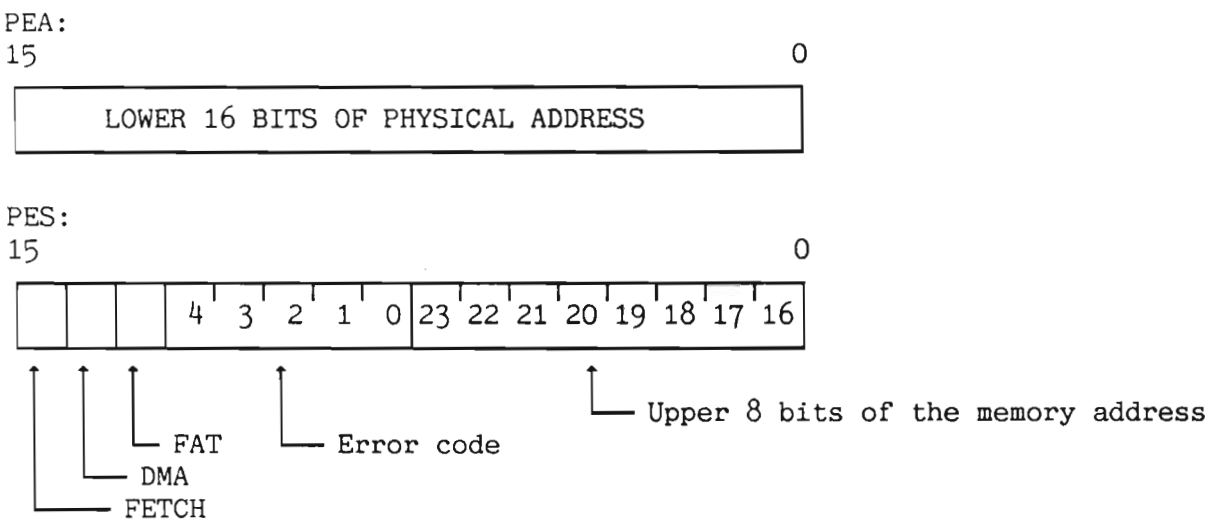


Figure 12. PES and PEA Layout

You can find the 24-bit address from bits 0-15 in PEA and bits 0-7 in PES.

This 24-bit address will enable you to find the failing module:

2 Mb modules:

1. module	0	- 3777777
2. module	4000000	- 7777777
3. module	10000000	- 13777777
4. module	14000000	- 17777777

256 Kw modules:

1. module	0	- 777777
2. module	1000000	- 1777777
3. module	2000000	- 2777777
4. module	3000000	- 3777777

64 KW modules:

1. module	0 - 177777
2. module	200000 - 377777
3. module	400000 - 577777
4. module	600000 - 777777

39 MEMORY OUT-OF-RANGE <PEA> <PES>

EXPLANATION:

An attempt to access a nonexistent memory location has occurred.

PROCEDURE: Check if bit 14_{10} in PES is set. If this bit is set, it means that DMA was active when MEMORY PARITY ERROR/MEMORY OUT-OF-RANGE occurred.

Run tests:
MEMORY
PAGING
INSTRUCTION
CACHE
(see chapter 5)

40 POWER FAILURE

EXPLANATION:

The message will be given when SINTRAN automatically restarts after a power failure or @STOP-SYSTEM command.

EXAMPLE:
14.21.32 ERROR 40 in 23327 at 110330: POWER FAILURE

PROCEDURE:

If there is no automatic restart:

- Check that the key on the operators's panel is in the locked position.
- Check if the battery is switched ON.

Run the POWER-FAILURE TEST PROGRAM (see chapter 5 for additional information).

44 CORRECTED MEMORY ERROR <PEA>
<PES>

EXPLANATION:

A single data bit in a word read from memory has been corrected by the ECC network on the memory modules.

PROCEDURE:

Run tests:
MEMORY
(see chapter 5)

48 FALSE BEX INTERRUPT

EXPLANATION:

Interrupt from the bus extender (BEX), but no error status is set. It is probably an error on the BEX card, or in the second card crate.

PROCEDURE:

Run test:
CONFIGURATION
(see chapter 5)

49 REMOTE POWER-FAIL INTERRUPT

EXPLANATION:

Interrupt from the bus extender (BEX), which has a special switch set.

PROCEDURE:

Run test:
CONFIGURATION
(see chapter 5)

70 BEX PARITY ERROR

EXPLANATION:

A bus extender parity error has occurred. Probably a hardware error.

PROCEDURE:

Run test:
CONFIGURATION
(see chapter 5)

71 FALSE MPM4 INTERRUPT
BUSC NO. <nnn>

EXPLANATION:

A false interrupt from one of the memory banks in the MPM4.

PROCEDURE:

Run test:
MEMORY
(see chapter 5)

72 MPM4 POWER-FAIL INTERRUPT
BUSC NO. <nnn>

EXPLANATION:

A false interrupt from one of the memory banks in the MPM4.

PROCEDURE:

Run test:
MEMORY
(see chapter 5)

73 MPM4 MEMORY OUT OF RANGE
BUSC NO. <nnn>

EXPLANATION:

An attempt to address a nonexistent memory location in MPM4 has occurred.

PROCEDURE:

Run test:
PAGING
MEMORY
(see chapter 5)

74 MPM4 MEMORY ERROR
LOCAL PES <nnn>

EXPLANATION:

Local MPM4 error. This error will be followed by errors 73 or 75.

PROCEDURE:

Run test:
MEMORY
(see chapter 5)

75 MPM4 PARITY ERROR
BUSC NO. <nnn>

EXPLANATION:

An MPM4 parity error has occurred. It is probably a hardware error.

PROCEDURE:

Run test:
MEMORY
(see chapter 5)

76 MPM4 WRITE PARITY ERROR
BUSC NO. <nnn>

EXPLANATION:

A port discovered a parity error in MPM4.

PROCEDURE:

Run test:
MEMORY
(see chapter 5)

4.4 SINTRAN III stopped or hanging

If the machine has gone into a stop or a hang-up situation, the following should always be noted before pressing the buttons STOP or MCL:

1. Is the machine in a stop or in a hang-up situation?

   The machine has stopped if the OPCOM lamp on the computer's panel is lit and the RUN lamp is not lit.

   If this is not the case, but there is no response from the machine, you have a hang-up situation.

2. Are paging and interrupt turned on or off? Look at the computer's panel.

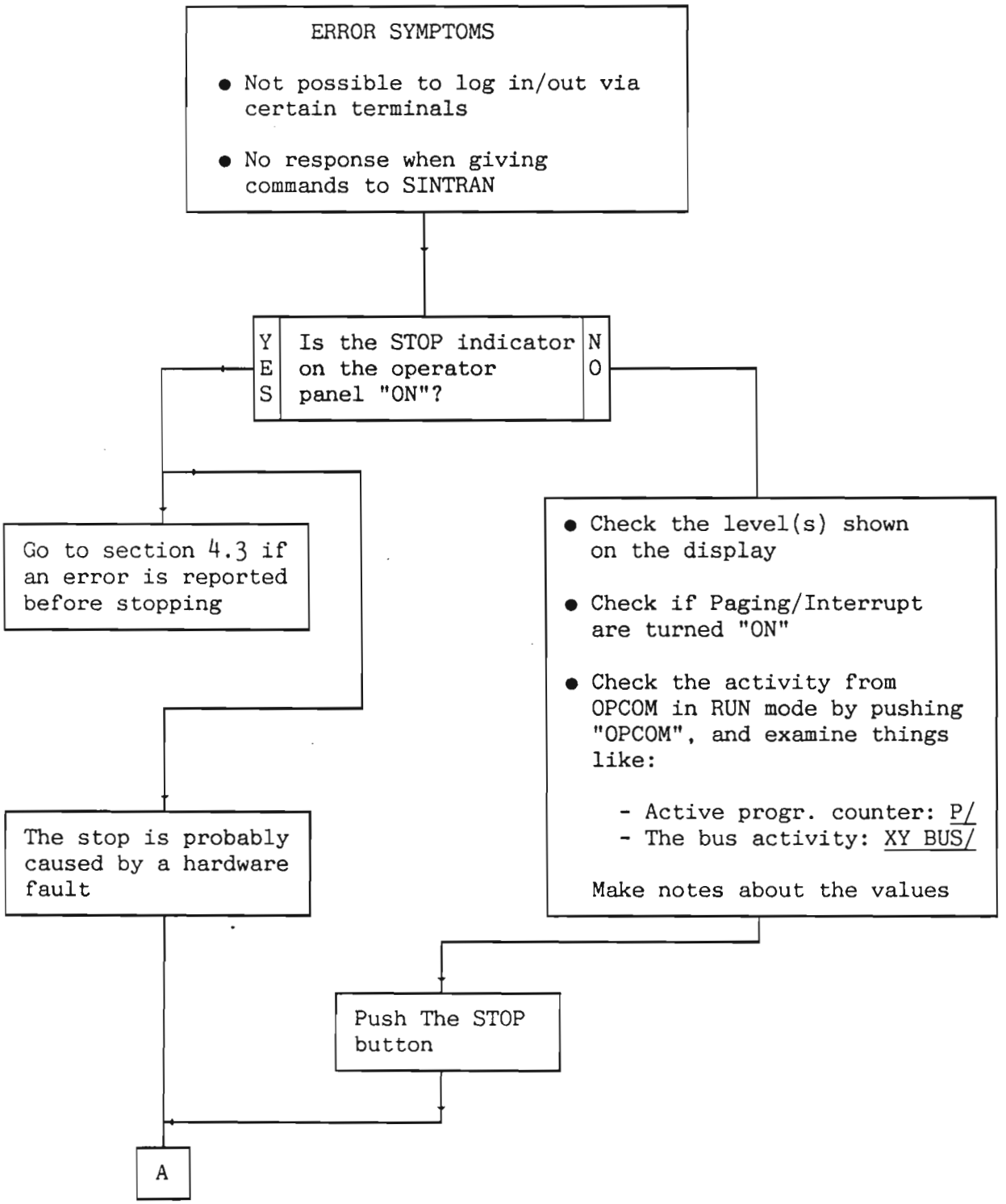
3. What interrupt levels are active? Look at the computer's panel.

4. Try to find out what was running on the machine when the error occurred.

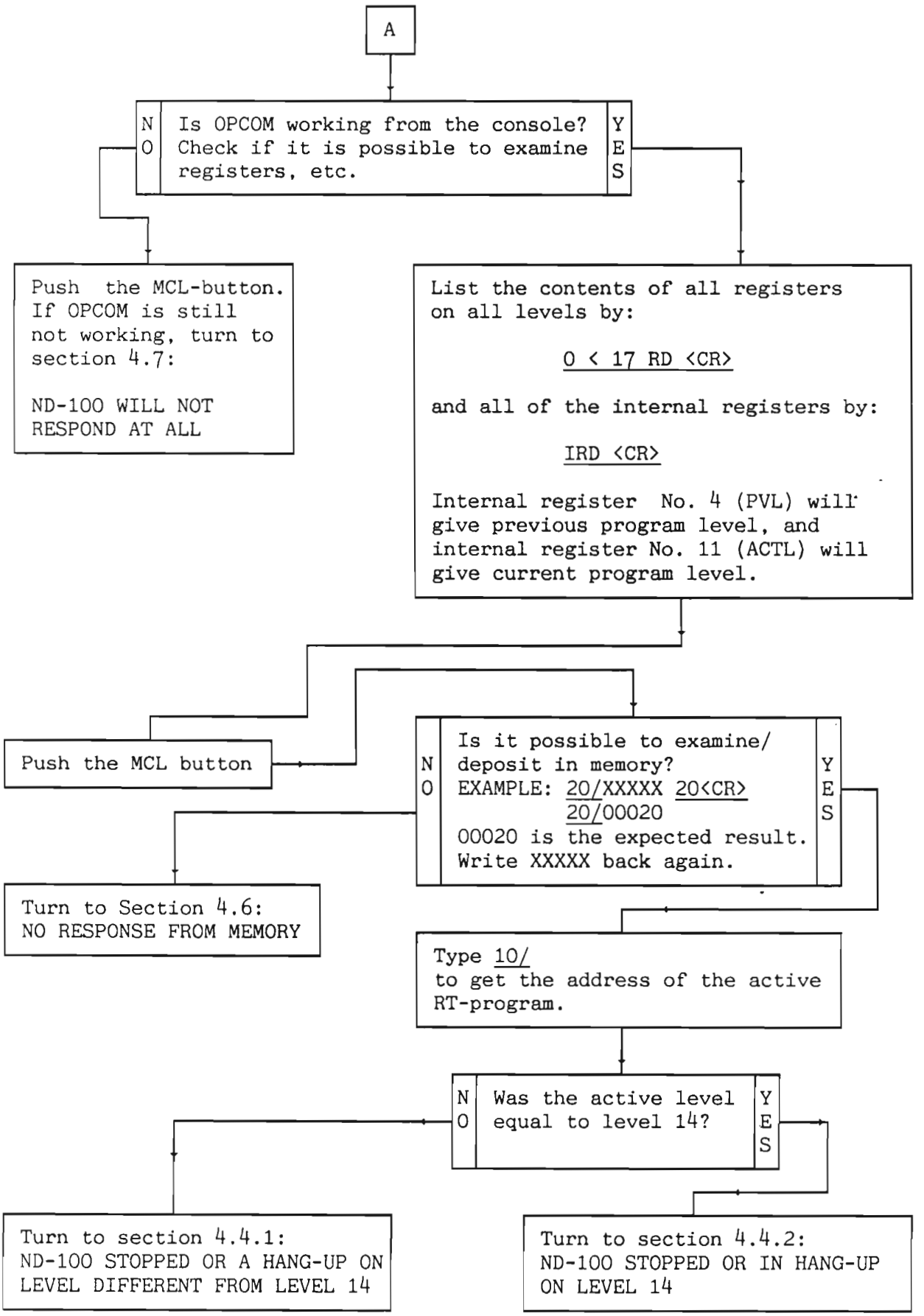
5. Note the latest commands given on the terminal.

6. Follow the troubleshooting procedures, which start on the next page.

TROUBLESHOOTING PROCEDURE:

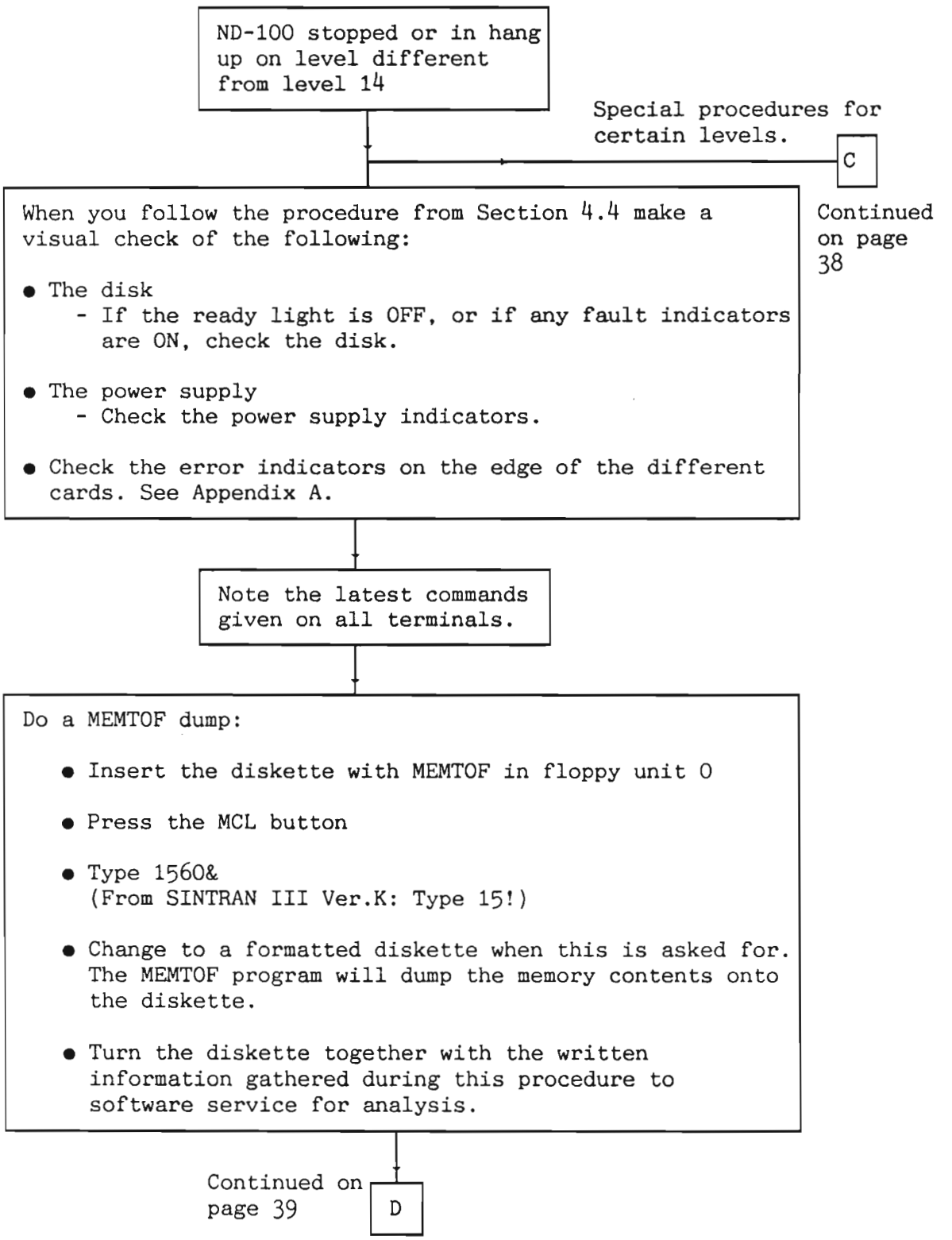


Continued on page 36



4.4.1 ND-100 stopped or hang-up on level different from 14

TROUBLESHOOTING PROCEDURE:



SPECIAL PROCEDURES FOR CERTAIN LEVELS:

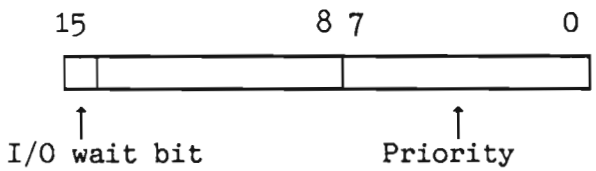
C

Active level=1

Normally a hang-up situation. A RT-program was running.

PROCEDURE:

- If in a stop condition: Press the MCL- and LOAD-buttons.
- If in a hang-up condition: Press the STOP-button. Have a look in memory locations 7 or 10 (should be equal). Add 1 to the content found in this location. This gives you the address of the RT-program's status word.



Give the I/O wait bit the value "1" , set the Priority bit="0", and type ! to continue.

Active level=3

A hang-up or a stop condition normally caused by:

- Overwriting in the start of SINTRAN III resident part

PROCEDURE:

1. Do a MEMTOF dump (see page 37)
2. Test memory by running the test program MEMORY
3. Test the page tables by running the test programs PAGING and INSTRUCTION
4. Press the MCL- and LOAD-buttons.

Active level=5-9

A stop or a hang-up situation normally caused by special user software (RT-programs)
PROCEDURE: Press the MCL- and LOAD-buttons.

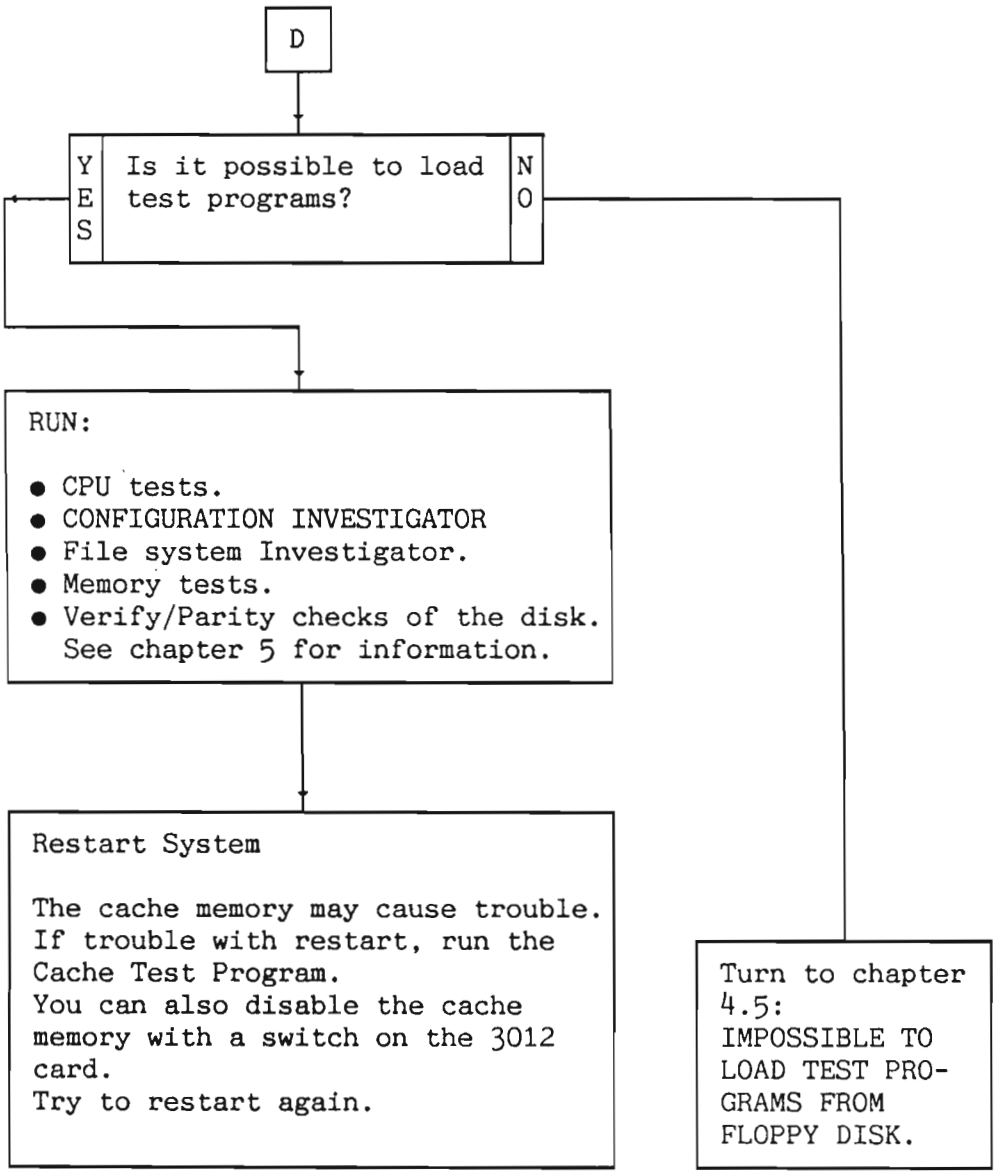
Active level=10-13

A stop or a hang-up situation caused by the I/O system (an I/O device causes the problem).

PROCEDURE:

1. The contents of the B-register on the active level give you the address of the data field on the peripheral that caused the trouble. Use this address to find the device from the SINTRAN III Listing Part II.
2. Run a test program to test the particular device.
3. Press the MCL- and LOAD-buttons.

From page 38



4.4.2 ND-100 stopped or hanging on level 14

Level 14 is connected to the internal interrupt system. SINTRAN III will read the IIC-(internal interrupt code) in case of a level-14 interrupt.

When the IIC is read, the contents of this register are cleared. The contents of the IIC are found in the following way:

Print the contents of the B-register on level 14:

```
16 B/ xxxxx
```

If running SINTRAN III version K, you must type:

```
7E <CR>
```

By subtracting 200 (octal) from the contents of the B-register, the address of these different parameters is found:

xxxxx - 200 / FAILING ADDRESS (PERR)

and in the following addresses (press the carriage return-key):

PREVIOUS LEVEL (ACTL)

INTERNAL-INTERRUPT CODE (IIC)

PARITY-ERROR STATUS (PES)

PARITY-ERROR ADDRESS (PEA)

Names in brackets are the names used by SINTRAN III.

NOTE

The values of PEA and PES are only valid if the IIC is equal to to 10 or 11 (octal).

The following table shows the procedure to be followed for the different values of the IIC.

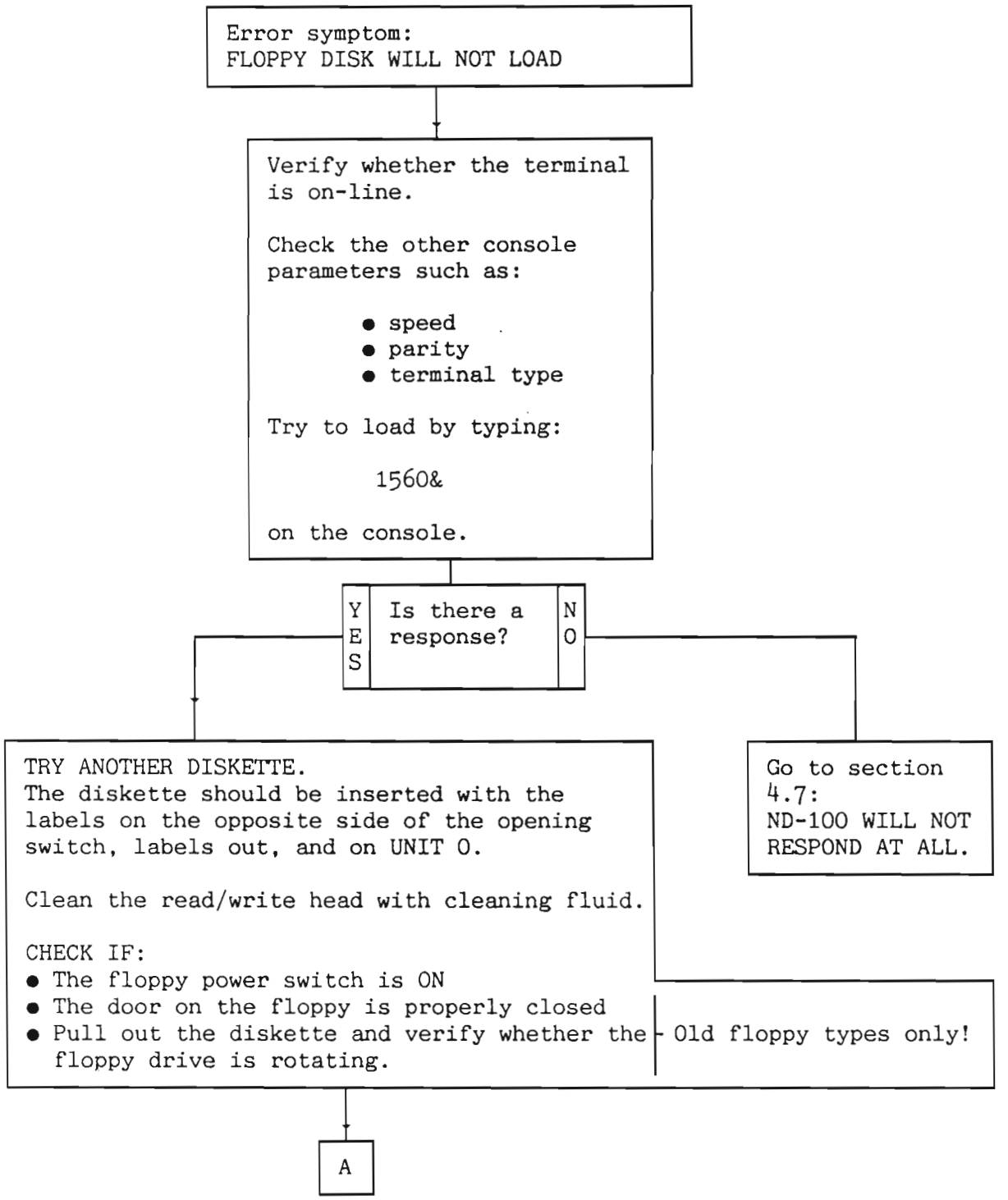
IIC VALUE:	PROCEDURE (run the following tests):
1 Monitor call	CPU
2 Memory protect violation	CPU and Paging
3 Page fault	CPU, Paging, Memory and Cache
4 Illegal instruction	CPU
5 Zero indicator set	CPU
6 Privileged instruction	CPU
7 IOX error No reply from addressed interface module	CONFIGURATION INVESTIGATOR
10 Memory parity error	Memory
11 Memory out-of-range	Memory
12 Power fail	Power-fail CHECK: ● Key in the LOCKED position? ● Power-supply backup battery OK?

Table 1. Test Procedures Used for Different IIC Values

It is also important to check if bit 14_{10} in PES is set. If this bit is set, it indicates that DMA was active when MEMORY PARITY ERROR/MEMORY OUT OF RANGE occurred.

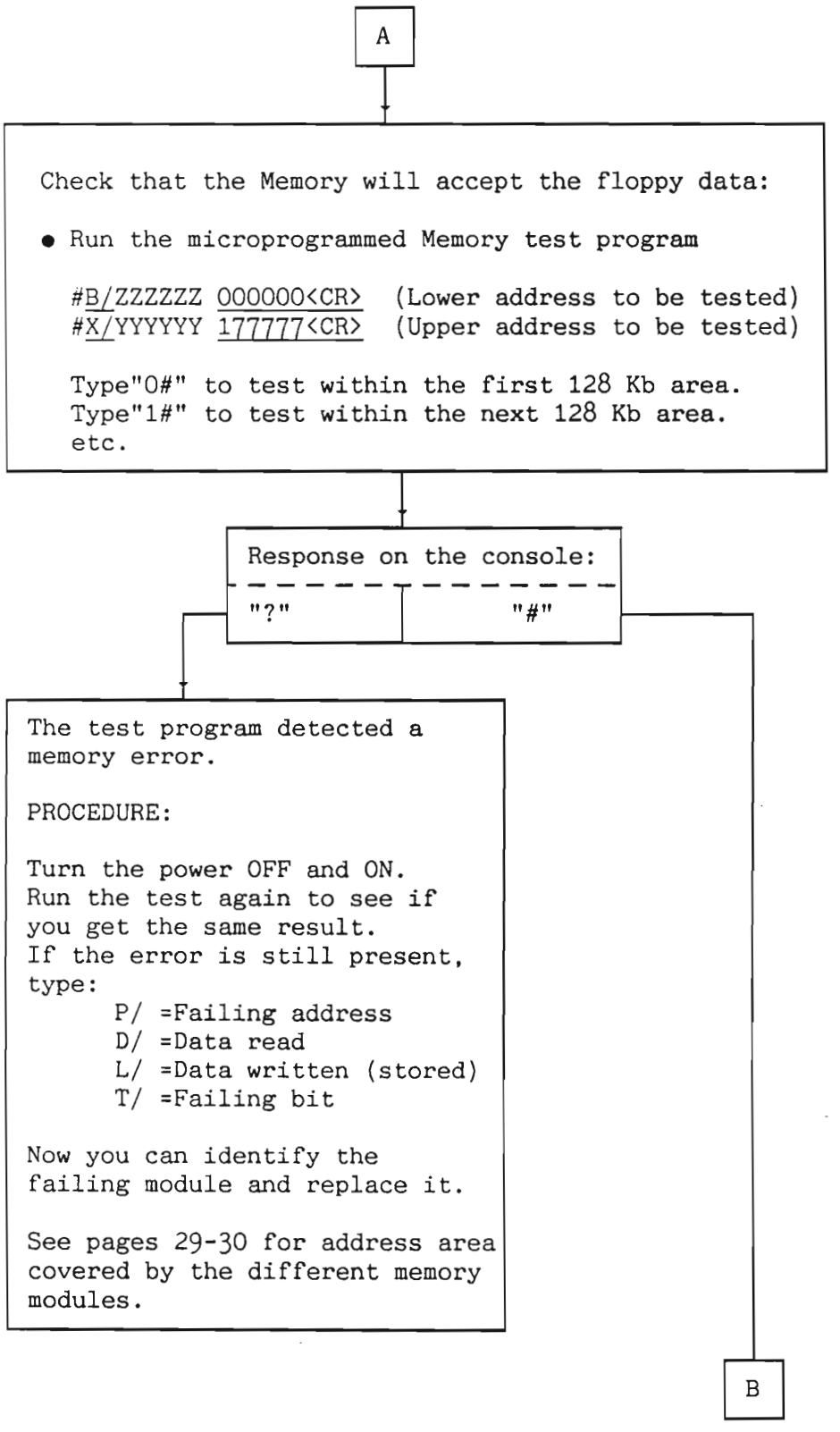
4.5 Impossible to load test programs from floppy disk

TROUBLESHOOTING PROCEDURE:



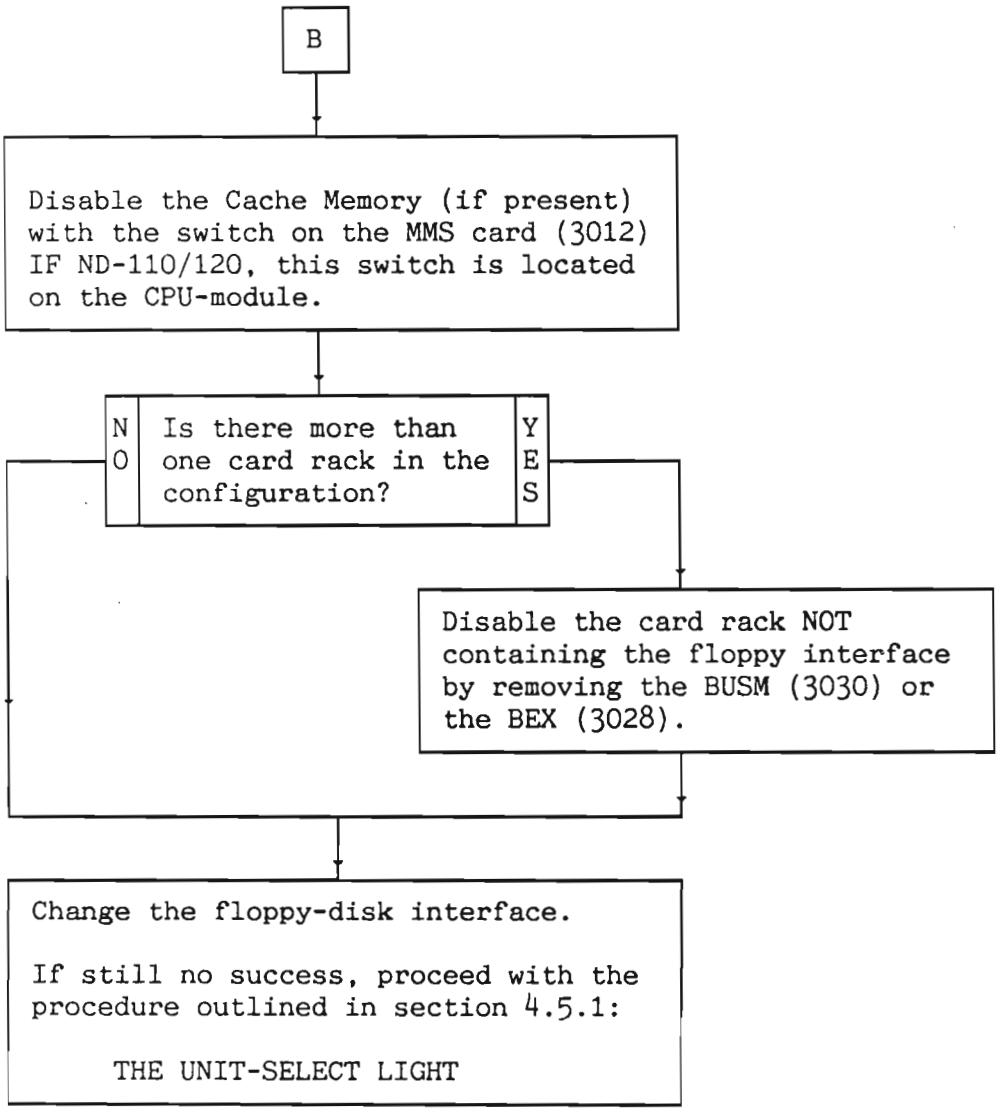
Continued on page 43

FROM THE PREVIOUS PAGE:



Continued on page 44

FROM THE PREVIOUS PAGE:



4.5.1 The unit-select light

The light emitting diode positioned in the opening switch of the floppy drive is lit when:

- The unit is selected
- The head is loaded
- The unit is ready for reading

No "click" sound (old floppy types only):

A "click" sound is heard from the head-load-solenoid when the head is loaded. If the light emitting diode is lit, but there is no "click" sound, there may be something wrong with the floppy drive.

No light:

If the diode is not lit, this may indicate that the unit is not properly selected. This could be caused by:

- Error in the microprogram that reads from unit 0.
- Malfunction in the I/O system jamming the signals initiated by the microprogram
- Error in the formatter (on old floppy types only)
- Error in the unit

Floppy monitor does not start:

If the LED is lit, but the floppy monitor has not started, the reason could be:

- Error in the formatter
- Error in the unit
- Memory error
- CPU error
- Defective diskette

Memory and CPU errors indicate that the instructions read from the floppy disk have not been correctly executed.

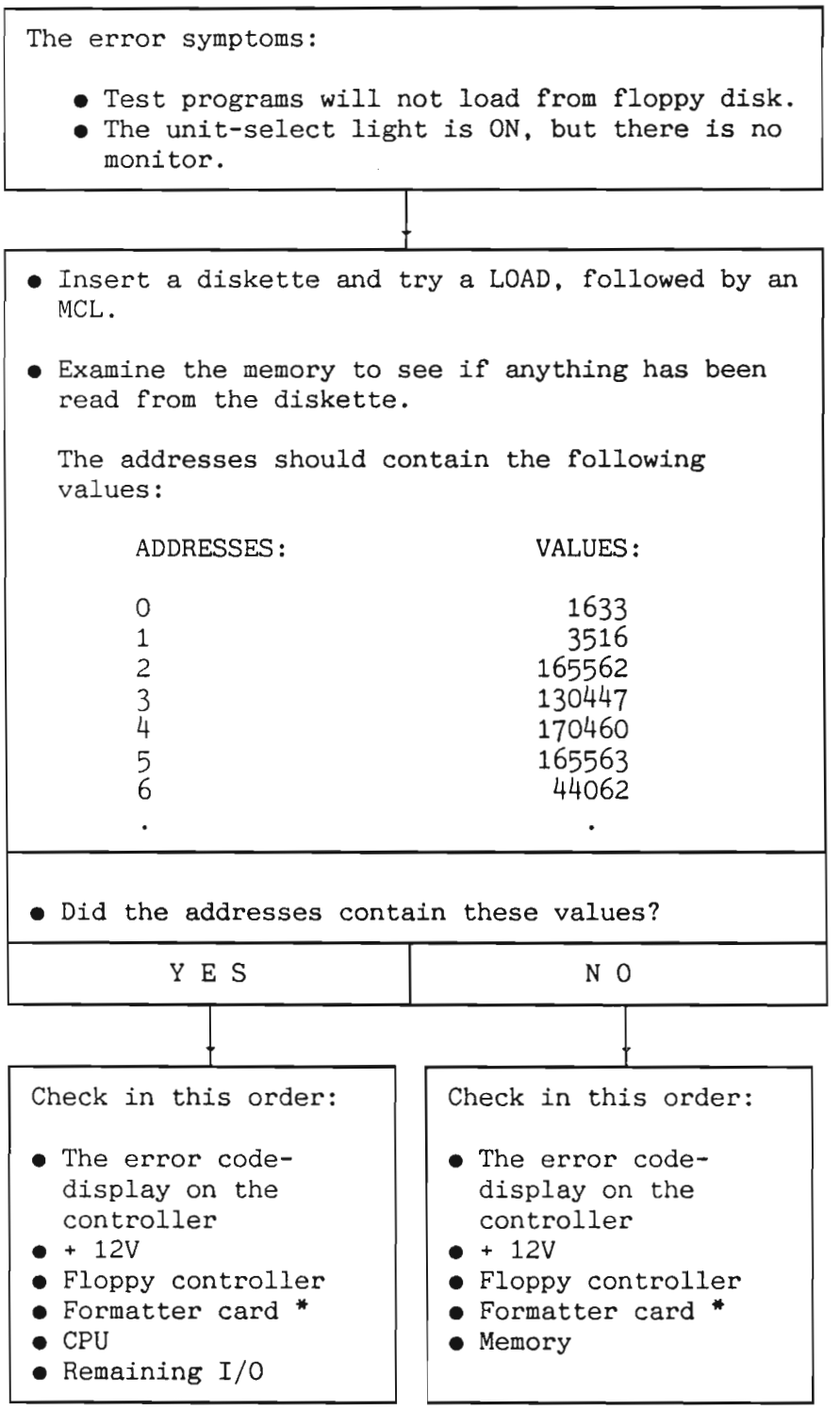
Watch out for the following error symptoms:

1. The unit-select light is ON, but there is no monitor.

2. The unit-select light is OFF.

The troubleshooting procedures for these error symptoms are found on page 47 and 48.

The unit-select light is ON, but there is no monitor:



* On old floppy drives only.

The unit light is OFF:

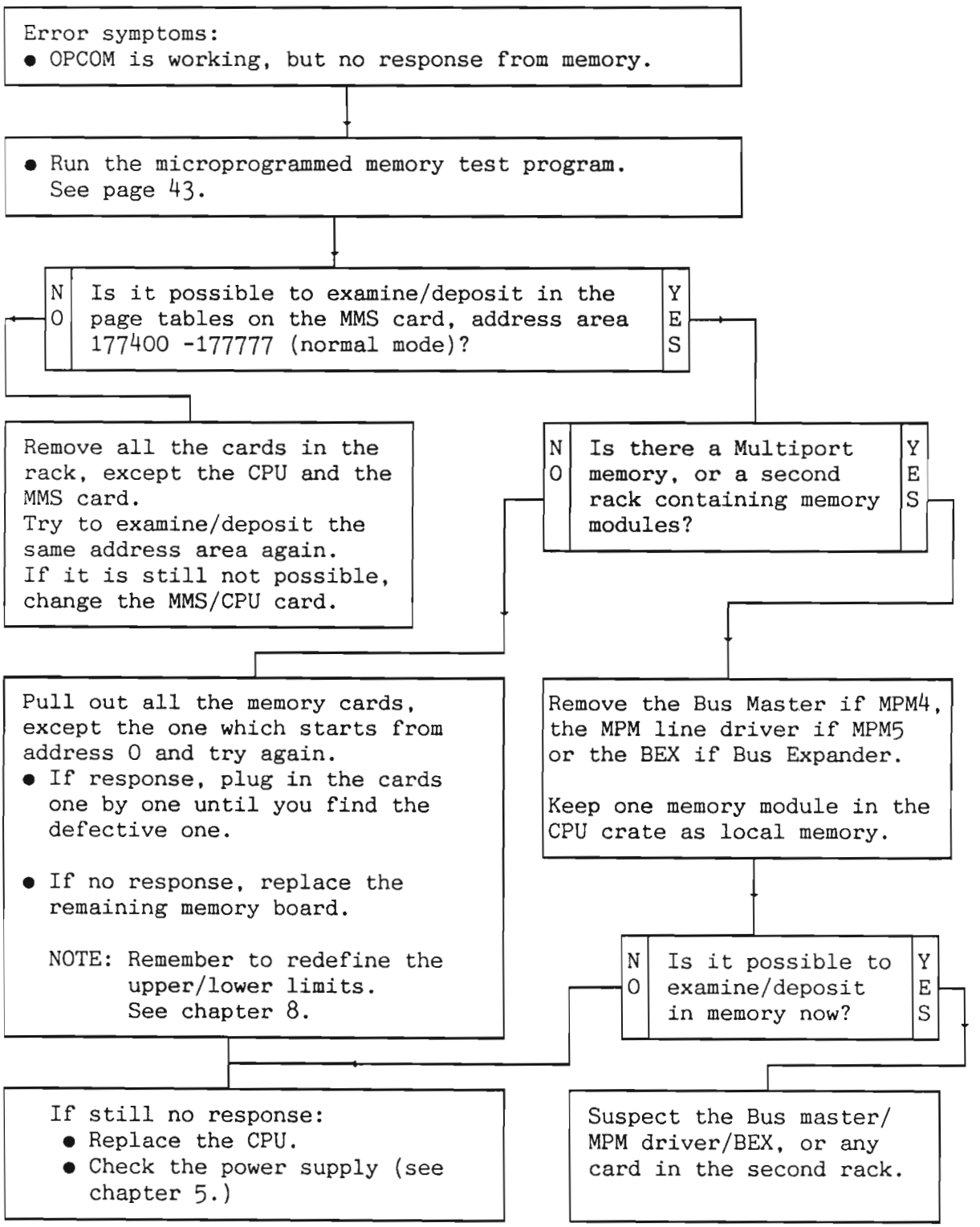
The error symptoms:

- The programs will not load from the floppy disk
- The unit light is OFF

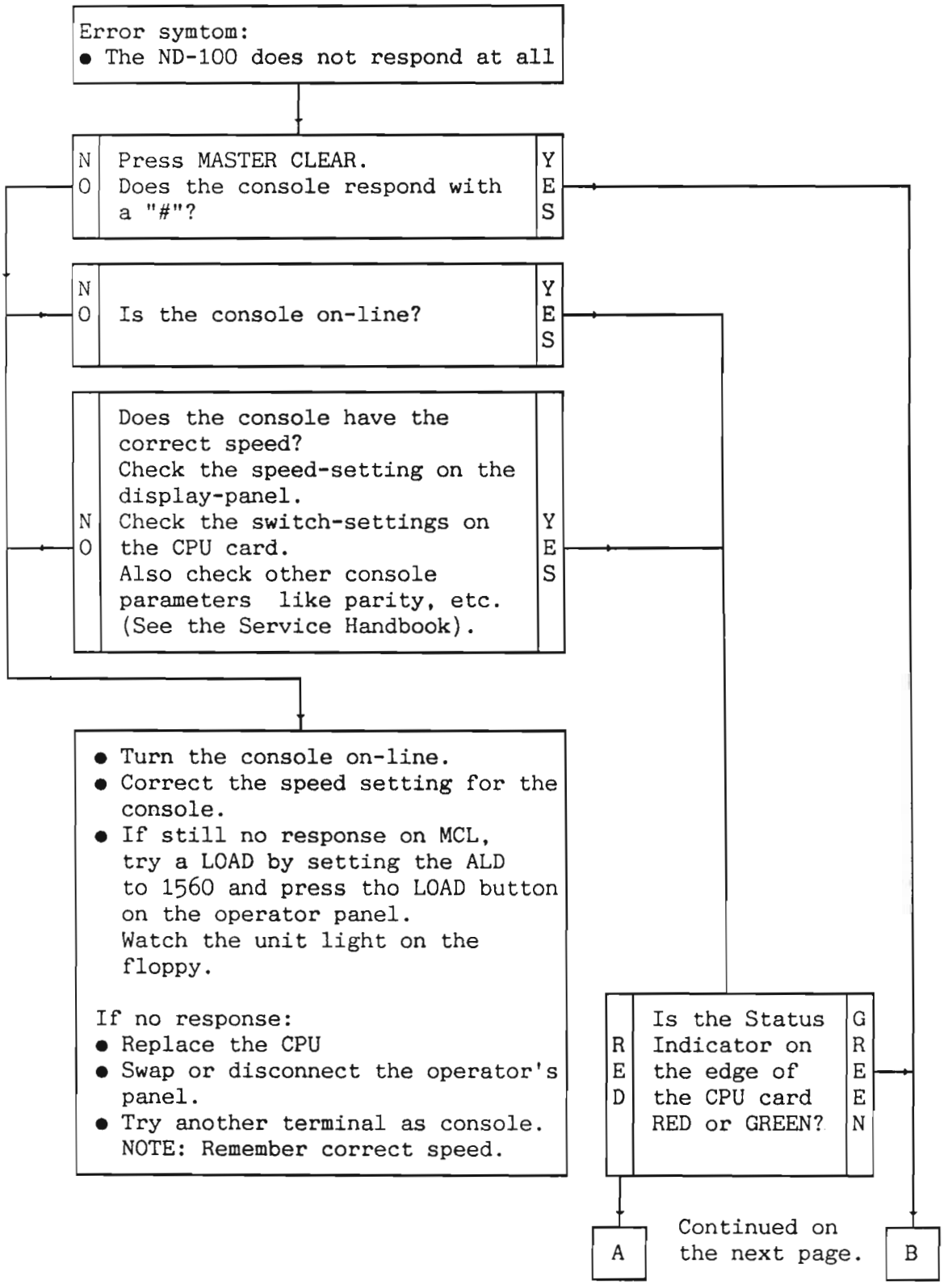
Check in this order:

- The floppy interface
- The floppy drive
  See chapter 6 for replacement of the floppy drive/floppy drive power
- The DC voltage on the floppy drive
- +12V DC for the controller

4.6 No response from memory



4.7 ND-100 will not respond at all



FROM THE PREVIOUS PAGE:

A

POSSIBLE ERRORS:

- Check if powersense is ON.
- Check the power supply and the power-supply indicators.
- Possible CPU error. Change the CPU card.
- Remove the cards, one after the other, starting from the right of the rack, so that just the CPU is left.
  Check the MCL signal on the ND-100 bus.
  This may be active for some reason.
  Note that the MCL signal is on until the CPU has passed the selftest, and will be turned off at the end of the selftest.

B

POSSIBLE ERRORS:

- Probably problems with the input from the console to the CPU.
  - Check the cables from the console.
  - Change the CPU.
  - Change the display-panel.
- If more then one rack in the system, disable the second rack by removing the Bus Master, the MPM driver or the BEX.
- Remove the cards, one after the other, starting from the right of the rack, so that just the CPU is left.

4.8 No response from certain terminals

ERROR SYMPTOM:
The terminal does not respond.

Try to press the RETURN and ESCAPE-keys and see if the terminal responds.

If not, check the following:

- The speed of the terminal, set by software (TSPEED), and the terminal type (CTTYP).
- The terminal itself, or the cables.
- The terminal interface.

The procedure below shows how to check the TSPEED and the CTTYP:

NOTE: You have to stop the system during this procedure (3).
Ask the System Supervisor.

1. Enter as user SYSTEM.

2. @SINTRAN-SERVICE-PROGRAM<CR>
   *CHANGE-DATAFIELD<CR>
   LOG. UNIT NO.: XX<CR> %Terminal number (Octal)
   INPUT OR OUTPUT? INPUT<CR>
   MEMORY? YES<CR>
   IMAGE? YES<CR>
   SAVE-AREA? YES<CR>

	MEMORY	IMAGE	SAVE-AREA	
TSPEED/	XXX	XXX	XXX YYY<CR>	NOTE: Use data from table 2
CTTYP/	XXX	XXX	XXX YYY<CR>	NOTE: Use data from Appendix B in SINTRAN III Commands Reference Manual, (ND-60.128).

   .

   *EXIT<CR>

3. Ask the System Supervisor to stop the system.

4. Now the system can be restarted.

While using this procedure, the following should be considered:

Location TSPEED in the terminal's input datafield must be set according to the table below. The initial value of TSPEED is 177777 (-1).

NOTE

If setting the speed (by software) for any terminal connected to a 3010-card or 3013-card, you must set the speed for the other three terminals in the same terminal group as well.
An 8-terminal interface is regarded as two groups of four.

The speed will not be changed before SINTRAN III is started or restarted (i.e. Stop-system followed by MASTER CLEAR and Restart (20!)).

TSPEED should be changed in SINTRAN III RESIDENT, THE IMAGE AREA, and the SAVE-AREA.

Baud rate	TSPEED
50	42
75	63
110	377
134.5	104
150	356
200	125
300	335
600	146
1200	273
1800	252
2400	167
4800	231
9600	210
19200	0

Table 2. TSPEED

Chapter 5 Test programs

This section gives a short description of the most important test programs for ND-100 and ND-110.

5.1 Loading of test programs

The test programs may be run stand-alone or under SINTRAN.

All test program monitor commands can be executed stand alone:

DATCL
DEFINE-MACRO
DELETE-MACRO
DUMP-PRINTER-BUFFER
EXIT
EXPLAIN-COMMAND
HELP
LIST-MACROS
LIST-FILES
LOAD-PROGRAM
MODE
MONITOR-HELP
OPCOM
PRINT-NOTE
PROGRAM-STATUS
PROGRAM-HELP
SET-TERMINAL-TYPE
SET-PRINTER-MODE
SET-PRINTER-DEVICE-NUMBER or SET-PRINTER-FILE
SET-CONSOLE-DEVICE NUMBER
TERMINAL-MODE
UPDAT

Some of these monitor commands may also be executed when the test program is loaded under SINTRAN, but not all. You will find details about monitor commands and other valuable information in the manual:

ND-100/ND-110 Test Program Description (ND-30.005 EN).

Examples of complete loading of a test program are shown below.

Example: Stand-Alone

1. Insert the diskette containing the test programs in the floppy disk drive, unit 0.

2. Press MASTER CLEAR. Terminal 1 responds by printing:"#".

3. Type 1560& on terminal 1. The terminal responds by printing:

```
TPE Monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day

The command HELP gives you the full list of available commands

TPE>
```

4. Type LOAD DISC-TEMA (or another test program).

```
TPE>LOAD DISC-TEMA <CR>

    DISC-TEMA - Version: XXX - Year-Month-Day

DISC NAME:
```

Example: Loading under SINTRAN

Some test programs may be run under SINTRAN.

When running under SINTRAN, the autoload function is also available. You must give the test program file name on the same line as the TPE-MONITOR program name:

```
@TPE-MON CACHE <CR>
```

To start under SINTRAN as an RT program, you give the command:

```
@RT TPEMON <CR>
```

In this case, the program starts on the system console, device number 1.

If you want to use another terminal, the background program TPE-RT-MON must be activated from user SYSTEM or preferably from user RT on that terminal:

```
@TPE-RT-MON <CR>
```

Be aware that user RT must have at least two pages, one of which must be free. If user SYSTEM is entered, it must have directory and write access to user RT.

The restart address is 20.

5.2 Which test program to use?

In this section you will find a table which table recommends the tests you should use to test the different parts of the computer system, including the peripherals.

In section 5.3 you will find a short description of each test, followed by an example showing you how to run the test.

C A R D S

PRINT	NAME	RECOMMENDED TEST	SEE PAGE
3002	N100 CPU	INSTRUCTION	59
3003	MPM LINE DRIVER	MEMORY	65
3005	DYNAMIC RAM	MEMORY	65
3006	PERTEC MAGTAPE CONTROLLER	MAGTAPE	92
3012	MEMORY MAN W/CACHE	PAGING, CACHE	63, 62
3013	8-TERMINAL INTERFACE	TERMINAL-ASYNC	72
3015	HDLC	HDLC-MEGALINK	84
3018	SMD CONTROL	DISC-TEMA	74
3019	SMD DATA	DISC-TEMA	74
3023	MEGALINK	HDLC-MEGALINK	84
3027	FLOPPY DISK CONTROLLER	FLOPPY-STREAM	95
3029	UNIVERSAL DMA FOR ND-100	UNIVERSAL-DMA	87
3030	ND-100 BUS MASTER	MEMORY, CONFIGURATION	65, 67
3031	ND-100 BUS CONTROLLER	MEMORY, CONFIGURATION	65, 67
3032	MPM4 PORT	MEMORY	65
3033	ND-100 CPU	INSTRUCTION	59
3034	256 K MEMORY	MEMORY	65
3036	64K RAM	MEMORY	65
3038	8" DISK CONTROLLER	DISC-TEMA	74
3041	ST-506 DISK CONTROLLER	DISC-TEMA	74
3042	2MB MEMORY	MEMORY	65
3043	15 MHZ SMD CONTROL	DISC-TEMA	74
3044	15 MHZ SMD DATA	DISC-TEMA	74
3090	ND-110/CX CPU	INSTRUCTION	59
3095	ND-110/CX CPU	CACHE	62
3102	ND-120 CPU	PAGING	63
3101	PIOC	PIOC-ETHERNET	111
3104	MEMORY MANAGEMENT II W/CACHE	PAGING, CACHE	63, 62
3105	8-TELEX INTERFACE	TERMINAL-ASYNC	72
3106	FLOPPY AND STREAMER CONTR	FLOPPY-STREAM	95
3107	8-TERMINAL INTERFACE	TERMINAL-ASYNC	72
3109	MPM LINE DRIVER	MEMORY	65
3110	CTI (COLOUR-TERM INTERFACE)	TCTI (NEW)	117
3111	8-TERMINAL INTERFACE W/ BUFFER	TERMINAL-ASYNC	72
3112	8"-5 1/4" FLOPPY & STREAMER	FLOPPY-STREAM	95

Figure 13. Test Programs for the Different Cards

D E V I C E S

NAME	RECOMMENDED TEST	SEE PAGE
CDC FINCH DISK DRIVE	DISC-TEMA	74
CDC CMD DISK DRIVE	DISC-TEMA	74
CDC MMD DISK DRIVE	DISC-TEMA	74
CDC SMD DISK DRIVE	DISC-TEMA	74
CDC RSD DISK DRIVE	DISC-TEMA	74
CDC FSD DISK DRIVE	DISC-TEMA	74
FUJITSU DISK DRIVE	DISC-TEMA	74
MICROPOLIS DISK DRIVE	DISC-TEMA	74
CIPHER	MAGTAPE	92
PERTEC	MAGTAPE	92
ARCHIVE STREAMER	FLOPPY-STREAM	95
TANDBERG STREAMER	FLOPPY-STREAM	95
TANDBERG TDV 2115	TERMINAL-ASYNC	72
TANDBERG TDV 2215	TERMINAL-ASYNC	72
FACIT 4420	TERMINAL-ASYNC	72
CDC 938X	LP-TEST-1878	77
DATAPRINTER 1210	LP-TEST-1878	77
EPSON MX80	TERMINAL-ASYNC	72
PHILIPS GP 300 L	TERMINAL-ASYNC	72
TERMINETTE 340	LP-TEST-1878	77
TEXAS 825	TERMINAL-ASYNC	72
DIABLO 1640/50	TERMINAL-ASYNC	72
TALLY 1612	LP-TEST-1878	77
DATAPRODUCTS DP-55	TERMINAL-ASYNC	72
GENICOM 3024	TERMINAL-ASYNC	72
PHILIPS ELPHO-20	TERMINAL-ASYNC	72

Figure 14. Test Programs for the Different Devices

5.2.1 Instruction

This is a verification program for the ND-100, ND-100/CE, ND-100/CX, ND-110/CX and the ND-120/CX instruction set. It runs as a stand alone test program under control of the TPE-monitor. None of the tests are executable under SINTRAN.

TIME REQUIRED:

CPU dependent.

Procedure:

Insert the diskette containing the test programs.

```
#1560&

        TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.


TPE>LOAD INSTRUCTION-B <CR>

    INSTRUCTION  VERIFY  -  Version: XXX - Year-Month-Day

The command HELP gives you the full list of available commands
 TPE>

CPU type.....: ND-110 or ND-110/CX
Floating format...: 32 bits
Memory Management.: MMS-2 included on CPU card
Cache.....: Yes
ALD register.....: 21540B
CPU cycle.....: Fast


TPE>RUN <CR>

=== RUNNING TESTS ON LEVEL 1 ==


=== ARGUMENT INSTRUCTIONS                          === END OF TEST ===
=== MEMORY REFERENCE INSTRUCTIONS                  === END OF TEST ===
=== SEQUENCING INSTRUCTIONS                        === END OF TEST ===
=== REGISTER INSTRUCTIONS                          === END OF TEST ===
=== BIT INSTRUCTIONS                               === END OF TEST ===
=== SHIFT INSTRUCTIONS                             === END OF TEST ===
=== 32 BITS FLOATING INSTRUCTIONS                  === END OF TEST ===
=== PRIVILEGED INSTRUCTIONS                        === END OF TEST ===
=== BYTE INSTRUCTIONS                              === END OF TEST ===
=== PHYSICAL MEMORY INSTRUCTIONS                   === END OF TEST ===
=== BINARY CODED DECIMAL INSTRUCTIONS              === END OF TEST ===
=== CX INSTRUCTIONS                                === END OF TEST ===
=== STACK INSTRUCTIONS                             === END OF TEST ===
=== SEGMENT INSTRUCTIONS                           === END OF TEST ===
=== INTERNAL INTERRUPTS                            === END OF TEST ===
                                - continued -
```

procedure - continued - :

=== RUNNING TESTS ON LEVEL 2 ===

=== RUNNING TESTS ON LEVEL 3 ===

=== RUNNING TESTS ON LEVEL 4 ===

=== RUNNING TESTS ON LEVEL 5 ===

=== RUNNING TESTS ON LEVEL 6 ===

=== RUNNING TESTS ON LEVEL 7 ===

=== RUNNING TESTS ON LEVEL 8 ===

=== RUNNING TESTS ON LEVEL 9 ===

=== THE TESTS ARE NOW LOOPING ===

At this point press the ESCAPE key in order to stop the test.

<ESC>
==escape==
TPE>

5.2.2 Cache

There are three test programs for the Cache:

- CACHE-100
- CACHE-110
- CACHE-120

These three test programs run in stand-alone mode only.

Procedure:

This example shows the use of CACHE-110.

Insert the diskette containing the test programs.

```
#1560&

        TPE Monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day

The command HELP gives you the full list of available commands

TPE>LOAD CACHE-110 <CR>

    CACHE-110 - Version: XXX - Year-Month-Day

This is a ND-110/CX CPU.

 TPE>RUN <CR>

Initialize memory : >>>>>>>>>>>>>>>>>>Initialized

Total amount of initialized memory: 1720B / 976D pages.

Test number(s) (1 to 8 dec): <CR>All-tests<CR>

Run mode: Single pass. Abort after 10 errors.
Test started. Time: 1987.03.24 17:56:48

   1. Control Store verification (Upper 2K)  - End of test -
   2. Basic functions                        - End of test -
   3. Inhibit limits                         - End of test -
   4. Enable/Inhibit pages                   - End of test -
   5. Cache "Used bit memory" test           - End of test -
   6. Cache "Data memory" test               - End of test -
   7. Cache "Page number memory" test        - End of test -
   8. Cache efficiency                       - End of test -

Test finished. Time: 1987.03.24 18:09:32

TPE>
```

5.2.3 Paging

This test program is designed to test the paging and memory management system functions on the ND-100/ND-110 computer systems. It runs on all ND-100/ND-110 types and with both MMS 1 and MMS 2 in stand-alone mode only.

At start-up the program will do the following:

- Find CPU and MMS configuration.
- If MMS type 2 is found, the microprogram is checked to find whether or not it is updated to read the extended PCR and PSG bits. If not, these bits will not be checked through this test.

NOTE

If the program is restarted (at address 20), it will NOT go through the steps mentioned above.

Procedure:

Insert the diskette containing the test programs.

#1560&

TPE Monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day

The command HELP gives you the full list of available commands

TPE>LO PAGING <CR>

PAGING - Version: XXX - Year-Month-Day

```
CPU type.....: ND-110 or ND-110/CX
Floating format...: 32 bits
Memory Management.: MMS-2 included on CPU card
Cache.....: Yes
ALD register.....: 21540B
```

TPE>RUN<CR>
Test number(s) (1 to 11 dec): <CR>All-tests<CR>

```
Run mode: Single pass. Abort after 10 errors.
Test started. Time: 1987.03.24 18:02:38

 1. PAGETABLE AREA as MEMORY (Address and data bits) - End of test -
 2. PAGING CONTROL REGISTERS on all levels           - End of test -
 3. PGU/WIP bits for all PITS and ENTRIES            - End of test -
 4. ALTERNATIVE PIT usage on all levels              - End of test -
 5. RING VIOLATION interrupt on all levels           - End of test -
 6. PAGE FAULT interrupt                             - End of test -
 7. READ PROTECT VIOLATION interrupt                 - End of test -
 8. WRITE PROTECT VIOLATION interrupt                - End of test -
 9. FETCH PROTECT VIOLATION interrupt                - End of test -
10. PRIVILEGED INSTRUCTION interrupt                 - End of test -
11. PHYSICAL ADDRESS generation                      - End of test -

Test finished. Time: 1987.03.24 18:10:24

TPE>
```

5.2.4 Memory

This test program will test memory modules on the the ND-100 computer systems. It includes the test program monitor and library. The program permits testing of systems with:

- non-correcting local memory
- error-correcting local memory
- PIOC and Ethernet memory
- Big Multiport Memory (BMPM)
- Multiport 4 Memory (MPM4)
- Multiport 5 Memory (MPM5)

A service program is included, which, among other things, can print the contents of the multiport error log and scan the "port status". These things might be useful to know:

- Extended addressing will always be set.
- The first 64Kw of memory are mapped onto page table 0.
- Memory is tested in blocks of 8kb (10.000 oct. words).

The 64Kw of memory currently under test is mapped onto page table 1 and is accessed by enabling Alternative Page Table usage (setting bit 0 of the status word), and then turning on and off the paging system according to needs.

Procedure:

Insert the diskette containing the test programs.

```
#1560&

        TPE Monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day

The command HELP gives you the full list of available commands

TPE>Load MEMORY <CR>

       MEMORY  - Version: XXX - Year-Month-day

THIS IS A NORD-100 WITH xxxxK WORDS (16-BIT) MEMORY (DEC.)
```

xxxx is the decimal number of kilowords seen from ND-100.

```
TPE>RUN <CR>

AREA TESTED: 0.5-xx.xx
READ TEST ON PROGRAM PART       === END OF TEST ===
ADDRESSES IN ADDRESSES          === END OF TEST ===
WRITE/READ TEST (7 PATTERNS)    === END OF TEST ===
RAPIDLY CHANGING ADDRESS BITS   === END OF TEST ===
PARITY ERROR DETECTION          === END OF TEST ===
WALK TEST (34 PATTERNS)         === END OF TEST ===

=== THE TESTS ARE NOW LOOPING ===

=ESCAPE=

TPE>
```

5.2.5 Configuration

This is the basic test program for testing the I/O system. The program is more a utility program than a hardware-test program. It checks the hardware configuration of an ND-computer installation and gives a lot of information.

Note that by comparing the DEVICE NUMBER LIST to a list known to show all devices in a your configuration, you may identify and replace devices not answering or answering incorrectly.

The INTERRUPT PRIORITY LIST may identify misplaced devices (CCAs), as the highest priority within an interrupt level is given to the device located nearest to the ND-100 CPU-CCA. If two devices on level 12 change place physically (slot position), they will also change place in the INTERRUPT-PRIORITY LIST.

Procedure:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: xxx - year-month-day.

The command HELP gives you the full list of available commands.

TPE>LOAD CONFI <CR>

CONFIGURATION - Version: XXX - Year-Month-Day

TPE>RUN <CR>

H A R D W A R E C O N F I G U R A T I O N

```
CPU type.....: ND-110 or ND-110/CX
Floating format...: 32 bits
Memory Management.: MMS-2 included on CPU card
Cache.....: Yes
ALD register.....: 21540B
Total memory size.: 2 Mbytes
```

- continued -

procedure - continued - :

Hardware device name		first dev no	last dev no	ident codes lev10	lev11	lev12	lev13	log. dev no
Real time clock	1	10	13				1	
Real time clock	2	14	17				2	407
External interrupt	2	20	23				6	412
External interrupt	1	24	27				7	
Real time clock	3	50	53				4	734
Real time clock	4	54	57				3	737
ND-500	1	60	77			16		
Terminal interface	1	300	307	== Ident code not checked ==				1
Terminal interface	5	340	347	44		44		44
Terminal interface	6	350	357	45		45		45
Terminal interface	7	360	367	46		46		46
Terminal interface	8	370	377	47		47		47
Versatec	1	600	607		4			22
ND-500	3	660	677			36		
ND-500	4	760	777					
Digital reg. output	2	1004	1007	26				401
ND-500	2	1060	1077			116		
Terminal interface	9	1300	1307	50		50		60
Terminal interface	10	1310	1317	51		51		61
Terminal interface	11	1320	1327	52		52		62
Terminal interface	12	1330	1337	53		53		63
Terminal interface	13	1340	1347	54		54		64
Terminal interface	14	1350	1357	55		55		65
Terminal interface	15	1360	1367	56		56		66
Terminal interface	16	1370	1377	57		57		67
ND-100 ECC disc contr.	1	1540	1547		17			1100
Floppy disc DMA	1	1560	1567		21			1145
ECCR		100115	100115					
Busc	1	100200	100203				20	
Busc	2	100204	100207				21	
ND-100 universal DMA	1	140050	140057		140010			
ND-100 universal DMA	2	140060	140067		140011			
ND-100 universal DMA	3	140070	140077		140012			
ND-100 universal DMA	4	140100	140107		140013			
ND-100 universal DMA	5	140110	140117		140014			
ND-100 universal DMA	6	140120	140127		140015			
ND-100 universal DMA	7	140130	140137		140016			

- continued -

procedure - continued - :

i n t e r r u p t p r i o r i t y s e q u e n c e

ident	*hardware device name*		*level (dec.)*
1	*real time clock*	*1*	*13*
7	*external interrupt*	*1*	*13*
6	*external interrupt*	*2*	*13*
20	*busc*	*1*	*13*
21	*busc*	*2*	*13*
3	*real time clock*	*4*	*13*
4	*real time clock*	*3*	*13*
2	*real time clock*	*2*	*13*
16	*ND-500*	*1*	*12*
116	*ND-500*	*2*	*12*
36	*ND-500*	*3*	*12*
114	*ND-500*	*4*	*12*
44	*terminal interface*	*5*	*12*
45	*terminal interface*	*6*	*12*
46	*terminal interface*	*7*	*12*
47	*terminal interface*	*8*	*12*
50	*terminal interface*	*9*	*12*
51	*terminal interface*	*10*	*12*
52	*terminal interface*	*11*	*12*
53	*terminal interface*	*12*	*12*
54	*terminal interface*	*13*	*12*
55	*terminal interface*	*14*	*12*
56	*terminal interface*	*15*	*12*
57	*terminal interface*	*16*	*12*
140010	*ND-100 universal DMA*	*1*	*11*
17	*ND-100 ECC disc contr.*	*1*	*11*
4	*versatec*	*1*	*11*
21	*floppy disc DMA*	*1*	*11*
140013	*ND-100 universal DMA*	*4*	*11*
140012	*ND-100 universal DMA*	*3*	*11*
140011	*ND-100 universal DMA*	*2*	*11*
140014	*ND-100 universal DMA*	*5*	*11*
140015	*ND-100 universal DMA*	*6*	*11*
140016	*ND-100 universal DMA*	*7*	*11*

- continued -

```
procedure - continued - :

      44            terminal interface          5        10
      45            terminal interface          6        10
      46            terminal interface          7        10
      47            terminal interface          8        10
      50            terminal interface          9        10
      51            terminal interface         10        10
      52            terminal interface         11        10
      53            terminal interface         12        10
      54            terminal interface         13        10
      55            terminal interface         14        10
      56            terminal interface         15        10
      57            terminal interface         16        10
      26            dig.reg. 2 output           2        10


=== END OF INVESTIGATION ===
===  NO ERRORS DETECTED  ===


                          M E M O R Y   M A P
                         ====================

!=========!=======!=======!=======!=======!=======!=======!=======!=======!
! Bank no !    0  !    1  !    2  !    3  !    4  !    5  !    6  !    7  !
!=========!=======!=======!=======!=======!=======!=======!=======!=======!
!  000B   ! Local ! Local ! Local ! Local ! Local ! Local ! Local ! Local !
!---------!-------!-------!-------!-------!-------!-------!-------!-------!
!  010B   ! Local ! Local ! Local ! Local ! Local ! Local ! Local ! Local !
!---------!-------!-------!-------!-------!-------!-------!-------!-------!

Total memory size.: 2 Mbytes

TPE>
```

5.2.6 Terminal-async

The program tests asynchronous devices and executes some tests to check terminal devices both on input and output.

In all tests, the program will continuously check:

- the status word
- the parity
- the interrupt
- the ident codes

Procedure:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD TERM-A <CR>

TREMINAL-ASYNC - Version: XXX - Year-Month-Day

TPE>LIST-TERMINAL-DEVICES <CR>

```
-------------------------------------------------------------
!                  Terminal Devices Present                 !
-------------------------------------------------------------
!    300  !    340 B!    350-B!    360-B!    370-B!   1300 B!
-------------------------------------------------------------
!   1310-B!   1320-B!   1330-B!         !         !         !
-------------------------------------------------------------
   -  Means probably no terminal connected
   B  Means buffered type interface
```

- continued -

procedure - continued - :

```
TPE>INTERFACE-TEST <CR>
No lines pr. card              : 8 <CR>
First device number     <oct): 340 <CR>
Maintenance mode  (YES or NO): YES <CR>
Speed                          : All-speeds <CR>

Testing Device No.: 340   350   360   370   1300   1310   1320   1330
Tests are looping.
```

> *At this point press the ESCAPE key in order to stop the test.*

```
==ESCAPE==

TPE>
```

> *C O M M E N T*
>
> *You may also test the display by the command DISPLAY-TEST. This will fill the screen with 5 different test-patterns.*
>
> *The keyboard may be tested by the command KEYBOARD-TEST. You will be asked to press the different keys on the keyboard to check that they work correctly.*

5.2.7 Disc-tema

This program is a general tool for use on disks and disk-controllers. It has a set of commands which enable you to format, dump contents, change single words or check parity on disks.

It is also capable of copying, comparing, verifying and matching the contents of two disks.

At the start of the program, some tests are run. During execution of the commands the disk status is read. If any errors occur, they are reported. This is a useful test in itself.

Procedure:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD DISC-TEMA <CR>

DISC-TEMA - Version: XXX - Year-Month-Day

The command HELP gives you the full list of available commands

DISC NAME:DISC-75-MB-1 <CR>

Data way to disc system 1 tested.
Memory address register on disc system 1 tested.
Memory buffers initialized.

TPE>Match<CR>

FROM DISC-75MB-1
Unit (0-3 Oct.): 0<CR>

TO DISC-75MB-1
Unit (0-3 Oct.): 0<CR>

TPE>Parity-check <CR>

DISC-75MB-1
Unit (0-1 Oct.):0<CR>

TPE>Clear-device <CR>

DISC-75MB-1
Unit (0-1 Oct.): 0 <CR>

TPE>Function <CR>

DISC-75MB-1

- continued -

procedure - continued - :

On this disk type FUNCTION will destroy data in the last cylinder in the spare track buffer pool.
Most new disks have an area reserved for the FUNCTION TEST. The data pool and the flaw-table are not affected by the function test.

DISC-TEMA will give a warning ONLY when data may be lost.

Do you still want to continue (Yes/No): Yes <CR>

Specify from 1 to 4 unit numbers, terminated by <CR>. Separate the numbers with a space or a comma (,). The units specified must be turned ON and ready. The units NOT specified must be turned OFF, or nonexistent.
UNIT(S) (0-3 Dec.): 0 1 2 3 <CR>
TPE>

5.2.8 LP-test-1878

The objective of this test program is to perform various tests on the line printers and/or their interface(s). Most of the tests are visual. All tests are stopped by pressing the ESCAPE-key on the console.

Initial action:

After loading, the program asks for the printer device number. The number is checked to see if it is a likely number for printers, and that it exists. If not, it will ask again.

The commands:

- Column-test
- Format-test
- Interface-test
- Set-parameters
- Run-test-pattern
- Stress-busy-test

Procedure:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD LP-TEST <CR>

LP-TEST - Version: XXX - Year-Month-Day

TPE>RUN-TEST-PAT <CR>
Device no. (oct):

C O M M E N T *Specify the line printer's device number.* *This command runs 5 different test-patterns, and* *each pattern starts with a form-feed and the pattern number.*

TPE>COLUMN <CR>
CHARACTER:<CR> E <CR>
COLUMN (FROM,<TO>) (1-132 DEC.):40,50 <CR>

The printer will do a form-feed, and then write lines with the letter E from column 40 to column 50. Press the ESCAPE key to terminate the test.

ESC

==escape==

- continued -

procedure - continued - :

TPE>FORMAT <CR>
CHANNEL: 5 <CR>

The printer does a form-feed and skips to Channel 5 (a position) and prints:

*********** THIS IS TOP OF FORM ******** THIS IS CHANNEL 5*

CHANNEL:

ESC

==escape==

TPE>INTERFACE <CR>
INTERFACE: CDC <CR>
CDC-LP-INTERF.-1047

ILLEGAL CHARACTER TESTED.
INTERFACE TESTED WITH ALL CHAR.
TEST IS LOOPING.

ESC

==ESCAPE==

TPE>STRESS <CR>

C O M M E N T

The printer does a form-feed, and then prints the numbers 0-9, one number on each line.

TPE>

5.2.9 ND-100 CPU selftest

The ND-100 CPU self test tests the basic functions of the ND-100 CPU. Functions that require response from other CCAs are not tested (i.e., memory access, paging and cache use). The program will give a pass/fail response, but no error information.

The program is in a Read Only Memory (ROM) on the ND-100 CPU-CCA and is started when the power is switched ON and when the MCL (MASTER CLEAR) button is depressed and released. Testing is done in ten steps. If an error occurs, the test will loop on the step where the error was detected.

To indicate successful completion of a test, the command sign, #, will appear on the console and MOPC (Micro program Operators Communication) will accept commands. A green LED on the ND-100 CPU also indicates a successfully completed CPU selftest.

TIME REQUIRED:

2 seconds.

Procedure:

Press the STOP and MCL buttons on the ND-100 operator panel. Wait 2 seconds. System response on console terminal:#

STOP *MCL*

#

5.2.10 Microprogram memory check

The program will write and read back several test patterns to/from any memory accessible from the ND-100. The patterns are: all 0s, all 1s, walking 1, walking 0 and address-in-address. The program will stop when an error occurs, and error information becomes available.

The program is situated in the ROM on the ND-100 CCA. The area to be tested must be specified by its 128Kb area number (0 through 53), and by the minimum and maximum octal addresses to be tested within this 128Kb area. The program may then be started by typing "#".

When successfully completed, another "#" is printed. If the program stops as the result of an error, a "?" is printed, and error information can be found in the registers as follows:

- T/failing bits
- P/failing address
- D/pattern read
- L/pattern written
- B/start address within 128Kb area
- X/stop address within 128Kb area

TIME REQUIRED:

10 seconds per 128Kb memory bank.

Procedure:

Press STOP and MCL on ND-100 operator panel. Type the underlined characters on the console terminal as the computer responds with the nonunderlined characters. After entering the first area No. and # in the last line in the procedure, you will have to wait about 10 seconds.

STOP MCL

#B/zzzzzz 000000<CR>

#X/yyyyyy 177777<CR>

#0##

B/	Start address within the 128Kb area, z is any previous content of B-register.
X/	Stop address within the 128Kb area, y is any previous content of X-register.
0	128Kb address area Number.

5.2.11 HDLC-Megalink

This program is a verification and debugging program for HDLC and Megalink interfaces. The program is a stand-alone version and contains three separate tests and a number of commands to specify parameters when changing default values.

When the program starts, it determines how much memory is available (up to 512K words), and whether there are any responding disk controllers. If there are, the program enters the disk-controller ident code into a table.

The commands listed below will be sufficient to verify the hardware in the interface:

```
TPE>SPECIFY-TEST-CONFIGURATION      (How tests are to be run)

TPE>RUN                             (Basic tests)

TPE>FIND-SPEED                      (Finds the transmission speed)

TPE>LOOP TEST                       (Runs data in specified mode)
```

All tests should be run in maintenance mode first. While not in maintenance mode, the tests must be run with a dummy plug installed in the plug panel.

PROCEDURE:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD HDLC <CR>

HDLC-MEGALINK - Version: XXX - Year-Month-Day

Default HDLC device number: 1640

TPE>Specify-test-configuration <CR>
HDLC device no. (oct.): 1640 <CR>
Maintenance mode (yes/no): yes <CR>

All tests should be run in maintenance mode first. While not in maintenance mode, the tests must be run with a dummy plug installed in the plug panel.

TPE>loop-test <CR>

A status report is written every time you press the space-key on the terminal: .

	Frames	O/U run	CRC-err	Data-err	Abort	Astat	Lstat
HDLC out	773	0	0	0	0	5405	5405
HDLC in	772	0	0	0	0	7410	3410

ESC

== Escape==

- continued -

procedure - continued - :

TPE>Find-speed <CR>

Clock rate: 983.04 Kbits/s (+-2%)

TPE>Run <CR>
PIO/DMA-test or both: both <CR>
PIO-test
DMA-test

Wait for approximately 1 minute

Tests are now looping

ESC

== Escape ==

>

STOP *MCL*

#

5.2.12 Universal-DMA

The Universal-DMA program will test a Universal-DMA interface and its memory channel.

The most important commands are:

- INITIALIZE: This command is used to specify some test parameters used by the other tests.
- DMA-CHANNEL-TEST: This command is used to test the memory channel.
- SINGLE-VERIFICATION: This command is used when testing just one interface. The test requires the following special test equipment:

  1995 AA Universal DMA Test Card (No.324455)

- DOUBLE-VERIFICATION: This command is used for a complete test of two cards and their memory channels. The test requires the following special test equipment:

  Test cable 325429 02 Rev. B (test no 1)
  Test cable 325433 02 Rev. B (test no 2)

The other commands are used for debugging or initializing.

Procedure:

1.DOUBLE-VERIFICATION:

Insert the diskette containing the test programs. *Install two test cables.*

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD UNIVERSAL-DMA <CR>

UNIVERSAL-DMA - Version: XXX - Year-Month-Day

TPE>INIT<CR>
Initialize
Single test (yes/no): N<CR>

First device number: (oct.): 140050 <CR>

Second device number: (oct.): 140060 <CR>

Do you want to move the buffer area (yes/no): Y

Minimum address of buffers is 064000

Start address of First buffer area seen from CPU (oct.): 1000000<CR>

Corresponding address in the First Universal-DMA channel (oct.): 1000000<CR>

Start address of Second buffer area seen from CPU (oct.): 1004000<CR>

Corresponding address in the Second Universal-DMA channel (oct.): 1004000<CR>

- continued -

procedure - continued - :

>DOUBLE-VER <CR>
Double-verification

Do you want to reset data array before run (yes/no): Y<CR>

Do you want test to loop (yes/no): N<CR>

Do you want messages written on terminal (yes/no): Y<CR>

Do you want continuous output mode (yes/no): Y<CR>

Do you want to look for errors in DMA data array (yes/no): Y<CR>
Option tests: 4<CR>
All options
Option No 1 completed 000000 000001 times.
Option No 2 completed 000000 000001 times.
Option No 3 completed 000000 000001 times.

2. DMA-CHANNEL:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD UNIVERSAL-DMA <CR>

UNIVERSAL-DMA - Version: XXX - Year-Month-Day

TPE>INIT<CR>
Initialize
Single test (yes/no): Y<CR>

First device number: (oct.): 140050 <CR>

Do you want to move the buffer area (yes/no): Y

Minimum address of buffers is 064000

Start address of First buffer area seen from CPU (oct.): 1000000<CR>

Corresponding address in the First Universal-DMA channel (oct.): 1000000<CR>

- continued -

procedure - continued - :

>D-C<CR>
DMA-channel-test

Do you want test to loop (yes/no): N<CR>

Do you want to loop on error (yes/no): N<CR>

Addresses tested by cpu (yes/no): Y<CR>

32-bit data channel (16 bit=no) (yes/no): N<CR>

Set start address of test array (oct.): 1000000<CR>

Set length of test array (oct.): 177777<CR>

End of test 1
End of test 2

Do you want to loop (yes/no): ESC
== escape ==

3. SINGLE-VERIFICATION MODE:

Insert the diskette containing the test programs.
Install test cable.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD UNIVERSAL-DMA <CR>

UNIVERSAL-DMA - Version: XXX - Year-Month-Day

The command HELP gives you a list of the commands
>INIT<CR>
Initialize
Single test (yes/no): Y<CR>

First device number: (oct.): 140050 <CR>

Do you want to move the buffer area (yes/no): Y

Minimum address of buffers is 064000

Start address of First buffer area seen from CPU (oct.): 1000000<CR>

Corresponding address in the First Universal-DMA channel (oct.): 1000000<CR>

- continued -

```
procedure - continued - :

>SI<CR>
Single-verification

Do you want to reset data array before run  (yes/no): Y

Do you want test to loop   (yes/no): N

Do you want messages written on terminal   (yes/no): Y

Do you want continuous output mode   (yes/no): Y
Option tests: 7<CR>
all-tests

   Option No.     1  Completed  000000 000001 Times
   Option No.     2  Completed  000000 000001 Times
   Option No.     3  Completed  000000 000001 Times
   Option No.     4  Completed  000000 000001 Times
   Option No.     5  Completed  000000 000001 Times
   Option No.     6  Completed  000000 000001 Times
>
  STOP   MCL
#
```

5.2.13 Magtape

This program is a stand-alone test program for Cipher/Pertec controllers (ND-557), and also the different functions on the magtape drives.

If you want to run the function tests on the magtape unit, you have to turn it ON-line before running the test.

If you do some hardware changes (switches, cables etc.) after a test run, it is possible to restart the test program by pressing the MASTER CLEAR button and typing:

```
20!
```

If you must change memory or memory switch setting, you have to re-load the test program.

Procedure:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD MAGTAPE <CR>

MAGTAPE - Version: XXX - Year-Month-Day

Magtape controller 1 is present

TPE>Set-parameters <CR>
Loop mode.....(Yes or No): No <CR>
Density 3200 BPI (Yes or No): Yes <CR>

TPE>RUN <CR>
RUN

Headings printed before each test (Yes/No): Y <CR>

No. of runs before unload (Dec.): 1 <CR>

Which density? 0=1600BPI,1=3200 BPI (0-1 Oct.): 1 <CR>

==> Memory address register

==> Control register

==> Modus register

==> Wordcounter

==> Reading data on DMA in testmode

==> Unit ready for test

- Cipher tape unit 0 ready -

- continued -

procedure - continued - :

**** WARNING : ECO level on the ND100 controller is "N" or lower.*
Remote density select and extended error status will be ignored.

==> File protect ring test

==> Load point test

==> Overflow in read test

==> Write consecutive test

==> Write, read, data, and status tests

==> Write consec., read, read consec., and read threshold test

==> Backspace test

==> EOF test

==> Interrupt test

TPE>EXIT <CR>

5.2.14 Floppy-streamer

This test program can test the following cards:

- 3027 Floppy-Disk Controller
- 3106 Floppy and Streamer
- 3112 Floppy and Streamer 8" & 5.25".

In addition, the floppy drive/streamer itself is tested.

Normally a ND-100 has one floppy controller and one floppy drive. That means that you have to load the test program from the unit which you want to test.

If the loading and starting of the test program work properly, it means that the controller and the unit work O.K for both read- and bootstrap operations.

If it is impossible to load the test program, you can use TELEFIX to load the program into the ND-100.

Procedure:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD FLOPPY-STREA <CR>

FLOPPY-STREAM - Version: XXX - Year-Month-Day

Found device number : 1560, 3112 Floppy streamer DMA 8" & 5.25"

TPE>Select-device <CR>

Device name.....: ?
Correct answers are:
FLOPPY-DISC-1
STREAMER-TAPE-1

Device name.....: Floppy-disc-1 <CR>
Unit (0 to 3 Dec): 01 <CR>

Controller....: 3112 Floppy-streamer DMA 8" & 5.25"
Micro program : G

Insert scratch Floppy Diskette and type any character.

TPE>

- continued -

procedure - continued - :

> *C O M M E N T*
>
> *Giving the command FUNCTION brings you into a new command list for functional tests. You can either run these functional tests one by one, or all in sequence by giving the command:*
>
> *func>RUN <CR>*

```
func>RUN <CR>

==> ACTIVATE-SELFTEST <==
==> IOX-DATAWAY-TEST  <==
==> DMA-DATAWAY-TEST  <==
==> Z80-RAM-TEST      <==
==> DISPLAY-TEST      <==
==> TEST-FORMATS      <==
==> WEAR-TEST         <==
==> OVERWRITE         <==
==> ARM-TEST          <==
==> PROVOKE-ERRORS    <==

FUNC>Exit <CR>

TPE>format <CR>

Format number... (0-17 Oct.):17 <CR>

Physical address on floppy
  Surface  (0 to 1 dec): 0 <CR>
  Track    (0 to 76 dec): 0 <CR>
Track amount  (1 to 154 dec): 154 <CR>


TPE>copy-floppy <CR>

From unit (0-3 Dec.):0 <CR>
To   unit (0-3 Dec.):01 <CR>

TPE>check-floppy <CR>

Physical address on floppy
  Surface  (0 to 1 dec): 0 <CR>
  Track    (0 to 76 dec): 0 <CR>
  Sector   (1 to 8 dec): 1 <CR>
Sector amount  (1 to 1232 dec): 1232 <CR>

TPE>
```

5.2.15 Power-fail

This section describes the POWER-FAIL test program.

The program POWER-FAIL is designed to test the power failure and restart detection on ND-100/ND-500 computer systems, seen from ND-100. It also verifies that the main memory content is not corrupted during the time the power is OFF. It runs on all ND-100/ND-500 types, only in stand-alone mode. The program run under the TPE-MONITOR.

Procedure:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD POWER-FAIL <CR>

POWER-FAIL - Version: XXX - Year-Month-Day

There is only one program command in this test program:

RUN

Before running this command, you must take the following precautions:

- Turn the disks OFF, or activate the Write protection.
- Set the panel-key in the locked position.
- Set the ALD (upper thumbwheel switch on the CPU to 12.

Now you can give the RUN command.

The program will initialize

- Memory with patterns.
  You will see the initialization progress on the console.

- Bus Expanders and Bus Controllers.
  The initialized devices will be reported on the console.

The following message will be displayed:

-WAITING FOR POWER FAIL-I am now waiting for a power failure
-Will you please turn me off !

Turn the power OFF

Now you must turn the power OFF. Use the main AC switches, or just pull out the mains AC plug.

If you just want to test the power fail mechanism, you can turn the power ON again after 3 seconds. If you want to test the STANDBY power capacity you must wait up to the time guaranteed by ND before you switch the power ON again.

Turn the power ON

Now you can turn the power ON. If everything is working normal, TPE will respond with the following message:

==TPE42=> * POWER FAIL *****

The POWER-FAIL test program will be restarted

NOTE

If you do not get this message, but a new TPE from the floppy, it means that something is wrong with the standby power.

POWER-FAIL will tell you which device the power fail was detected by:

POWER FAIL OCCURRED- <Source of the power fail>

The source could be: ND-100 CPU
A BUS Expander
A BUS Controller

The memory is checked:

```
-MEMORY VERIFICATION - Checking memory for valid contents.
                       This may take some time.
```

If errors occur, they will be reported like this:

```
*** ERROR ***          MEMORY CONTENT IS WRONG.
                        Address     Expected    Found
                        .......     ........    .....
```

5.2.16 The printer test program

This test program has been made to reflect changes in printers in the last few years.

It is divided into different test routines, not all of which are appropriate for all printers.

The routines are designed to give an indication of the state of the mechanics of the printers, assuming that the controlling software is correct.

NOTE

Some tests - in particular diagonal-lines, circles and cross-hatch, can take some time to run.

The test routines cover such operations as:

- horizontal and vertical positioning of the print-head
- horizontal tabulation
- print attributes (bold, italics, underline etc.)
- font/character sizes
- selection of feeder/sorter bin
- printing of graphics

The graphic tests serve two purposes:
Give an indication of whether the paper feed or print-head positioner needs adjustment.
Test the individual needles of dot-matrix printers.

In addition to the 'general' routines, there are also a few that can only be run on specific printers, e.g. the big-letters test, which prints big letters with the block graphics characters on a Mannesmann-Tally MT6xx printer.

Since some of the tests use only one character font/size etc, it is sensible to allow the user to be able to change some of the default settings. This can be done with the SET-PARAMETER command.

There is also a 'run' routine which executes all the most important tests on the specified printer type. Test routines that tend to use lots of paper are omitted.

Different printer information

Printers must be prepared for the tests, as described below:

Philips GPXXX

The only assumption for this printer type is that the initial default paper feed mechanism is sheet feeder 1, therefore the operator must insert paper into this feeder. Alternatively, the operator can change the default feeder (by the SET-PARAMETER command) prior to running any test, but after selecting the device.

Genicom 3024

For this type of printer, the operator must manually set the form length and select the US-ASCII character set, both by the printers front-panel switches.

Mannesmann-Tally MT6XX

This type of printer does not require any direct operator action prior to starting the program.

Elpho-20

This printer requires no special preparation.

Fujitsu M3023D

For this printer type, the operator must ensure that the line spacing is set to 6 lpi (lines per inch). Operation at 8 lpi is possible, but in this case the operator must specify 3/4 of the actual form length when selecting the printer.

Characteristics of the different printers

Philips GPXXX

PRINT-STYLES
The three highest font numbers specify down-loadable (soft) fonts. If these fonts have not been loaded, the printer will use the default font 1 (draft/data). Also, not all typefaces can be printed in all pitches. In cases where the required combination does not

exist, the printer defaults to the largest defined character size for the selected font.

ATTRIBUTES
In this test, the printer may state that it is printing 'bold' letters while it is actually delivering underlined print. This is because the bold-printing capability is an upgrade to the original microprogram. Some (early) printers will not have this capability, and default to underlined printing instead.

Genicom 3024

TABULATORS
The Genicom actually has tabulator operations, but it requires that all tabulator stops are set at the same time. This does not quite suit the way the test-routine is written, so the test program defines the Genicom as having no tabulator operations.

ROUTINES DOING GRAPHICS DUMP
When doing a graphics dump, the Genicom 'forgets' where the top of form is, which means that there is no relation between the side breaks in the output text and on the continuous forms. The printer also stops completely at times, which can only be remedied by pressing 'Online' twice.

NEEDLE-TEST
The Genicom printer uses only seven out of nine needles for graphic dumps, so the needle test does not test all the needles. For this reason, the needle test should be seen in conjunction with the attribute test, so that the operator can infer the state of the lowest two needles from descenders and underline printing.

Mannesmann-tally MT6XX

PRINT-STYLES
Only font 1 (data/draft) can be printed in 15 cpi. When the other fonts are selected, choosing 15 cpi selects font 1.

NEEDLE-TEST
The MT6XX printer is of the impact dot-matrix type, but it has the print needles arranged horizontally. This means that the print needles cannot be tested in the same way as for printers with vertically arranged needles. Instead of printing one graphics line with each needle, the MT6XX prints an all-black rectangle, where bad needles can be

identified by areas that are of a lighter shade than the rest.

Canon LBP-8 A1

PRINT-STYLES
In the same way as some of the other printers, the Canon cannot print all fonts in all character sizes. When an invalid (undefined) combination is selected, the printer tries to find something reasonably close to the given specification.

ATTRIBUTES
The phenomenon mentioned above also stretches to the attribute test, since the printer has separate fonts for some of the attributes (bold and light printing) instead of generating the required characters from the 'standard' font. Because of this, selecting certain attributes could easily make the printer select some other font or character size, or even ignore the attribute selection altogether, if the printer's memory contains no character set with this attribute. This is the reason that a 'standard' Canon printer will state that it is printing with the 'light printing' attribute, when it clearly is not.

FEEDER-TEST
The Canon printer has two feeding methods, automatic and manual. These are nominated feeder 1 and feeder 2, respectively, by the program. Automatic feed can be selected at any time, but hand feeding requires that the printer must be set offline first. For this reason, the operator must stand by the printer during this test, pressing 'Error Skip' followed by 'Online' every time the printer's display starts flashing '02' (for feeder 2 - manual feed). Then the operator must feed sheets into the printer until the 'Auxiliary feed' lamp goes out.

Elpho-20

No eccentric behaviour has so far been found with this printer.

Fujitsu M3023D

No eccentric behaviour has so far been found with this printer.

The fonts, pitches, etc.

THE FONTS

Philips GPXxxx:	1.	First ROM font (Draft)
	2.	Second ROM font (Gothic)
	3.	Third ROM font (Symbols)
	4.	Fourth ROM font (Micro)
	5.	Fifth ROM font (Orator Italic)
	6.	Sixth ROM font (Courier)
	7.	First down-loaded font
	8.	Second down-loaded font
	9.	Third down-loaded font
Genicom 3024:	1.	Draft
	2.	Near letter quality
Mannesmann-Tally MT6XX:	1.	Draft
	2.	Near letter quality
	3.	OCR A
	4.	OCR B
	5.	Line drawing
Canon LBP-8 A1:	1.	Line printer
	2.	Pica
	3.	Elite
	4.	Courier
	5.	Garland
Elpho-20:	1.	Letter Gothic
	2.	Pica 10
	3.	Orator
	4.	Elite 12
	5.	Elite 15
	6.	Courier
	7.	NOTIS 1
	8.	NOTIS 2
	9.	NOTIS 3
Fujitsu M3023D:	1.	OCR B

PITCHES

Philips GPXXX:	1.	10 CPI
	2.	12 CPI
	3.	15 CPI
	4.	Proportional, fixed space pitch
	5.	Proportional, space pitch determined by character generator
	6.	14.4 CPI
	7.	18 CPI
Genicom 3024:	1.	10 CPI
	2.	12 CPI
	3.	17 CPI
Mannesmann-Tally MT6XX:	1.	10 CPI
	2.	15 CPI
Canon LBP-8 A1:	1.	10 CPI
	2.	12 CPI
	3.	15 CPI
	4.	6 CPI
Elpho-20:	1.	10 CPI
	2.	12 CPI
	3.	15 CPI
	4.	Proportional, fixed space pitch
	5.	Proportional, space pitch determined by character generator
Fujitsu M3023D:	1.	12 CPI

FEEDERS

Philips GPXXX:	1.	Sheet feeder 1
	2.	Sheet feeder 2
Genicom 3024:	1.	Tractor feed
Mannesmann-Tally MT6XX:	1.	Tractor feed
Canon LBP-8 A1:	1.	Automatic feed
	2.	Manual feed (Auxiliary feed)
Elpho-20:	1.	Feeder bin 1
	to	
	4.	Feeder bin 4
Fujitsu M3023D:	1.	Tractor feed

SORTERS

Philips GPXXX:	1.	Output bin
Genicom 3024:	1.	Continuous forms output
Mannesmann-Tally MT6XX:	1.	Continuous forms output
Canon LBP-8 A1:	1.	Output tray
Elpho-20:	1.	Output bin 1
	to	
	10.	Output bin 10

Procedure:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>Load PRINT <CR>

PRINTER - Version: XXX - Year-Month-Day

TPE>
The following program commands can be used:

SELECT-DEVICE
SET-PARAMETER
SELECT-TEST-PATTERNS
PRINT-TEST-PATTERNS
COLUMN-TEST
PRINT-STYLES
ATTRIBUTES
TABULATOR-TEST
HORISONTAL-POSITIONING
VERTICAL-POSITIONING
NEEDLE-TEST
BIDIRECTIONAL-PRINTING-TEST
CIRCLES
CROSS-HATCH
FEEDER-TEST
SORTER-TEST
SEND-FORM-FEEDBIG-LETTERS
DIAGONAL-LINES
INTERFACE-TEST
RUN

5.2.17 Synchronous modem test program

This section describes the Synchronous Modem test program.

This program tests the communication line between two machines with synchronous modem buffer interface (1050 card) and runs some basic tests on the 1050 card in test mode. The communication test can operate both in half duplex or full duplex mode.

If you press "carriage return" during communication, the test will tell how many blocks have been received and the number of cycle redundancy code (CRC) errors detected.

There are three ways to run this test:

- Communication test between two interfaces/machines
- Communication test in maintenance mode
- Maintenance mode

The command SELECT-DEVICE must be run to select the device you want to test. If there is only one device present, this device will be chosen automatically.

The device you specify must be identical to the DEVICE NO. set by the select function in position 15E on the 1050 buffer card.

The select function in position 1E selects the IDENT CODE for the buffer card. This select function must correspond to the device number switch. If no correspondence here, error messages will be displayed.

This program contains the three commands:

RUN
SELECT-DEVICE
SET-PARAMETERS

PROCEDURE:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD SYNCH-MODEM <CR>

SYNCH-MODEM - Version: XXX - Year-Month-Day

TPE>SELECT-DEVICE <CR>
Sync modem number 2 is selected with device number 110B

TPE>SET-PARAMETERS <CR>
Maintenance mode.. (YES or NO): Yes <CR>

TPE>RUN <CR>

Underrun test *=== End of test ===*
Overrun test *=== End of test ===*
Input status bit test *=== End of test ===*
Receiver reset test with input sync register = 26 & 62 *=== End of test ===*

SELECT-DEVICE

The command SELECT-DEVICE must be run to select the device you want to test. If there is only one device present, this device will be chosen automatically. The device you specify must be identical to the DEVICE NO. set by the select function in position 15E on the 1050 buffer card.

5.2.18 PIOC-ETHERNET

The purpose of this test program, is to test PIOC and ETHERNET controllers, STAND ALONE.

Test 1 to 11 check basic functionality of the selected PIOC/ETHERNET.

Test 20 to 27 test the PIOC/ETHERNET memory as viewed from ND-100 and from MC68000.

Test 40 tests the lines with test-plugs installed.

NOTE

From version B00 of the test program, test 40 will be run without test plug (default). If you then want to run the test WITH test plug, this must be specified with the command SET-PARAMETERS.

It is advisable to run tests 1-11 before the other tests. This will ensure a proper initializing of the PIOC.

Procedure:

Insert the diskette containing the test programs.

#1560&

TPE monitor, ND-100 / ND-110 - Version: XXX - Year-Month-Day.

The command HELP gives you the full list of available commands.

TPE>LOAD PIOC-ET <CR>

PIOC-ETHERNET - Version: XXX - Year-Month-Day
- continued -

procedure - continued - :

```
TPE>List-present-devices <CR>

!--------------!---------!---------!---------!----------!---------!
! Device name  !   Devno !  Ident  ! Log dev !  Bank no ! Memsize !
!--------------!---------!---------!---------!----------!---------!
!*PIOC 1       ! 140020B ! 140002B ! 1700B   !     14B  ! 512 KB  !
! PIOC 2       ! 140024B ! 140003B ! 1701B   !     50B  ! 512 KB  !
! ETHERNET 1   ! 140360B ! 140034B ! 2240B   !     74B  ! 128 KB  !
! ETHERNET 2   ! 140364B ! 140035B ! 2241B   !    110B  ! 512 KB  !
!--------------!---------!---------!---------!----------!---------!


TPE>Run <CR>

PIOC 1
Test number(s) (1 to 40 dec): 1:27 <CR>

Run mode: Single pass. Abort after 10 errors.
Test started. Time: 1987.04.05 13:28:02


   1. IOX         check              - End of test -
   2. Memory      check              - End of test -
   3. Run         check              - End of test -
   4. Ident       check              - End of test -
   5. Int. contr. reset              - End of test -
   6. Int. contr. sw. reset          - End of test -
   7. Timing contr. reset            - End of test -
   8. Timing contr.r/w reg.          - End of test -
   9. DMA contr. w/r reg.            - End of test -
  10. Line-test maint. mode          - End of test -
  11. OPCOM int. and RTC check       - End of test -
  20. Pattern-test from ND-100       - End of test -
  21. Address-test from ND-100       - End of test -
  22. Pattern-test from MC68000      - End of test -
  23. Address-test from MC68000      - End of test -
  24. ECC-test from ND-100           - End of test -
  25. ECC-test from MC68000          - End of test -
  26. Protect-test from MC68000      - End of test -
  27. Refresh-test from MC68000      - End of test -

Test finished. Time: 1987.04.05 13:31:43
```

5.2.19 Graphic-term

This section describes the GRAPHIC-TERM test program.

This product is made to test and verify the TDV 2200S terminals equipped with the graphic option. Each command checks one or more of the graphic functions.

When a command is typed, the program responds with a short command description and waits until the <CR> button is pressed. After the button is pressed, the specified test is carried out.

The program waits for a new <CR> before the screen is erased and a new command can be given. In the command "RUN-ALL-TESTS" there is no prompting for <CR>. The program will wait for 5 seconds (default) before the next test/description is displayed. It is possible to change this delay in SET-PARAMETERS, and other RUN facilities.

Terminal types:

This version supports the following terminals:

ND-324 (NOTIS) and ND-325 (Net)
ND-246, ND-285, ND-320 and ND-322 w/graphic option

Procedure:

Insert the diskette containing the test programs.

#1560&

GRAPHIC-TERM is started from the TPE-MONITOR by the command:

TPE>Load GRAPH-TERM <CR>

GRAPHIC-TERM - Version: XXX - Year-Month-Day

TPE>

Program Commands

SELECT-DEVICE
Select the terminal to be tested by specifying the terminal's logical device number.

SET-PARAMETERS
Sets different modes and change program parameters such as delay between tests, loop mode, how many times, abort mode, abort after how many errors and full or normal error printout selection.

RUN-ALL-TESTS
Executes all commands in sequence. There is no prompting for <CR>. Instead, a delay (default 5 seconds) is inserted between each description/test. If loop-mode is set, RUN-ALL-TESTS will be repeated until the ESC-key is pressed or max-loops is reached.

CLEAR-SCREEN
Clearing screen, both graphics and alphanumerics. The graphic memory is cleared, the terminal memory is cleared, the writing mode is set to dot on, the line type is set to solid, character size is set to 1x.

CLEAR-GRAPHIC
Erases the graphic display without affecting the terminal in TDMODE.

GRAPHIC-VIDEO
Disables/Enables graphic video plane.

MOVE-CURSOR
Moves the cursor in different directions. Testing space right, space down, space left, space up and carriage return.

RECTANGLE-FILL
Fills screen by rectangle filling in VMODE. Direct scaling is disabled (Tektronix 4010 scaling), and fill pattern set number zero (default) is defined. Two coordinates equal to the screen are defined in VMODE, before the rectangle fill function is carried out.

CHESS-BOARD
Draws chess-board pattern on whole screen. Different coordinates are defined in VMODE to check rectangle filling. Rectangle fill is carried out in current rectangle-fill modes (see RECTANGLE-FILL).

COORDINATES
Draws lines in horizontal direction. Direct scaling is disabled (Tektronix 4010 scaling). Lines are drawn from left to right to check coordinate addressability in VMODE.

LINES
Draws lines of different styles to check the set-line-type function. First line is self-defined as 15 dots,5 space,1 dot, 5 space. The rest of the lines are standards, long dashed, short dashed, dot dashed, dotted and solid.

FONTS
Writes text with down-loaded fonts, fonts are read from a font file "GRAPHIC-FONTS:FONT". Direct scaling is enabled (Tandberg scaling). Font 7 is selected and down-load is initialized. Texts are written in normal and italic character types, in upper and lower case.

FLASHING-CROSSHAIR
The crosshair cursor is positioned in the center of the screen and flashing crosshair is enabled.

PLOT-POINTS-LINES
Uses PPMODE and IPMODE to plot points and lines in different directions.

GRAPHIC-MEMORY
Graphic memory transfer test. A sequence of bits is transferred to graphic memory, and read back into the host. These bits are transferred as a compressed bitmap. The Block Transfer Load address set, Compressed bit map data transfer to/from graphic functions are tested.

POLYGONS
Draw polygons with different fill patterns. Tektronix scaling is entered, and fill-pattern one, two and three, are selected for the polygons. The printout tests polygon definition mode.

COPY-WINDOW
Copies data between two windows on the screen. Tektronix scaling is entered, and fill-pattern two is selected. A filled polygon is drawn on the screen and two windows are defined. Data is copied between these windows. Fill pattern selection, define window and copy function are tested.

CIRCLES
Draws circles with different fill-patterns. Tektronix scaling is entered, and fill-patterns from 0-10 are selected. Circles are defined in draw-circle function.

ARCS
Draws arcs with different fill patterns. Tektronix scaling is entered, and fill-patterns from 0-10 are selected. Clipped arcs are drawn at different angles.

INKING
Enables "INKING" in graphic input mode. Vectors connect each point where the cursor moves.

GRAPHIC-HARDCOPY
Executes a graphic memory dump to an Epson MX100. It can drive an Epson MX80 / FX80 or RX80, but only with rotated plot.

5.2.20 Colour-term (TCTI)

This program is based on the earlier TNCT program, which tested the NCT (NORD Colour Terminal). The tests are almost equal to those in the old program, TNCT.

The Colour-term program is also able to test the newer CTI (Colour Terminal Interface).

Starting and Initial Action

- Under SINTRAN.

  The program will ask for file name for the colour terminal.

- Stand alone.

  If only one CTI device is present, the program will automatically select this one. If several or no CTI interfaces are present, you will be asked for hardware device number instead. This is specified as in the command SELECT-DEVICE.

Program commands

FUNCTION-TEST
This test checks the control-functions on the colour terminal, and is therefore an important initial test. The test is self-explanatory.

BUFFER-TEST
Symbols will be displayed as magnified symbols, made of a collection of the symbol itself.
32 symbols are displayed in one picture, the next 32 will be displayed each time any key is pressed until all 256 are shown.
If loopmode, pictures are shown continuously.

COMMUNICATION-TEST
This is a very useful test to run if communication is suspected for errors. These four tests are executed sequentially:

-TEST 1 : TEST IF UNEXPECTED INPUT(S)
-TEST 2 : TEST IF RESPONSE ON ENQUIRY (005)
-TEST 3 : TEST VALUE OF RESPONSE
-TEST 4 : TEST LINE/INTERFACE QUALITY

TEST 4 transmits blocks of 256 bytes to the colour terminal, and then the result of ENQUIRY is tested.

Normally 40 blocks are transmitted before the result printout. If loopmode, the test will go on until you press the <CR> key on the keyboard. Then the results will be printed. If you want a result printout without breaking the test, type any other key.

TRIM-PATTERN
Writes a square-pattern for geometry adjustment.

SCALE-VERIFICATION <colour>
This test is useful for trimming/adjustments of the monitor and the colour generator output. It displays a scale that should indicate the linearity on the DACs of the colour generator.

KEYBOARD-TEST
A picture of the NCT/CTI keyboard is drawn at the colour terminal. Touching an active key will alter the corresponding mark, and the detected key code is shown.

It is possible by this test to perform a verification of all active keys on the NCT/CTI keyboard without knowledge about the expected value of the codes. An active key means a key giving a code directly.

Example:

- Active keys: A,B,C,ESC etc.
- Non-active keys: SHIFT,CTRL etc.

Note that some codes may come from two keys (double-marked)!

COPY-CHARACTER-TO-CTI <from keyboard>
This function simply generate codes to the colour-terminal. The code may be given either from console keyboard or from colour-terminal keyboard

COPY-VALUE-TO-CTI
This function will simply generate codes to the colour-terminal. The code must be given as octal values from the console keyboard. If loopmode, the code will be repeated until any console key is typed.

SET-COLOUR-TERMINAL-TYPE <type>
Select the colour terminal type. Two types are available: NCT and CTI.

SET-PARAMETERS <loopmode>
This command will allow you to set / reset loopmode.

When loopmode is set, some of the tests will run until you stop them. The tests affected by the mode-setting are:

COMMUNICATION-TEST
BUFFER-TEST
COPY-VALUE-TO-COLOUR-TERMINAL

For further information, take a look at the explanation of the actual test.

SELECT-DEVICE <device no / file name>
When running under SINTRAN, a peripherial file must be specified. When running stand alone, the hardware device no. must be specified.

LIST-PRESENT-CTI-DEVICES
The hardware CTI device numbers present in the machine will be listed.

5.2.21 Stand-alone utility programs

This section describes these stand-alone utility programs:

- FILE SYSTEM INVESTIGATOR
- DIR-BACKUP
- MCOPY-TANB

The programs are found on the floppy

"SINTRAN Utility Programs" - ND-210628.

The file system investigator

The File System Investigator can be used to check that there are no serious errors in the file system. The check takes only 5 minutes on a 75 Mbyte disk. The following Disk-types can be used:

DISC-38MB-1	DISC-21MB-2	DISC-2-225MB-1-F
DISC-38MB-2	DISC-14MB-1	DISC-2-225MB-2-F
DISC-75MB-1	DISC-14MB-2	DISC-450MB-1-F
DISC-75MB-2	FLOPPY-DISC-1	DISC-450MB-2-F
DISC-288MB-1-R	FLOPPY-DISC-1	DISC-225MB-1-R
DISC-288MB-2-R	DISC-45MB-1	DISC-225MB-2-R
DISC-30MB-1	DISC-45MB-2	DISC-16MB-1
DISC-60MB-1	DISC-23MB-1	DISC-16MB-2
DISC-90MB-1	DISC-23MB-2	DISC-74MB-1
DISC-30MB-2	DISC-4-70MB-1-R	DISC-74MB-2
DISC-60MB-2	DISC-4-70MB-2-R	DISC-28MB-1
DISC-90MB-2	DISC-70MB-1	DISC-28MB-2
DISC-10MB-1	DISC-70MB-2	DISC-288MB-1-E
DISC-10MB-2	DISC-2-70MB-1-F	DISC-288MB-2-E
DISC-33MB-1	DISC-2-70MB-2-F	DISC-4-70MB-1-E
DISC-33MB-2	DISC-140MB-1-F	DISC-4-70MB-2-E
DISC-66MB-1	DISC-140MB-2-F	DISC-6-70MB-1-N
DISC-66MB-2	DISC-4-70MB-1-F	DISC-6-70MB-2-N
DISC-3-75MB-1	DISC-4-70MB-2-F	DISC-2-225MB-1-N
DISC-3-75MB-2	DISC-288MB-1-F	DISC-2-225MB-2-N
DISC-2-75MB-1	DISC-288MB-2-F	DISC-450MB-1-N
DISC-2-75MB-2	DISC-6-70MB-1-F	DISC-450MB-2-N
DISC-21MB-1	DISC-6-70MB-2-F	

The Procedure:

- Put the floppy disk with the stand-alone program in the floppy disk unit 0.
- Type 1560& on the console to load the floppy disk monitor, and an asterisk (*) appears on the screen.
- Start the FILE SYSTEM INVESTIGATOR as shown in the following example:

Example:

```
* Load Filesys <CR>
. . .

DEVICE NAME: Disc-75MB-1 <CR>
UNIT: 0 <CR>
```

Information about the available commands can be obtained by typing:

```
>Help <CR>
```

Execute the three following commands for checking of the consistency of the directory:

```
>Dump-directory-entry <CR>
. .

>List-users <CR>
. .

>Page-list <CR>
. .

E
```

Errors will be listed, and the output will describe the type of error and where it is located.

This listing may be directed to a line printer by using this command:

```
>Set-printer-device-number <CR>


DEVICE NO.: 430 <CR>
>
```

NOTE

Information about different variables used in the program, such as the DEVICE NUMBER, can be obtained by using the command:
>Program-status <CR>

Serious Error Messages

Serious error messages are:

- Page conflict (See SINTRAN III System Supervisor, ND-30.003, section 10.4.3)
- Serious error in bit file (See SINTRAN III System Supervisor, ND-30.003, section 10.4.3)

You can correct these errors by:

- @Test-directory <CR>
  - corrects bit-file errors.
- @Regenerate-dir <CR>
  - corrects error in object/user/directory entry or bit-file.

W A R N I N G

Do not use the commands TEST and REGENERATE if you get the error messages

PAGE-CONFLICT
or OUTSIDE-DEVICE-LIMITS

Corrections of these errors must be done by using the command CHANGE in DISK-TEMA. This requires knowledge about the internal structure of the filesystem.

DIR-backup

This program can be used for backup of all of the Winchester disks. Each streamer cartridge can store 45 Mb of data, so you need more than one cartridge for the backup if the disk is large (e.g. 74 Mb).

After the backup, the first part of the tape will contain information about:

- the backup date
- which disk unit the backup was copied from
- the number of pages
- CPU-information and the version of the backup system.

The following disks can be used:

DISC-14MB-1
DISC-14MB-2
DISC-16MB-1
DISC-16MB-2
DISC-21MB-1
DISC-21MB-2
DISC-23MB-1
DISC-23MB-2
DISC-28MB-1
DISC-28MB-2
DISC-45MB-1
DISC-45MB-2
DISC-74MB-1
DISC-74MB-2

COPYING FROM A DISK TO A STREAMER:

Insert the floppy disk containing the backup program into FLOPPY-DISC-1, UNIT 0 and load the program:

#1560& <CR>
*Dir-backup <CR>

```
============================================================
=                  Directory backup for                    =
=              Winchester-disc and Streamer                =
=                                                          =
=     Time and date:  day/Month-Year      hh:mm:ss        =
============================================================

  DIR-BACKUP - Version : C01 - OCTOBER 16, 1985
```

The command HELP gives you a list of the commands

Now you must insert the cartridge into the streamer drive.

NOTE

Remember that each backup requires one cartridge, except 74 Mb disks which need two cartridges. You are asked to change streamer Cartridge when needed.

If you wish to change the default values of the program, you should first execute the MODE command as shown below:

Example (default values):

>Mode <CR>

```
Running on a screen terminal.......(Yes/No) : Y <CR>
Restart SINTRAN after backup.......(Yes/No) : N <CR>
Compare after copy.................(Yes/No) : Y <CR>
Abort when compare error...........(Yes/No) : Y <CR>
Disable ESC function...............(Yes/No) : N <CR>
System name or number..............(Yes/No) : <CR><CR>
```

The BACKUP command

This command is for backup from Winchester disk (ST506) to streamer.

```
>Backup <CR>
TO
STREAMER system   (1-2 Oct.) 1 <CR>
Unit.................(0-3 Oct.) 0 <CR>

FROM
DISC-NAME.........................: Disc-45MB-1 <CR>
```

```
        C O M M E N T
If you want a list of the disk types,
 you may just write Help <CR> here.
```

```
Unit.................(0-3 Oct.) 0 <CR>

==  hh:mm:ss    Initialize disc and streamer  ==
```

```
        C O M M E N T
Takes 3-4 minutes.
```

```
==  hh:mm:ss    Copy from disc to streamer    ==
```

```
        C O M M E N T
Takes 10-12 minutes.
```

```
Current Page: xxxxxx
```

```
        C O M M E N T
Current page (Oct.) being copied.
The program will inform you when the
copying is finished, and the compare
procedure will start:
```

```
==  hh:mm:ss          End of volume          ==

==  hh:mm:ss    Compare disc and streamer    ==

==  hh:mm:ss          End of volume          ==

Ready with next streamer tape (Yes/No): Y <CR>

==  hh:mm:ss    Initialize disc and streamer  ==
>
```

If the COMPARE AFTER COPY function in the MODE command is selected, the backup of a 45 Mb disk takes about 20 minutes.

If the backup was not successful, an error message will be written on the terminal.

The RECOVER command

This command is for restoring the backup from streamer to disk.

```
>Recover <CR>

RECOVER
TO
DISC-NAME.....................................:Disc-45MB-1 <CR>
DISC-45MB-1

Unit.............(0-3 Oct.) 0 <CR>

FROM
STREAMER system (1-2 Oct.): 1 <CR>

Unit.............(0-3 Oct.) 0 <CR>

==  hh:mm:ss    Initialize disc and streamer  ==

==BAC08=> This backup is recorded day/month-year  hh:mm
========> From DISC-xxMB-x Unit 0 System TEST
========> This tape is number : 1, Starting at page number : 000000
========> Backup done with DIR-BACKUP-C01

==  hh:mm:ss  Copy TO DISC from streamer      ==

==  hh:mm:ss          End of volume           ==

==  hh:mm:ss  Compare disc and streamer       ==

==  hh:mm:ss          End of volume           ==
```

MCOPY-TANB

MCOPY-TANB is a program for copying between disks and magnetic tapes. This program copies directories on disk to and from these magtape drives:

- Cipher
- Tandberg
- Pertec
- STC

The following disks can be used:

DISC-75MB-1	DISC-14MB-1	DISC-2-225MB-1-F
DISC-75MB-2	DISC-14MB-2	DISC-2-225MB-2-F
DISC-288MB-1-R	DISC-21MB-1	DISC-450MB-1-F
DISC-288MB-2-R	DISC-21MB-2	DISC-450MB-2-F
DISC-38MB-1	DISC-45MB-1	DISC-225MB-1-R
DISC-38MB-2	DISC-45MB-2	DISC-225MB-2-R
DISC-30MB-1	DISC-23MB-1	DISC-74MB-1
DISC-60MB-1	DISC-23MB-2	DISC-74MB-2
DISC-90MB-1	DISC-4-70MB-1-R	DISC-28MB-1
DISC-30MB-2	DISC-4-70MB-1-R	DISC-28MB-2
DISC-60MB-2	DISC-70MB-1	DISC-288MB-1-E
DISC-90MB-2	DISC-70MB-2	DISC-288MB-2-E
DISC-2-75MB-1	DISC-2-70MB-1-F	DISC-4-70MB-1-E
DISC-2-75MB-2	DISC-2-70MB-2-F	DISC-4-70MB-2-E
DISC-3-75MB-1	DISC-140MB-1-F	DISC-6-70MB-1-N
DISC-3-75MB-2	DISC-140MB-2-F	DISC-6-70MB-2-N
DISC-10MB-1	DISC-4-70MB-1-F	DISC-2-225MB-1-N
DISC-10MB-2	DISC-4-70MB-2-F	DISC-2-225MB-2-N
DISC-33MB-1	DISC-288MB-1-F	DISC-450MB-1-N
DISC-33MB-2	DISC-288MB-2-F	DISC-450MB-2-N
DISC-66MB-1	DISC-6-70MB-1-F	
DISC-66MB-2	DISC-6-70MB-2-F	

NOTE

A backup on mag-tape must be copied back to the same type of disk that it was copied from.

Example of using MCOPY:

```
#MACL <CR>
##1560&
*Load MCOPY <CR>
MAG TAPE - DISK COPY, HUT 1649POD. ISSUED:
AUG 20, 1986
THE COMMAND HELP GIVES YOU A LIST OF THE
COMMANDS
```

```
>LIST-SPECIAL-COMMANDS <CR>

COPY-TO-MAG-TAPE
COPY-FROM-MAG-TAPE
COMPARE-DISK-TAPE
SINTRAN-BLOCK-SIZE
SET-MAG-TAPE-DEVICE-NUMBER
1600-BPI
SYSTEM-COPY
AUTOMATIC-COMPARE
SET-DISK-TYPE
CHANGE-MEMORY-BUFFER-ADDRESS
```

Backup produced on mag-tape by BACKUP-SYSTEM with the command DEVICE-COPY, can be read back by MCOPY using the command COPY-FROM-MAG-TAPE.

COPY/COMPARE

Three of these commands are used to copy or compare:

COPY-TO-MAG-TAPE
COPY-FROM-MAG-TAPE
COMPARE-DISK-TAPE

These commands have a set of parameters:

- The disk type, if not specified before

  DISK NAME: Disc-75MB-1 <CR>

- If you use one of the following disk types:

  38/75/288/30/60/90 Mb

  you will be asked whether you want the old or new directory size:

```
DIRECTORIES CREATED BY SINTRAN VERSION E OR LATER
ARE A FEW PAGES SMALLER THAN THOSE CREATED BY
VERSIONS A, B, C, D. DO YOU WANT THE NEW SIZE
(VERSION E OR LATER) OR THE OLD SIZE (VERSION D OR
EARLIER)?
PLEASE ANSWER OLD OR NEW : new <CR>
```

- The unit number:

  DISK UNIT /DECIMAL, (0-3) : 0 <CR>

- If your disk is one with multiple directories on the same unit, for example 10 Mb, 30/60/90 Mb, 2-75 Mb, 3-75 Mb, you will be asked one of the following

questions, depending on whether the system copy is turned on or off. If the system copy is on, you get the prompt:

REMOVABLE OR FIXED : Fixed <CR>
SUBUNIT (DECIMAL, 0-2) :1 <CR>

The first prompt refers to the directory that is to be copied. It can be either REMOVABLE or FIXED for 10 Mb and 30/60/90 Mb.

The second prompt asks for the subunit and applies to disks with more than one subunit (for example 60/90 Mb, 2-75 Mb, 3-75 Mb).

- Next question is about the magnetic tape unit:

  MAG-TAPE UNIT (DECIMAL, 0-3) : 2 <CR>

- If the system copy is turned off, and your disk type is one with multiple directories on the same unit, the program asks for the file number on the tape:

  MAG-TAPE FILE NUMBER (DEC. 0-99): 2 <CR>

  If you have copied several directories to one tape by giving file number, it makes it easier to select one specific directory later if you want to copy it back to a disk.

  Remember that the first file number on the mag-tape is file number 0.

Starting the COPY/COMPARE:

When you have answered all the prompts, the program asks you:

OK?

If you answer YES, the COPY/COMPARE operation will start.

Changing Disk Type and Mag-tape Device Number

The commands are:

- SET-MAG-TAPE-DEVICE-NUMBER
- SET-DISK-TYPE

When a COPY/COMPARE command is given, the program checks if the disk type has already

been specified, for example in connection with an earlier COPY/COMPARE operation.

If this is the case, the program will continue to use this disk type until it is changed by using the command:

```
>Set-disk-type <CR>
DISK NAME : Disk-2-75MB-1 <CR>
```

When the program is started, it assumes that the mag-tape drive is connected to mag-tape controller 1, device number 520 octal. This may be changed by giving the command:

```
>Set-mag-tape-device-number <CR>
MAG-TAPE DEV. No (OCTAL, 520-530) :530 <CR>
```

Mag-tape drives connected to mag-tape controller 2 have device number 530 octal.

Changing Modes of the Program

The commands are:

- SYSTEM-COPY
- AUTOMATIC-COMPARE
- 1600-BPI
- SINTRAN-BLOCK-SIZE

These commands are used to turn ON/OFF (set/reset) special features of the program. The relevant feature (mode) is either turned off or on, depending on what state it was in previously. When such a command is given, the program will answer whether the relevant feature is turned on or off.

Example:

```
>System-copy <CR>
SYSTEM COPY TURNED ON
```

AUTOMATIC COMPARE:

When the program is started, automatic compare is turned on. This means that after each copy operation, the program will automatically do a compare. When copying directories occupying multiple reels of tape (for example a 75 Mb directory on 1600 BPI), the program will compare each reel of tape after it has been copied. You thus avoid the trouble of having to mount each reel of tape twice.

NOTE

NOTE that the automatic compare can be turned OFF, but then you do not know if the backup was successful:

>AUTOMATIC-COMPARE <CR>
AUTOMATIC COMPARE TURNED OFF

SYSTEM COPY

With disk types having multiple directories on the same unit, it is possible to copy/compare multiple directories by using the command SYSTEM-COPY.

This mode is initially turned off. It can be turned on by giving the command:

>System-copy <CR>
SYSTEM COPY TURNED ON

SETTING THE BPI MODE:

The STC mag-tape drive may record data on magnetic tapes in either the 1600 BPI or the 6250 BPI mode. The mode is initially set in 6250 BPI, but this may be changed by giving the command:

>1600-BPI <CR>
1600 BPI TURNED ON

Recording the data in 1600 BPI mode makes it possible to read the tape on the Pertec mag-tape drive.

If you have a Cipher mag-tape drive, recording may be done in a 3200 BPI 1600 BPI mode. The mode however must be set manually by the user.

SETTING SINTRAN BLOCK SIZE:

The record size on tape is usually set at more than 1K (1024) 16 bit words. This enables a more efficient use of the tape. The command SINTRAN-BLOCK-SIZE can however be used to set the record size on tapes to exactly one page each. The purpose of this command is to enable the user to copy from tape to disk while SINTRAN is running. The SINTRAN command COPY-DEVICE is used for such copying.

SINTRAN block size is initially turned off.

NOTE

It is not possible to recover directories that occupy more than one reel of tape when using the SINTRAN command COPY-DEVICE. Note also that setting record size to one page leads to inefficient utilization of the tape. In addition, it also makes the copy/compare operation slower. The command SINTRAN-BLOCK-SIZE should therefore only be used if necessary.

Example:

```
>Sintran-Block-Size <CR>
SINTRAN BLOCK SIZE TURNED ON
```

Chapter 6 How to change a subunit in ND-100/CX

This chapter describes how to replace some of the subunits in ND-100/CX, and the necessary adjustments that have to be made after replacement.

6.1 Removing the cabinet panels

1. SIDE PANELS: Turn the three screws (A) on the top of the side panels 1/2 turn counterclockwise and lift the panels away.

2. FRONT PANEL: Loosen the two screws and release the lock (B) on the top of the front-panel and pull the panel off. On new cabinets the lock may be replaced by a screw.

3. REAR PANEL: Loosen the three screws (C) on the top of the rear panel and lift the panel away.

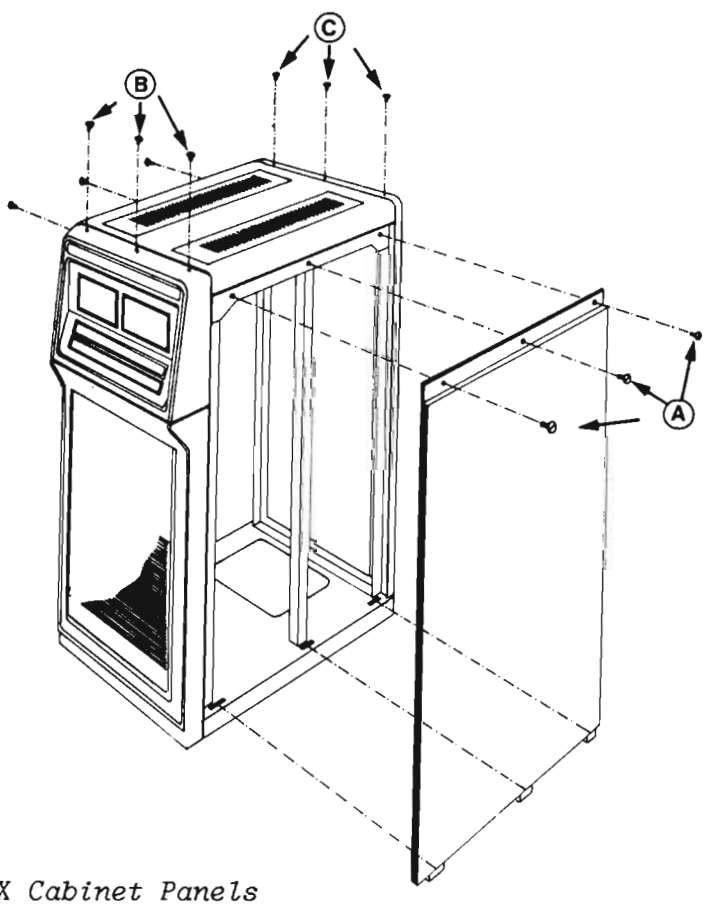


Figure 15. Removing the ND-100/CX Cabinet Panels

6.2 Changing a card

1. Stop the ND-100 computer containing the card to be changed.

2. Remove the panel on the cabinet (front or back) to access the card crate (See section 6.1.)

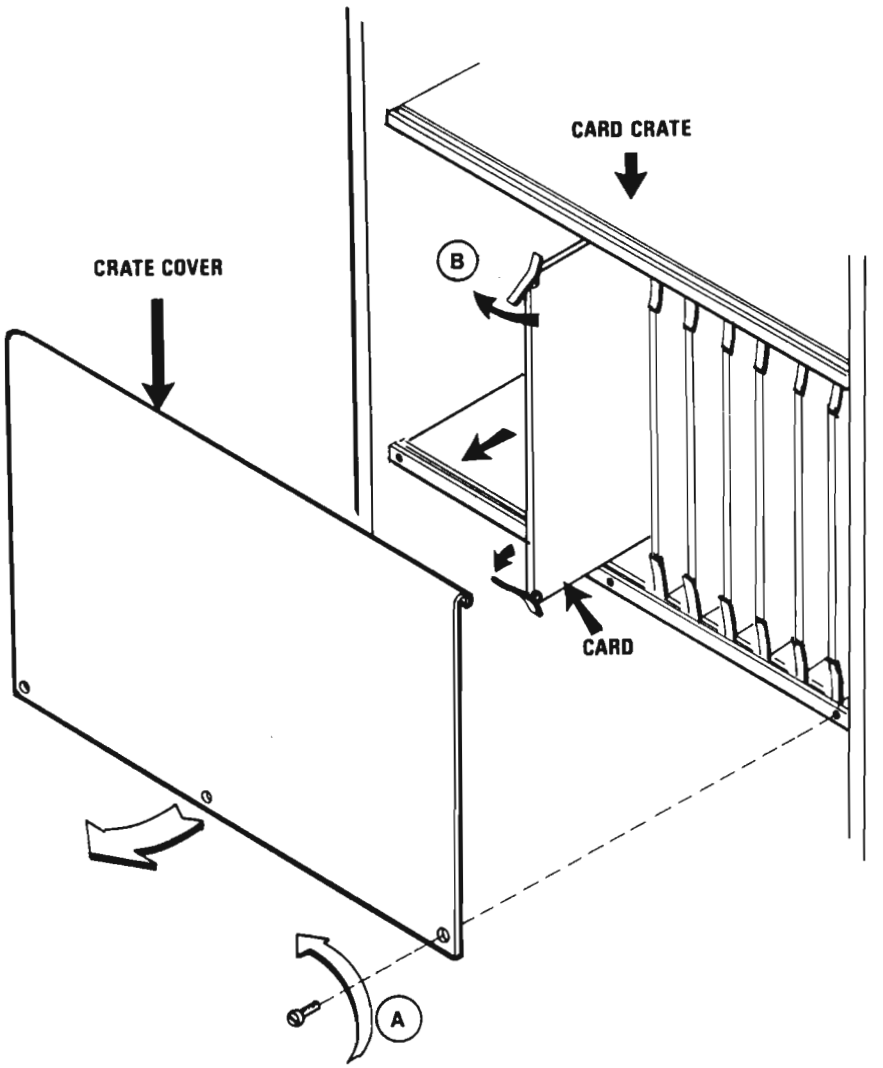


Figure 16. Changing a Card

W A R N I N G

There is always a risk that static electricity may DAMAGE the cards.

Use the grounded handcuffs located above the operator panel (at the front of the cabinet) when you change cards.

3. Remove the card-crate cover by unscrewing the three special fasteners (A) with one turn counterclockwise.

4. Remove the card gently from the card crate by opening the card extractors (B), and pulling the card gently out.

5. Check that the switch setting on the new card corresponds with the one on the card to be replaced.

6. Push the new card carefully into the card crate, using the guiding rails. Close the card extractors (B) so that they fit into the front rails on the card crate.

7. Switch the ND-100 computer on.

8. Replace the panel.

NOTE

If you want to TEST the new card, see chapter 5, Test Programs.

6.3 Changing a main power supply

PREPARING FOR REPLACEMENT:

(1) Stop the ND-100 computer.

(2) Remove the cabinet panels. See section 6.1.

(3) Turn the main switch as well as the battery switch OFF in the cabinet.

W A R N I N G

The equipment operates from 220V AC main power supply. This can cause DEATH ON CONTACT.

CHANGING SMPS1, SMPS2, or SMPS3:

(4) Disconnect the main power cables (A) and the round control cable (B) from the plug panel below the power-control panel.

This plug panel is accessible from the back of the cabinet in the ND-100.

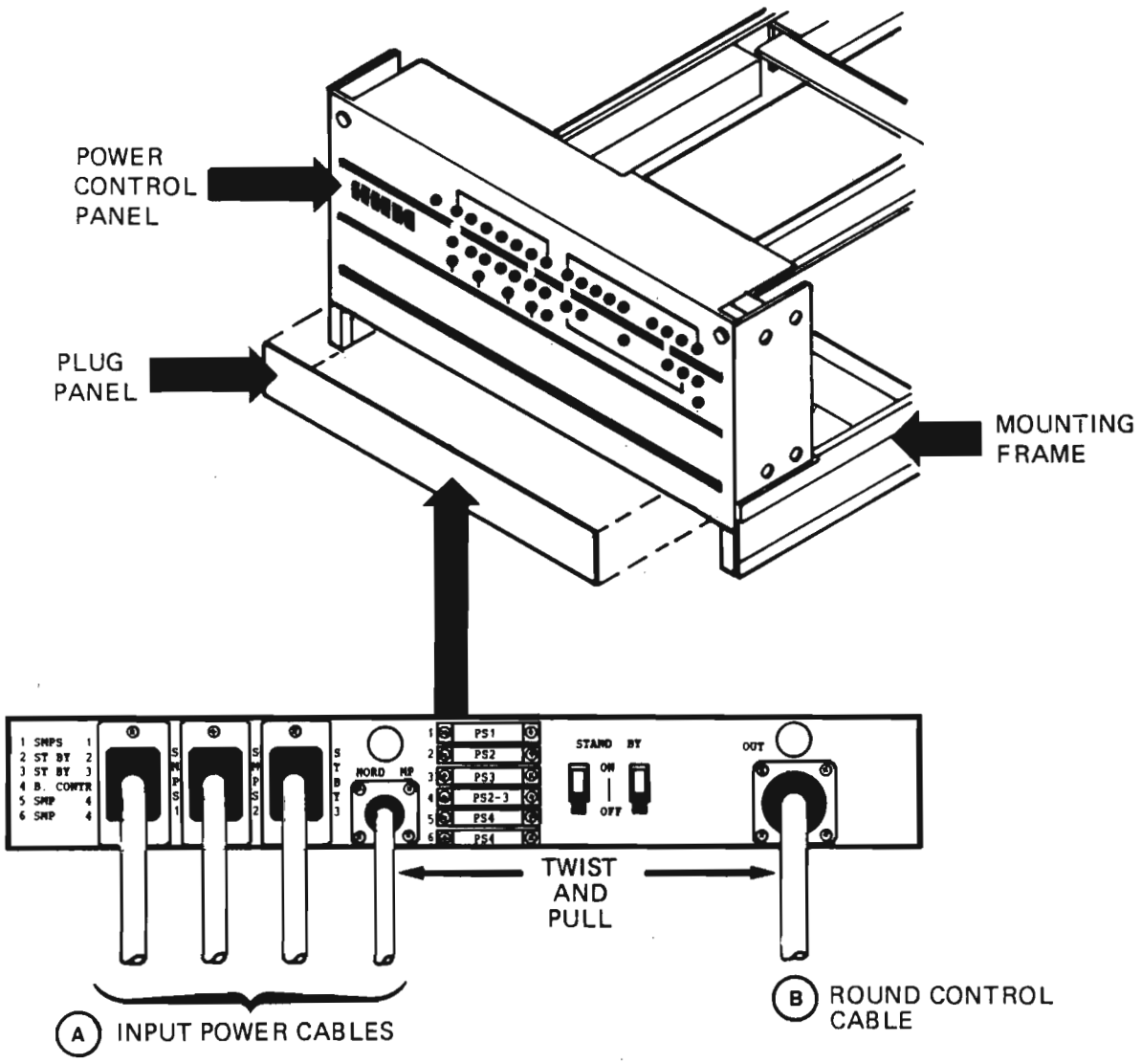


Figure 17. Input Power Cables

(5) Disconnect the three main wires (C) from the power supply.
Also disconnect the two special cables on SPMS2 marked:
"BATTERY ON/OFF" and
"BATTERY DISCHARGE".

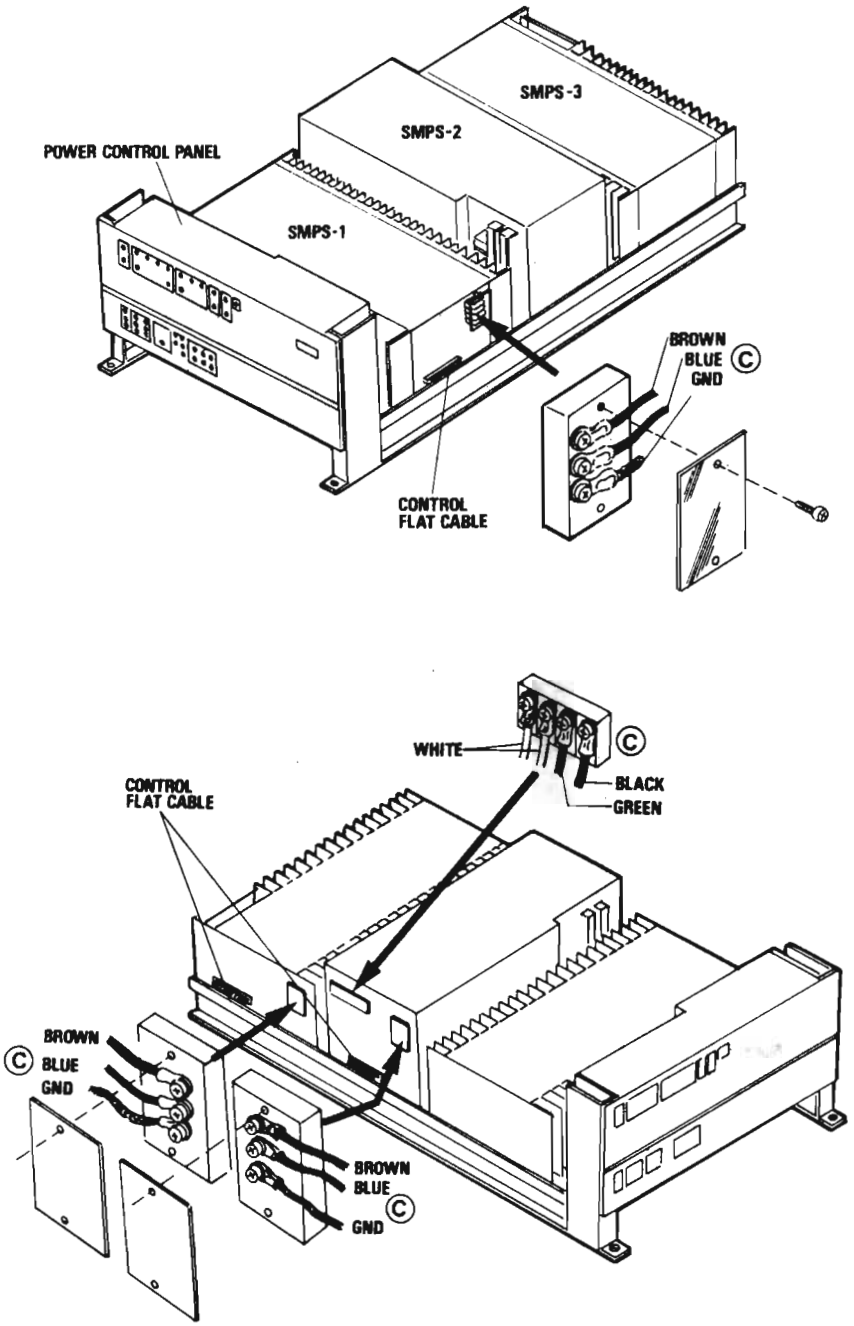


Figure 18. Input Power and Control Wires

(6) For SMPS1 only:

Loosen the two special fasteners (D) holding the power control panel fastened to the cabinet (1/2 turn counterclockwise), then tilt the power-control panel forward out.

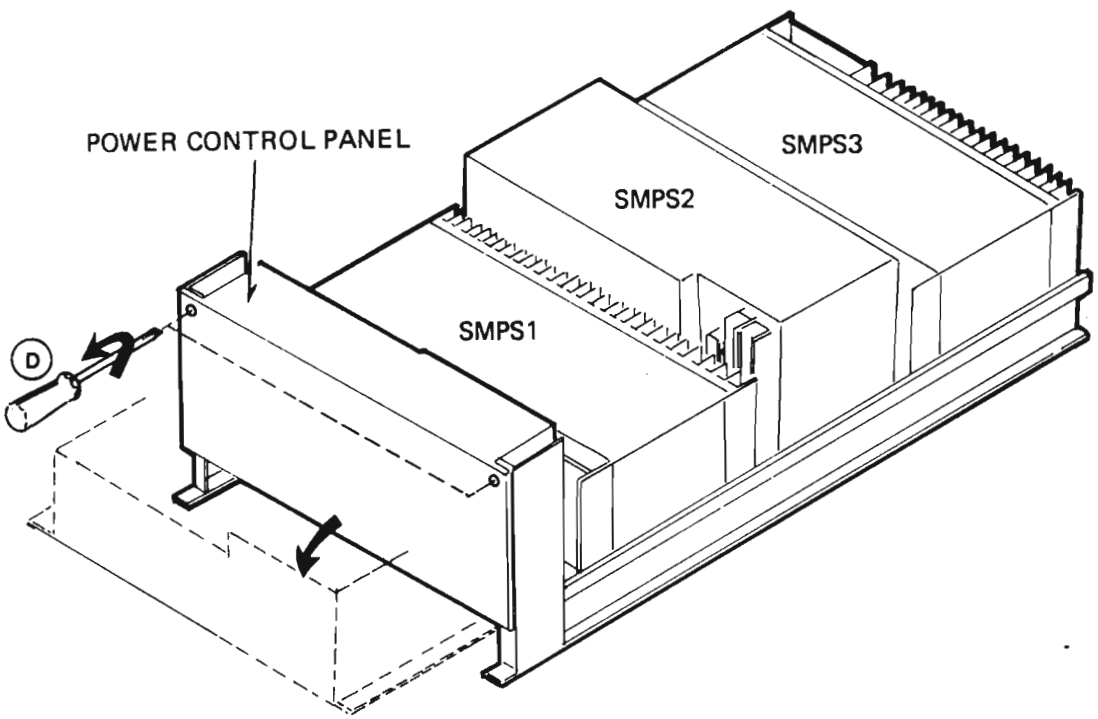


Figure 19. Loosening the Power Control Panel

(7) Disconnect the power-output cables (E) from the power supply (see fig. 20)

(8) Disconnect the ground wire at the rear of the power-supply mounting frame by:

- loosening the two screws (F) holding the power-supply rails fastened to the power-supply mounting bracket.
- pulling the power-supply rails 10 cm to 20 cm forward to gain easy access to the ground wire.
- unscrewing the screw (G) holding the ground wire (2 wires if SMPS4 is present).

(9) Pull the power-supply assembly out of the cabinet until it stops.

CAUTION

Make sure that no cables or wires are pinched between the power supply mounting frame and the rails.

(10) Remove the power-supply by:

- pulling out the control flat cable (See figure 18).
- unscrewing 4 screws from the underside of the mounting frame.

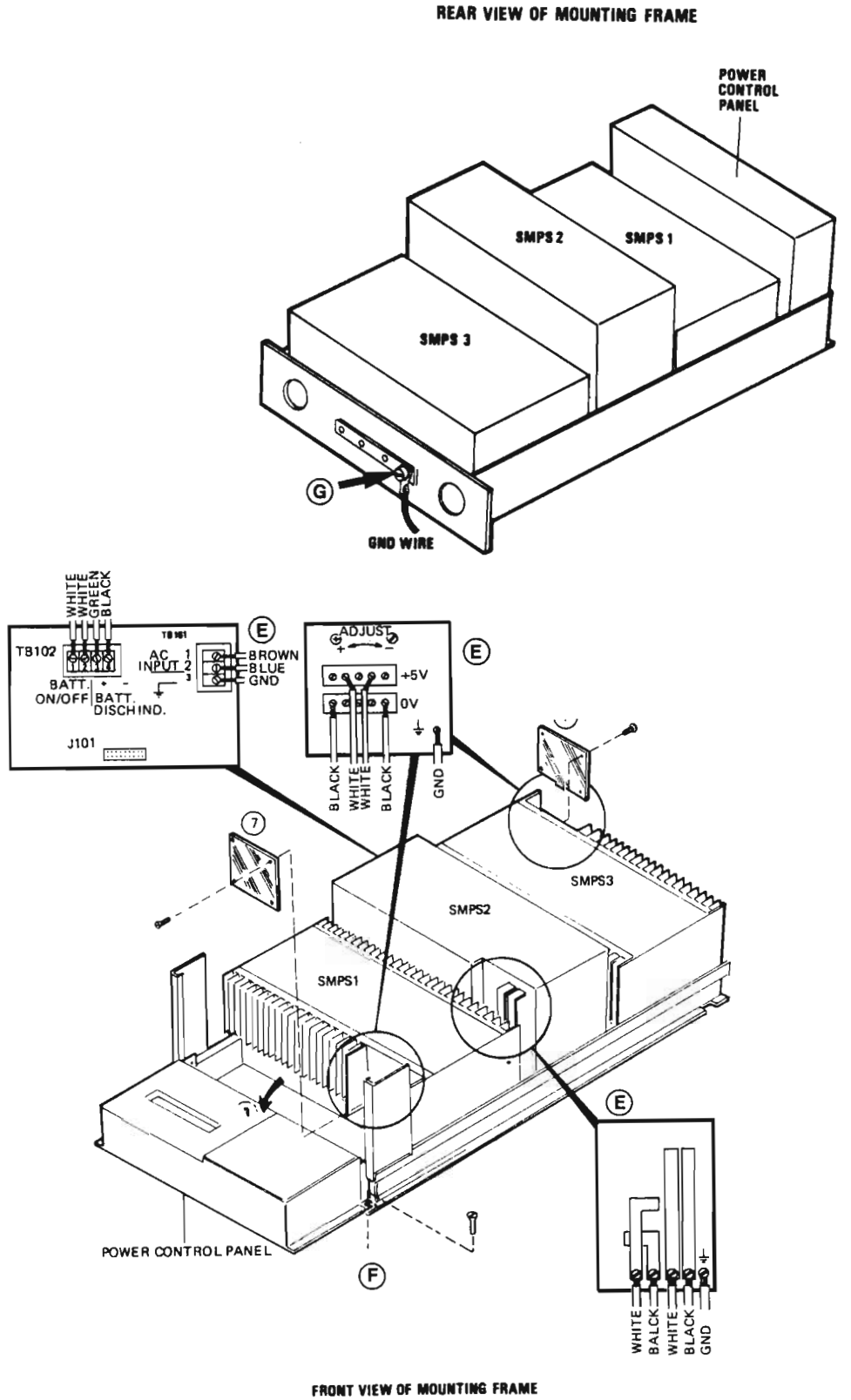


Figure 20. Removing a Power Supply from the Frame

(11) Installation of the new power supply is performed by following steps 4 to 10 in reverse order, doing the opposite of each one.

NOTE

ADJUST the VOLTAGE to minimum before the output from the power supply is applied to the card crate.

ADJUSTMENT OF THE MAIN POWER SUPPLY:

This adjustment is performed with the power-supply output connected to the card crate. The card crate should have all of its cards present to provide sufficient load for the power supply.

(1) Install an extension card in the card crate, together with a voltmeter.

The extension card is equipped with test points for all power voltages.

(2) Connect the power cables to the power supply, and measure the voltage at the extension card. It should be 5V DC (+ 50 - 100 mV).

(3) If necessary, adjust the output voltage.

(4) Let the power supply stand, with the power cables and the card crate connected, for 1/2 hour to 1 hour, or until it reaches operating temperature.

(5) Check the voltage again. It should have the same value as obtained in step (2).

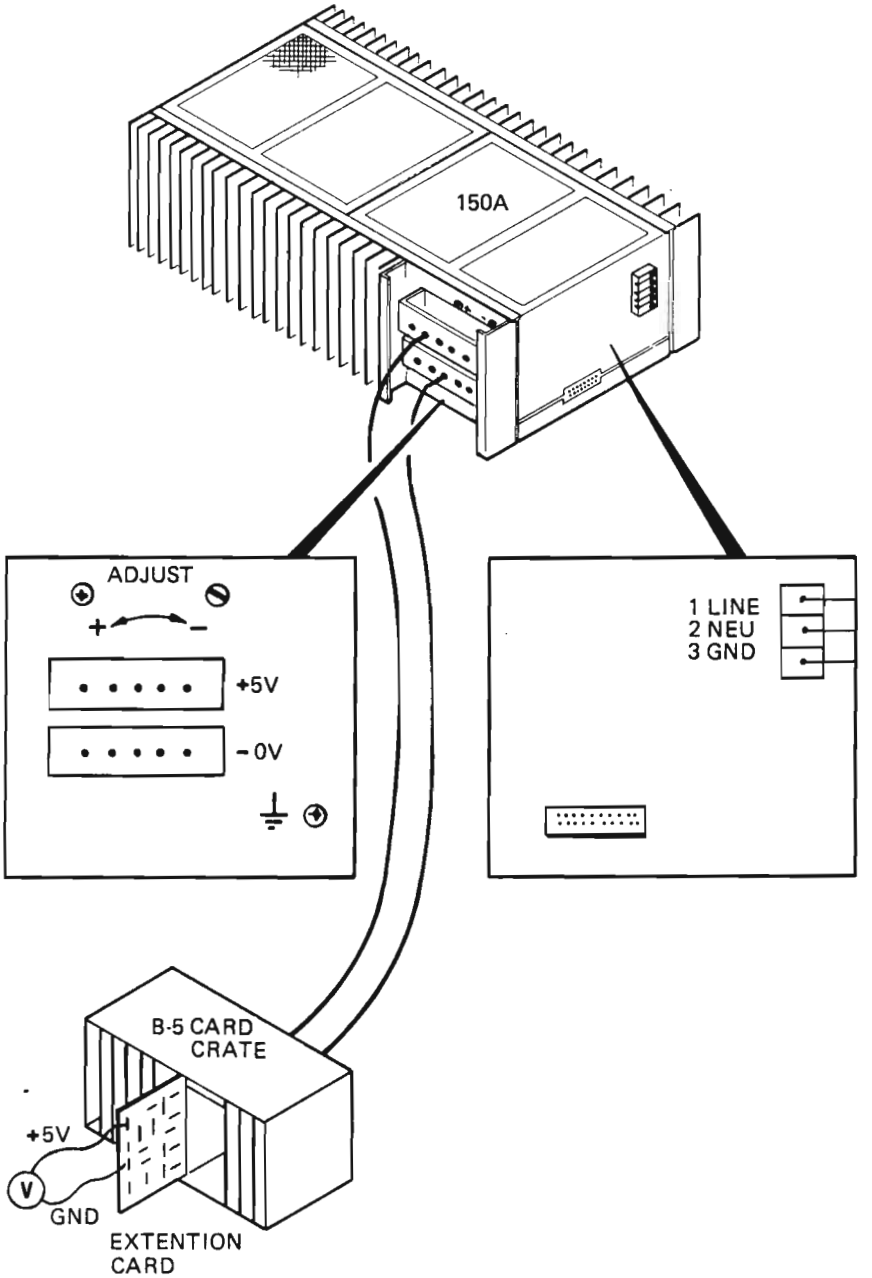


Figure 21. Adjustment of the Power Supply

TO TEST AND APPROXIMATELY ADJUST
THE STANDBY POWER SUPPLY:

(1) Connect the power cables and load to the 5V and 12V outputs on the power supply.

Use a headlight of type 12V/55W for the 5V output (this gives 2A load, maximum is 25A).

Use a headlight of type 24V/55W for the 12V output (this gives 1.15A load, maximum is 4A)

(2) Measure the voltages at the power supply outputs. They should be 5V (+ 0.25V) and 12V (+ 0.6V).

It is only possible to adjust only the 12V of the Philips PE-1759 standby supply from an external potentiometer, all the other types have this adjustment located inside.

(3) If necessary, adjust the 5V output (and 12V, if Philips PE-1759). The voltages are adjustable +10%.

(4) Check the standby operation (battery) by:

- connecting outputs "1" and "2" in TB 102 with a strap.
- pulling out the main plug.

The output voltages should still be present, and within the specifications stated in step (2).

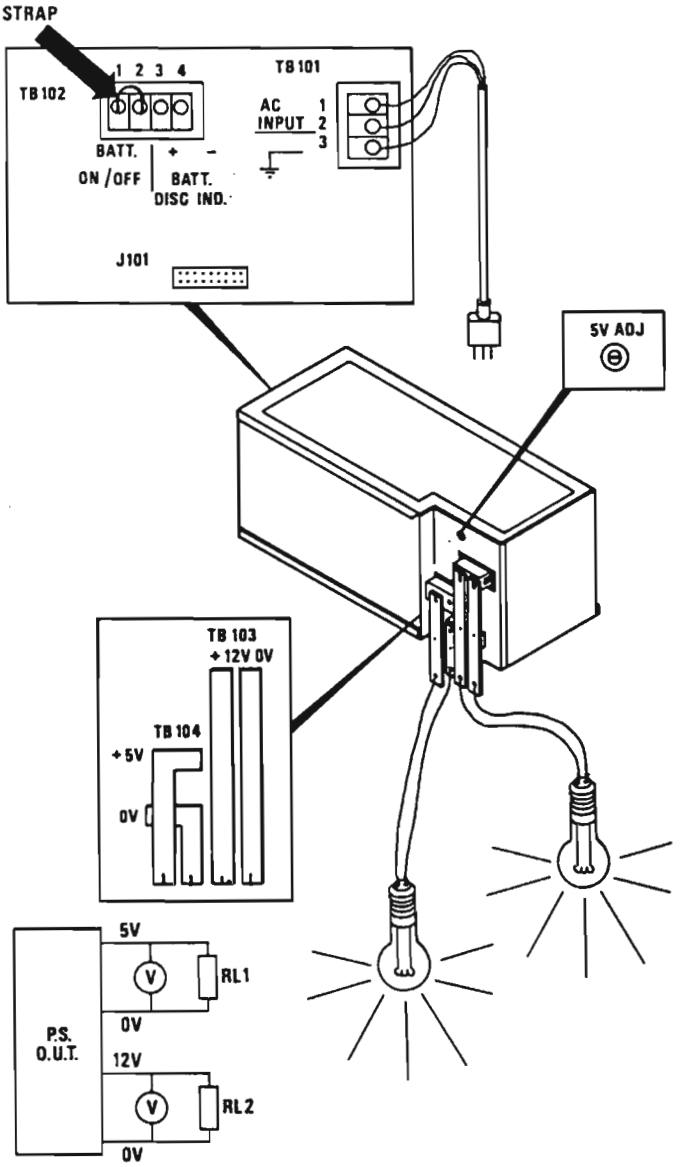


Figure 22. Approximate Adjustment of the Standby Power Supply

CAUTION

If the standby supply fails in standby mode, the standby battery and charging current must be examined immediately.

Data will be lost during a power failure if the standby battery is not operational.

FINE ADJUSTMENT OF THE STANDBY POWER SUPPLY:

This adjustment is performed with the power-supply output connected to the card crate. The card crate should have all its cards present to provide sufficient load for the power supply.

(1) Install an extension card in the card crate, together with a voltmeter.

The extension card is equipped with test points for all power voltages.

(2) Connect power cables to the power supply, and measure the 5V-STBY voltage at the extension card. It should be 5V DC (+ 50 - 100 mV).

(3) If necessary, adjust the 5V-STBY-output voltage.

(4) Let the power supply stand with the power cables and the card crate connected, a 1/2 hour to 1 hour, or until it reaches operational temperature.

(5) Control the voltage again. It should have the same value as that obtained in step (2), alternatively step (3).

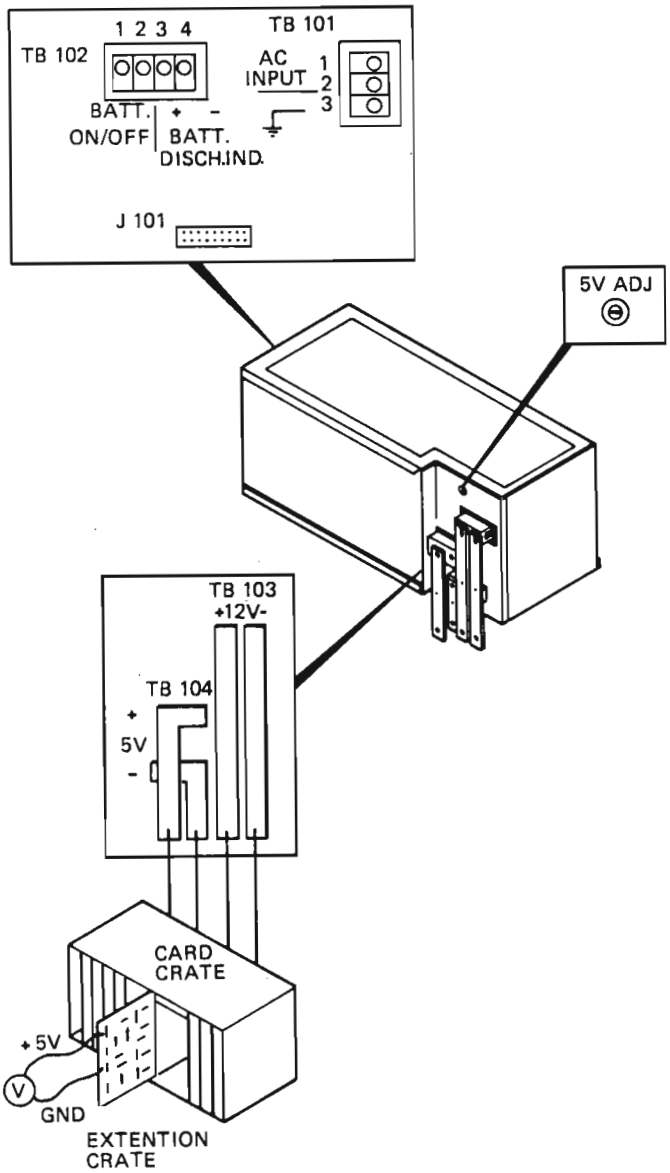


Figure 23. Fine Adjustment of the Standby Power Supply

REPLACING THE BATTERY IN THE STANDBY POWER SUPPLY:

(1) Remove the top cover from the standby power supply by unscrewing the 4 screws (A).

(2) Remove the battery from the power supply by:

- unscrewing the 4 screws (B) on the outside of the box.
- taking out the bracket and the battery from the inside of the box.
- disconnecting the two wires from the battery.

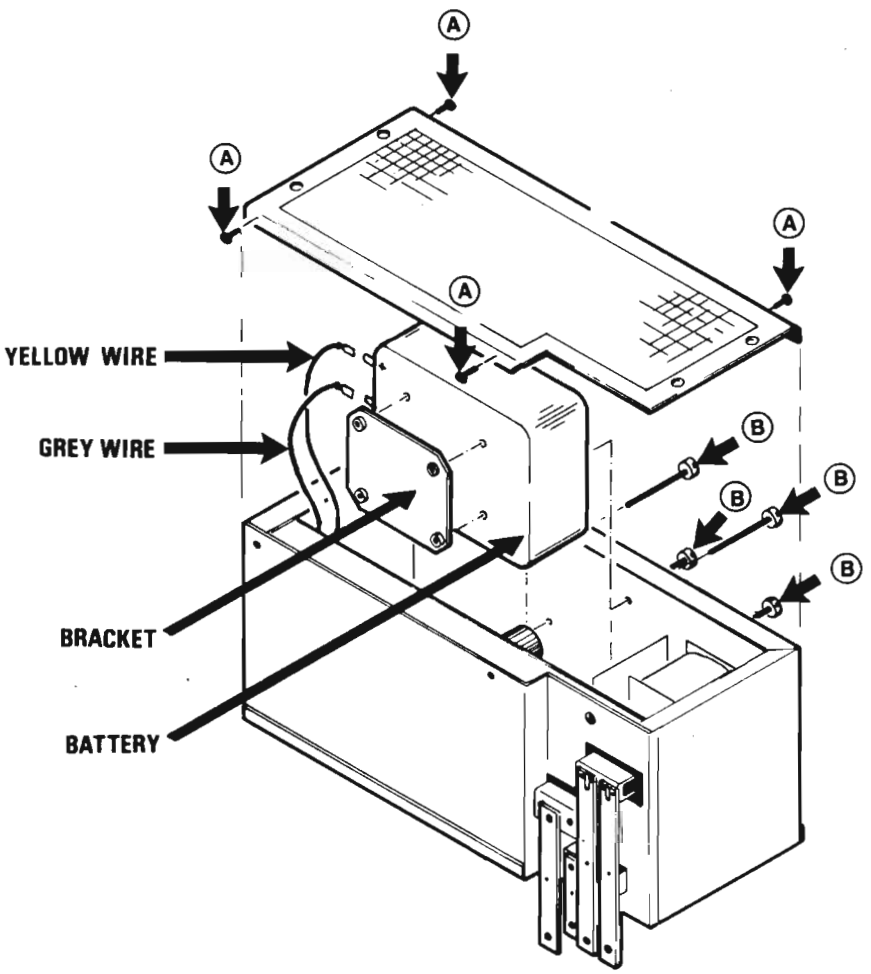


Figure 24. Replacing the Battery in the Standby Power Supply

(3) Installing the new battery is performed by following steps (1) and (2) in reverse order.

NOTE

The battery is of the NiCad (quick charge) type with 4AH capacity.

The charging current from the standby supply into the battery is 300 mA.

The maximum recommended charging current is 1.3A.

The charging time for an empty battery should be about T = 5/I hours, I in Ampere.

The voltage of a fully charged, unloaded battery is 27V.

6.4 Changing a power control panel

(1) Stop the ND-100 computer containing the control panel to be changed.

(2) Remove the rear panel of the ND-100 cabinet to access the control panel.

(3) Turn the power cables and battery switch OFF in the cabinet.

W A R N I N G

The equipment operates from 220V AC power supply. This can cause DEATH ON CONTACT.

(4) Disconnect the cables from the plug panel located under the power control panel by:

- pulling out the flat cable connectors (A) and the main power cables (B).
- twisting the 2 round cable connectors (C) about a 1/2 turn counterclockwise, then pulling them out.
- unscrewing the sockets belonging to the two round cables.

(5) Unlock the two special fasteners (D) by turning them about a 1/2 turn counterclockwise.

(6) Tilt the control panel forward (E).

(7) Unscrew the 2 screws (F) holding the power-control panel into the power supply mounting frame, then pull the panel out of the cabinet.

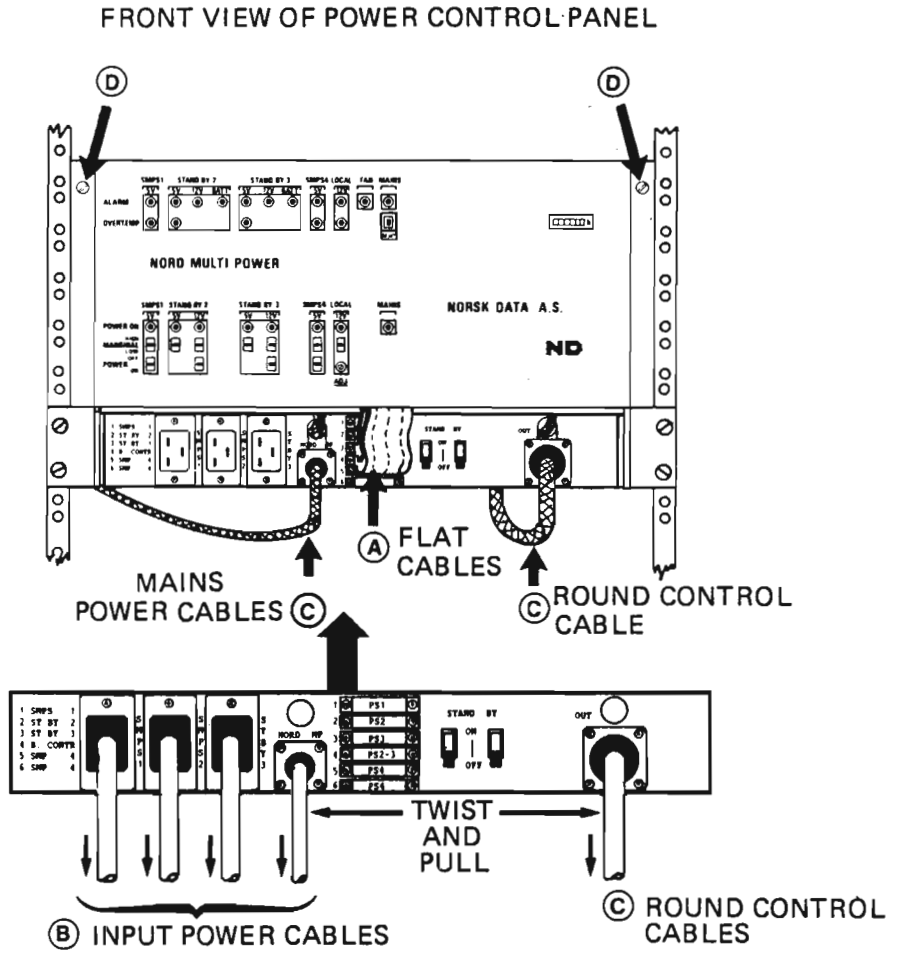


Figure 25. Changing the Power Control Panel

(8) Before installation, check the switch setting (G) on the new power control panel.

The switches are located at the rear of the power control panel.

NOTE

The following description of the switch setting is based on the Philips PE-1018 power-control panel.
If instead you have the EMI EMP 325 power control panel, the terms "ON" and "OFF" in the tables should be substituted with "CLOSED" and "OPEN", respectively.

These are the correct switch-settings for the power-control panel in ND-100:

	SMPS1	SMPS2	SMPS3	SMPS4
+12V	ON	OFF	ON	ON
+5V	OFF	OFF	ON	ON
Power Fail	OFF	OFF	ON	ON
Over Temperature	OFF	OFF	ON	ON

(9) Fasten the new control panel into the cabinet by screwing in two screws.

NOTE

Make sure that the power-control panel can be tilted forward freely, without being obstructed by the handle on the left side of the power-supply mounting frame.

(10) Fasten the new powercontrol panel, and reconnect the cables to the plug panel (see steps (4) and (5)).

(11) Switch the ND-100 computer ON.

(12) Replace the cabinet panels.

6.5 Changing a floppy drive

1. Turn the power OFF and remove the cabinet panels (see section 6.1).

2. Disconnect the flat cable, the ground cable, and the power cable from the back of the floppy drive.

3. Unscrew the four screws (A) holding the floppy housing and pull the housing out.

4. Disassemble the floppy housing and replace the floppy. See figure 26).

5. Installation of the new floppy is performed by following steps 1 to 4 in reverse order, doing the opposite of each one.

6. If you want to test the new floppy-unit you can use the test program FLOPPY-STREAMER.

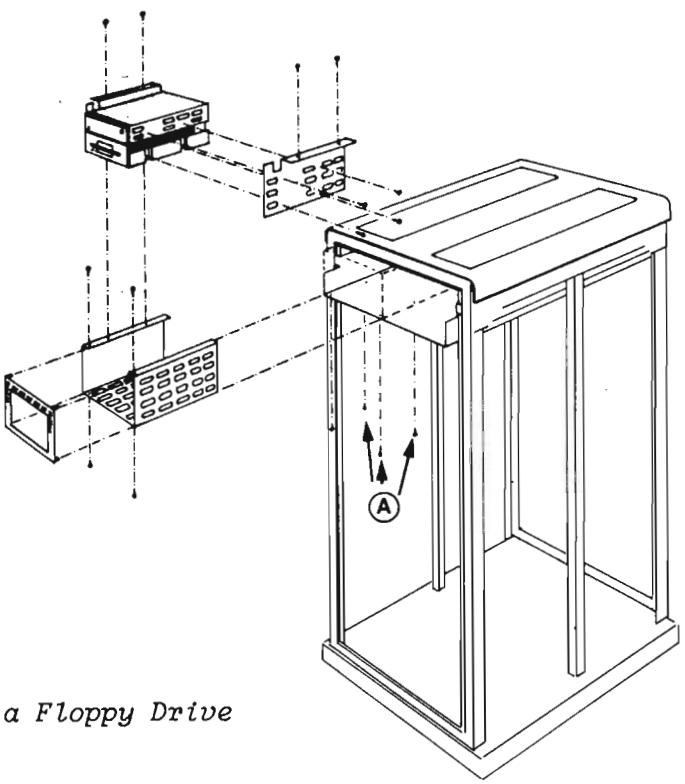


Figure 26. Changing a Floppy Drive

6.6 Changing a streamer

1. Turn the power OFF and remove the panels (see section 6.1).

2. Disconnect the flat cable, the ground cable and the power cable from the back of the streamer.

3. Unscrew the four screws (B) holding the streamer housing, and pull the housing out.

4. Disassemble the streamer housing and replace the streamer (see fig. 27

5. Install the new streamer by following steps 1 to 4 in reverse order, doing the opposite of each one.

6. If you want to test the new streamer, you can use the test program FLOPPY-STREAMER.

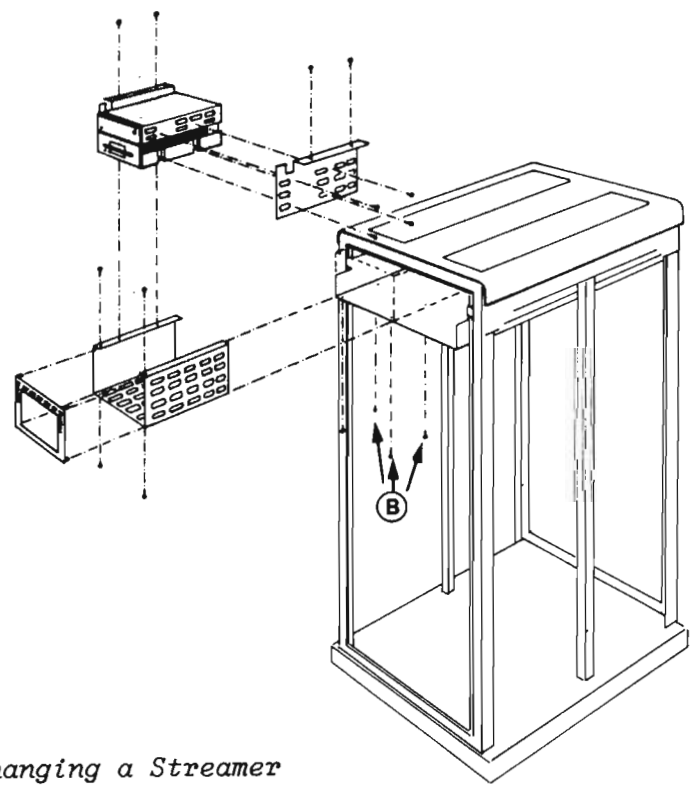


Figure 27. Changing a Streamer

6.7 Changing the fans

REMOVING THE CARD CRATE FANS:

1. Turn the power OFF and remove the cabinet panels (see section 6.1).

2. Disconnect the power cable from the back of the fan assembly. Hold under the fan assembly with one hand and unfasten the four screws holding it (see fig. 28).

   Note that the cables on the back of the card crate must be bent in the opposite direction in order to get access to the two screws.

3. Lift the fan assembly carefully out.

4. Replace the defective fan and mount the fan assembly into the cabinet again

   Turn the power ON and check that the new fan is working.

5. Replace the cabinet panel.

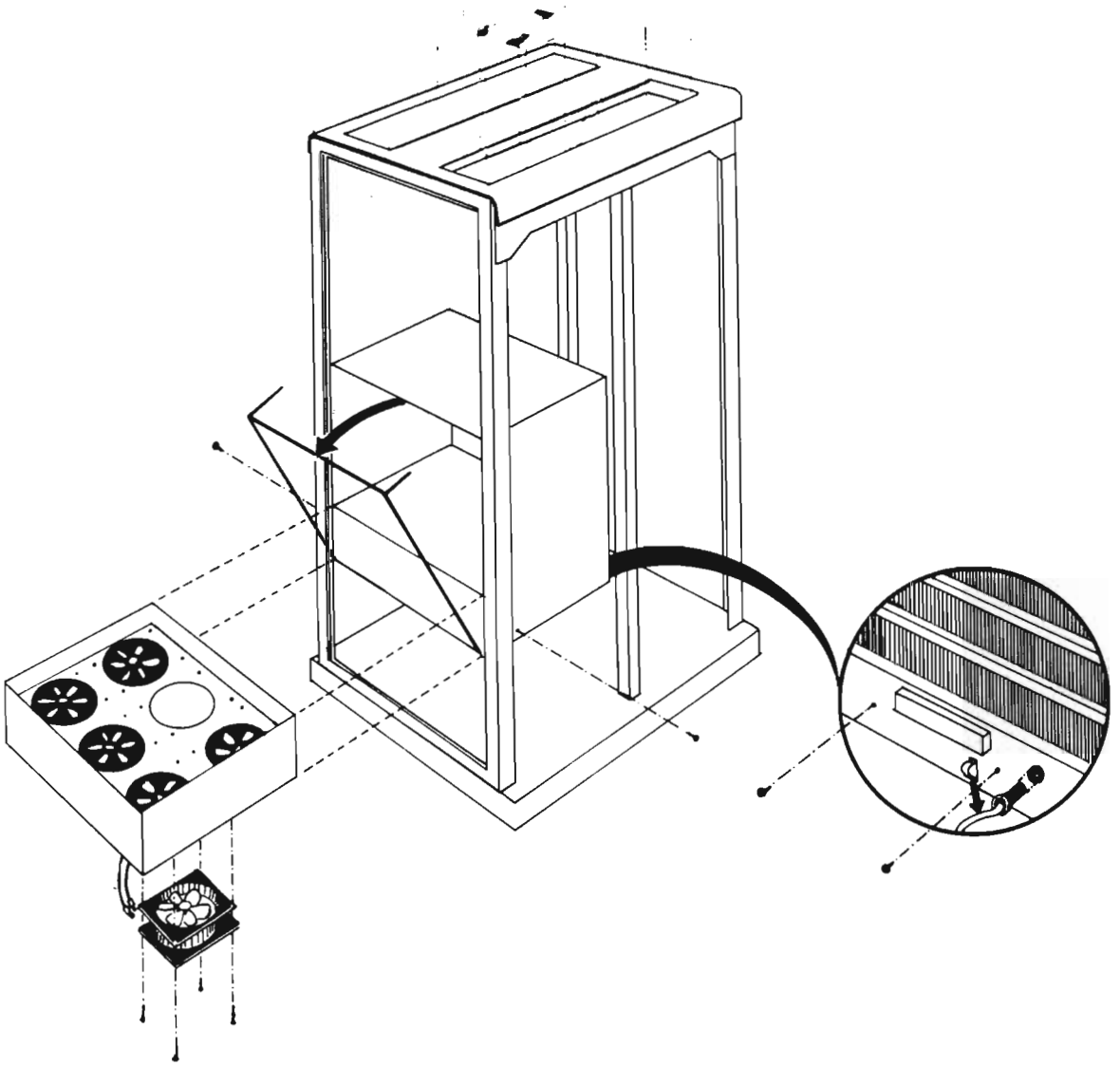


Figure 28. Removing the Card-Crate Fans

REMOVING THE TOP FANS:

1. Turn the power OFF. Unscrew the four screws (A) holding the fan-assembly cover.
2. Remove the defective fan by unscrewing the four screws (B) and disconnecting the power wires.
3. Put in the new fan, and mount the fan assembly into the cabinet again.
4. Turn the power ON, and check that the new fan is working.

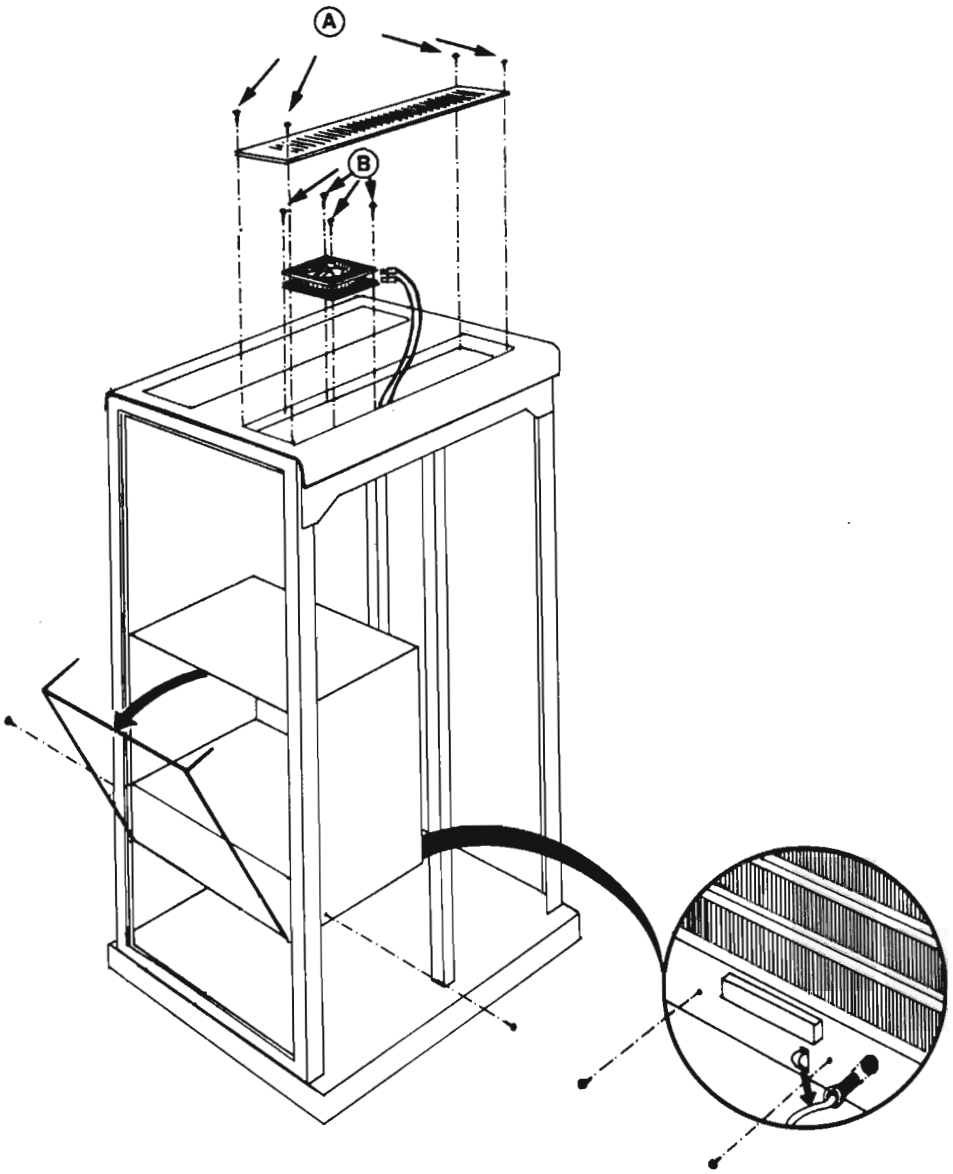


Figure 29. Removing the Top Fans

Chapter 7 How to change a subunit in ND-100 Compact

7.1 Removing the cabinet panels

1. SIDE PANELS:

   Turn the two screws (A) on the top of the side panels a 1/2 turn counterclockwise and remove the panels.

2. FRONT PANEL:

   Turn the two screws (B) on both sides of the front-panel 2 turns counterclockwise, and pull the panels off.

3. BACK PANEL:

   Turn the four screws (C) on the back panel a 1/2 turn counterclockwise and remove the panel.

4. THE TOP PANEL:

   Turn the two screws (D) on both sides of the top panel 2 turns counterclockwise, and lift the panel off.

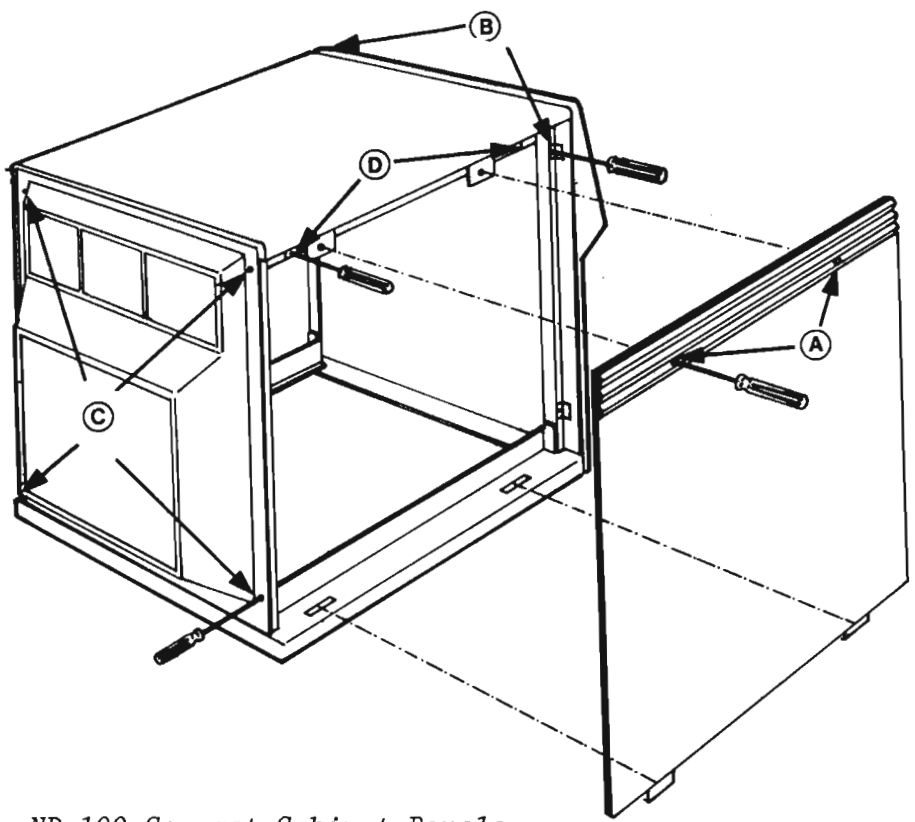


Figure 30. Removing the ND-100 Compact Cabinet Panels

7.2 Replacing the power supply

1. Stop the computer, turn the power OFF, and remove the left cabinet side-panel (see page 158).
2. Unscrew the four screws (A) on the front of the power supply, and use a screwdriver to lever it out of the power-supply cabinet, (see fig. 31).
3. Pull the power supply out of the power supply cabinet.
4. Install the new power supply by following steps 1 to 3 in reverse order, and doing the opposite of each one.
5. Check the voltage and adjust if necessary.
6. Replace the left cabinet side-panel.

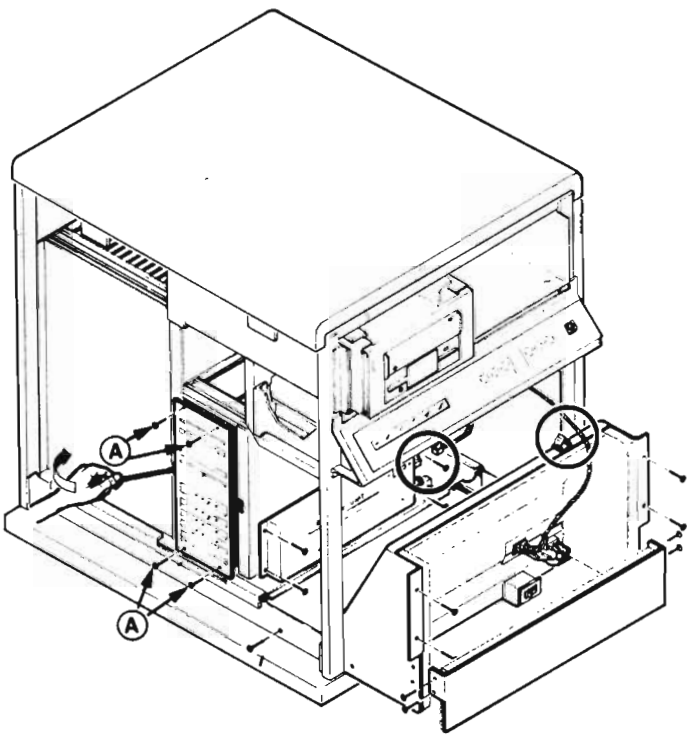


Figure 31. Replacing the Power Supply in ND-100 COMPACT

7.3 Replacing a floppy drive

1. Turn the power OFF, and remove the cabinet panels (see section 7.1).

2. Disconnect the flat cable, the ground cable and the power cable (A) from the back of the floppy drive.

3. Unscrew the four screws (B) holding the floppy housing and pull the housing out.

4. Disassemble the floppy housing and replace the floppy, (see the figure on page 161).

5. Install the new floppy by following steps 1 to 4 in reverse order, doing the opposite of each. For strapping and termination, see the Service Handbook Vol. II, chapter 5, section 8.

6. If you want to test the new floppy unit, you can use the test program FLOPPY-STREAMER.

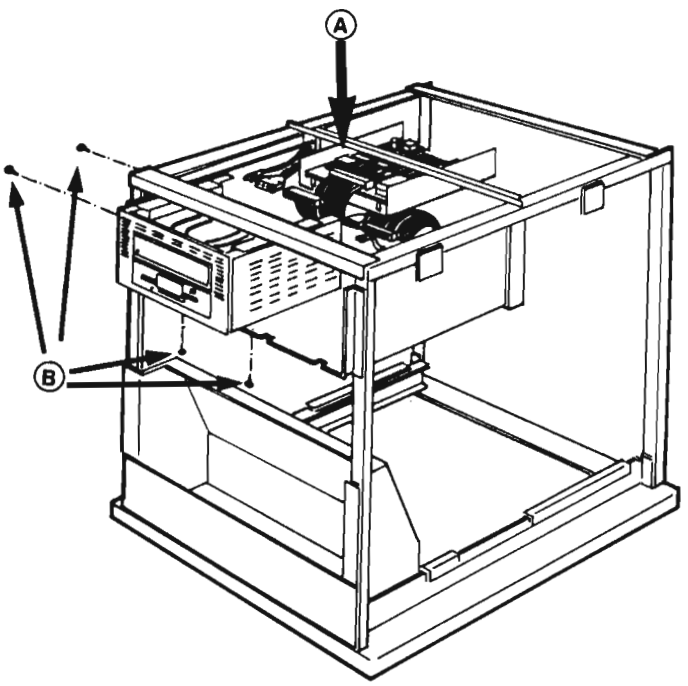


Figure 32. Replacing a Floppy Drive (I)

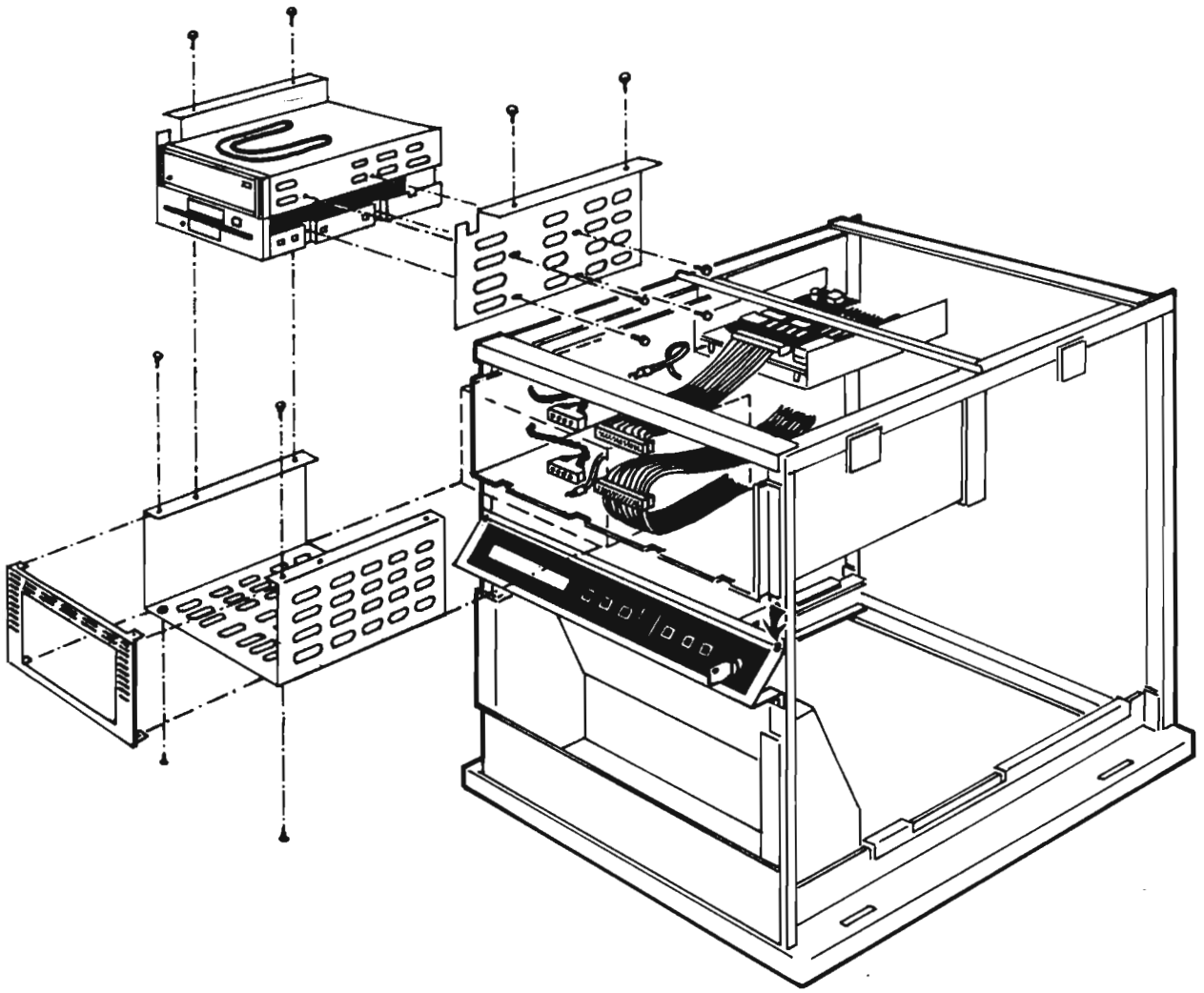


Figure 33. Replacing a Floppy Drive (II)

7.4 Replacing a streamer

1. Turn the power OFF, and remove the cabinet panels (see section 7.1).

2. Disconnect the flat cable, the ground cable and the power cable (A) from the back of the streamer.

3. Unscrew the four screws (B) holding the streamer housing and pull the housing out.

4. Disassemble the streamer housing and replace the streamer, (see the figure on page 163).

5. Install the new streamer by following steps 1 to 4 in reverse order, doing the opposite of each one.

6. If you want to test the new streamer, you can use the test program FLOPPY-STREAMER.

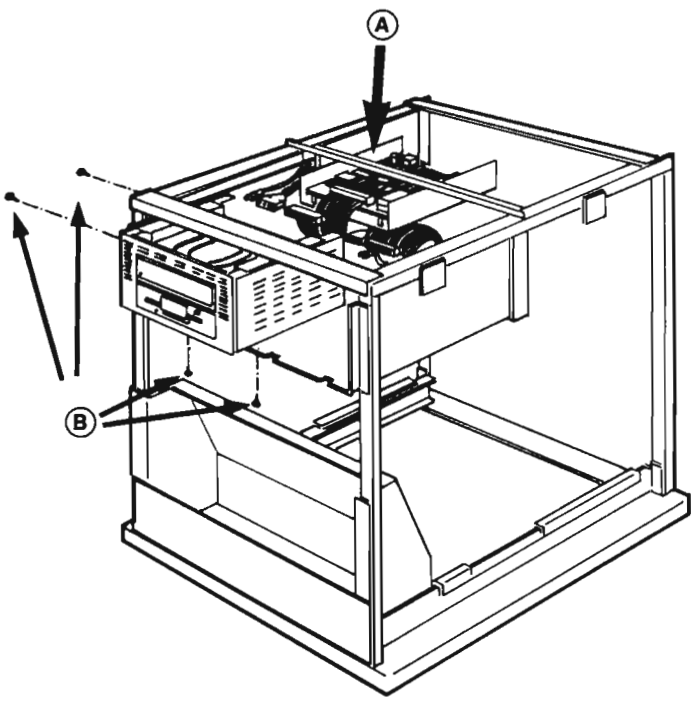


Figure 34. Replacing a Streamer (I)

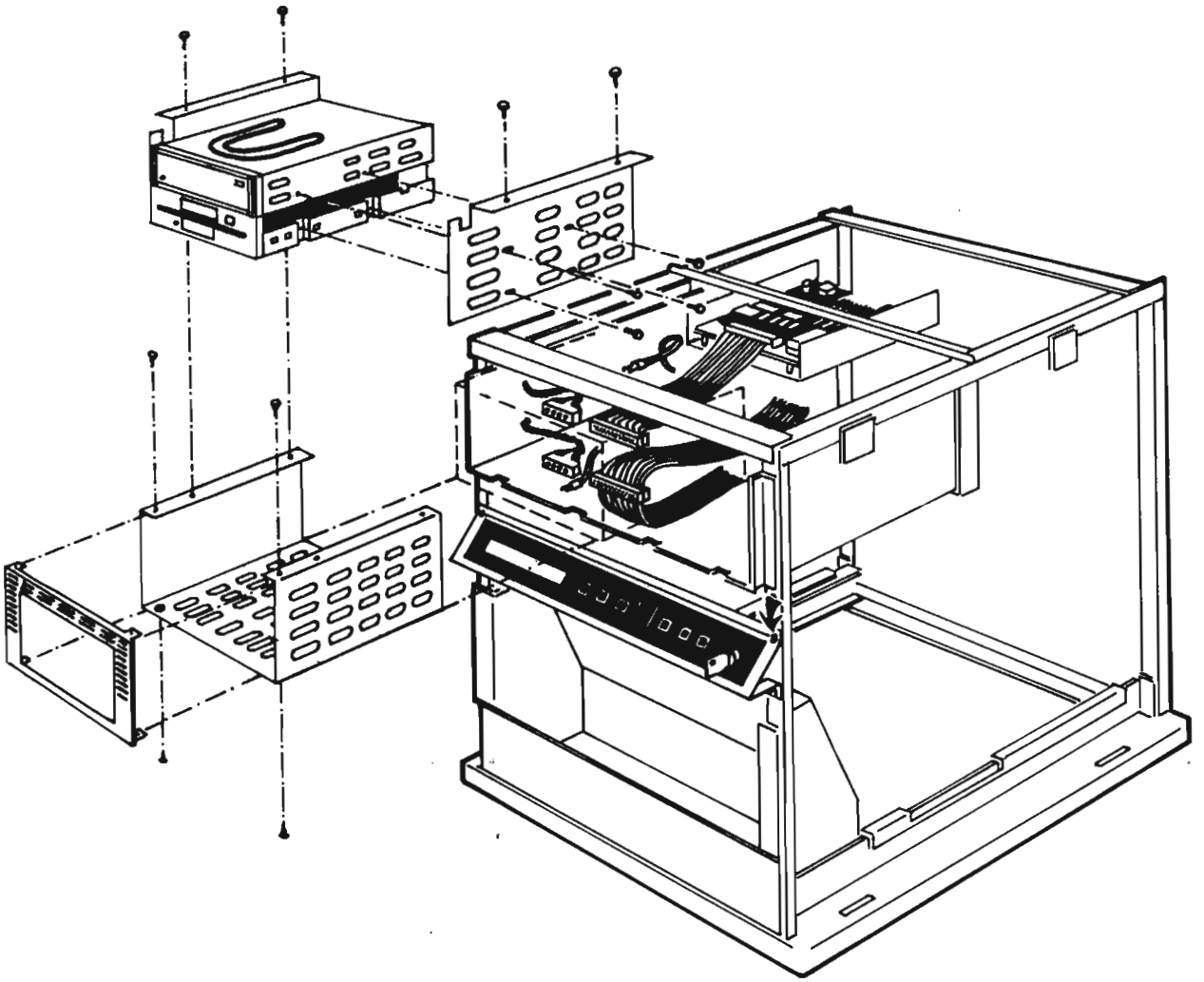


Figure 35. Replacing a Streamer (II)

7.5 Changing a disk drive

1. Turn the power OFF, and remove the left side panel.

2. Disconnect the flat cables, the ground cable, and the power cable (A) from the disk unit.

3. Unscrew the two screws holding the disk housing (B), and slide the housing out.

4. Remove the disk-unit from the housing by unscrewing the two screws (C) on each side.

5. Install the new disk-unit by following steps 1 to 4 in reverse order, doing the opposite of each one.
   For strapping and termination, see the Service Handbook Vol. II, chapter 5, section 13.

6. If you want to test the new disk unit, you can use the test program DISC-TEMA.

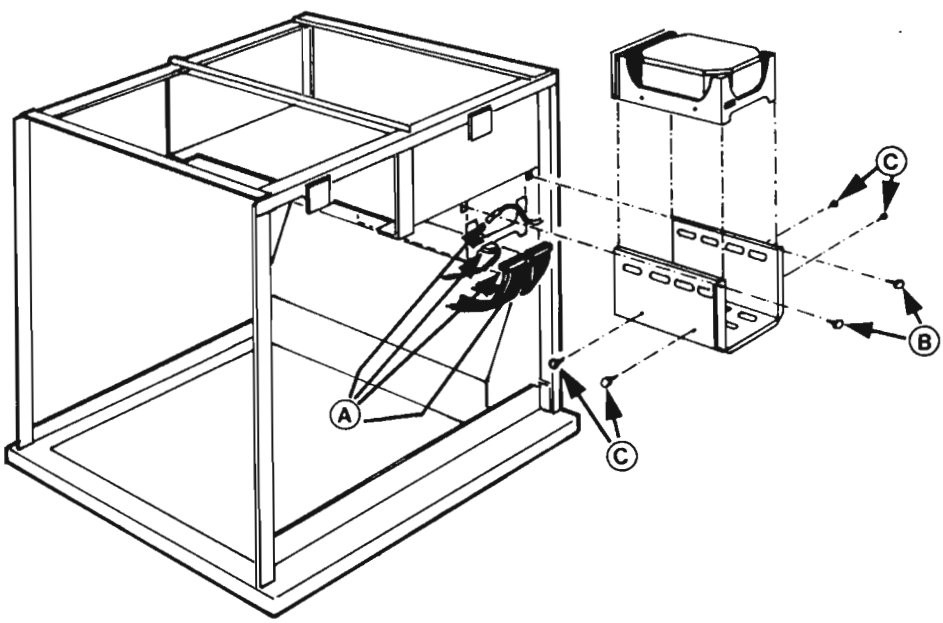


Figure 36. Replacing a Disk Drive

7.6 Changing the fans

THE CARD-CRATE FANS:

1. Turn the power OFF, and remove the back cabinet-panel (see section 7.1).
2. Unscrew the four screws (A) holding the fan, disconnect the power wire and lift the fan out.
3. Install the new fan, turn the power ON, and check that the new fan is working.
4. Replace the cabinet panel.

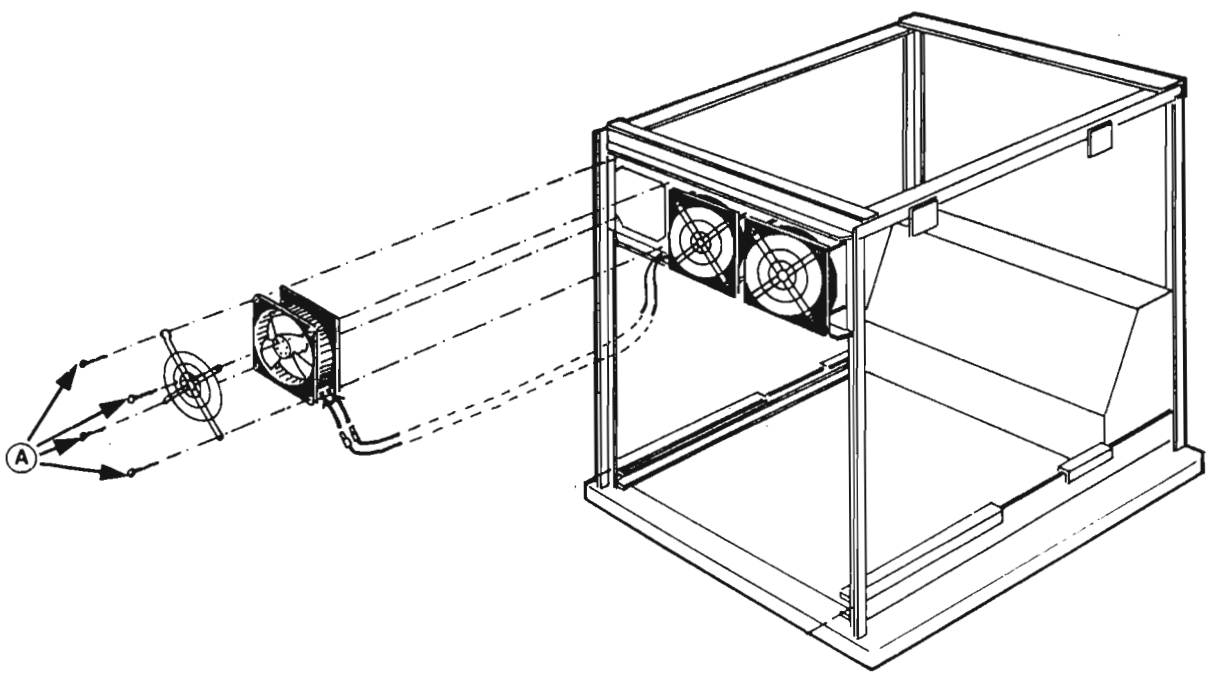


Figure 37. Removing a Fan (I)

THE BOTTOM FAN-ASSEMBLY:

1. Turn the power OFF. Unscrew the two screws (A) holding the bottom fan-assembly and slide it out.

2. Remove the defective fan by unscrewing the four screws (B) and disconnecting the power wires.
   Put in the new fan and mount the fan assembly into the cabinet again.

3. Turn the power ON, and check that the new fan is working.

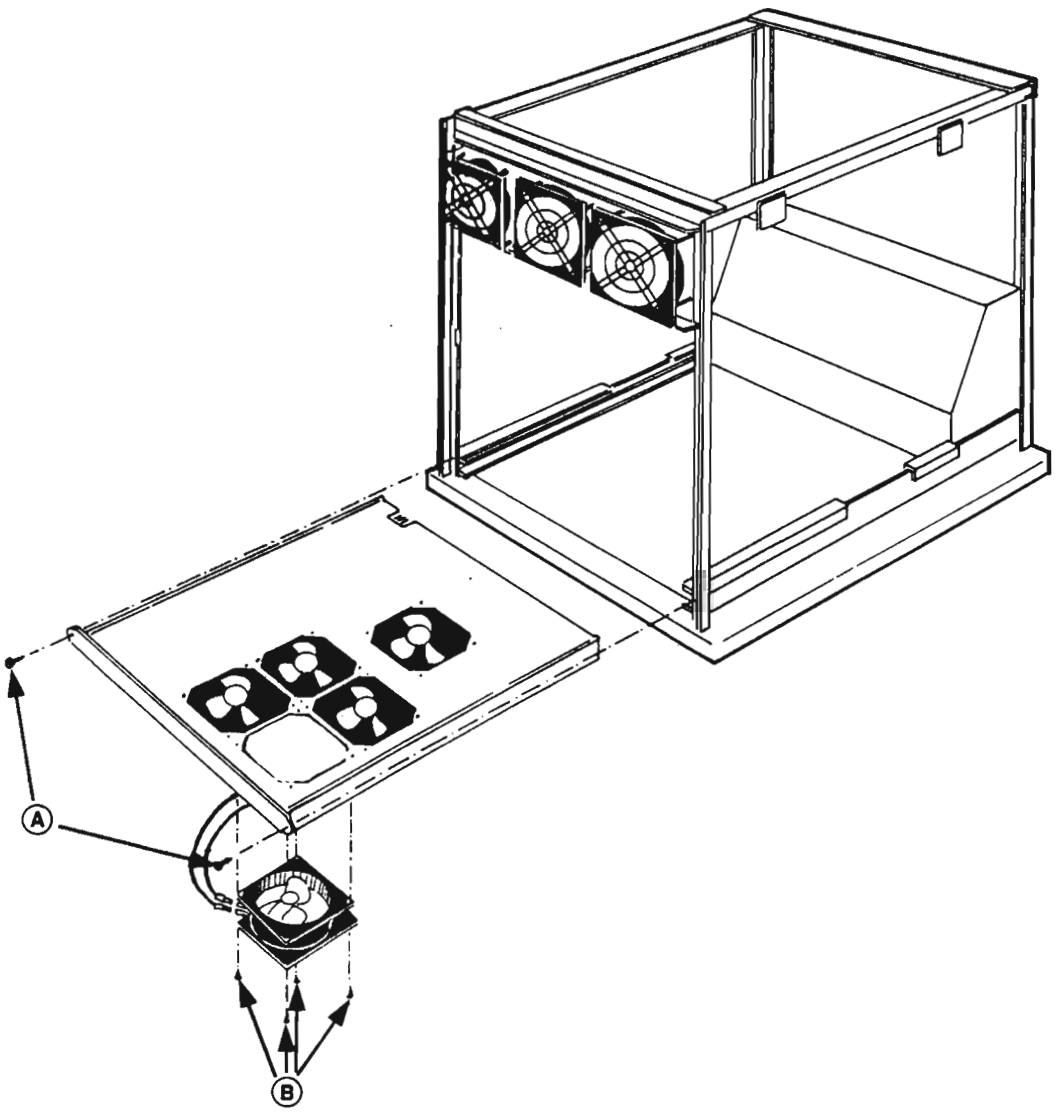


Figure 38. Removing a Fan (II)

Chapter 8 Switches, Displays and indicators on the ND-100 cards

This chapter contains information about switch-settings, LEDs, indicators and displays.

The figure below shows the symbols used in this chapter.

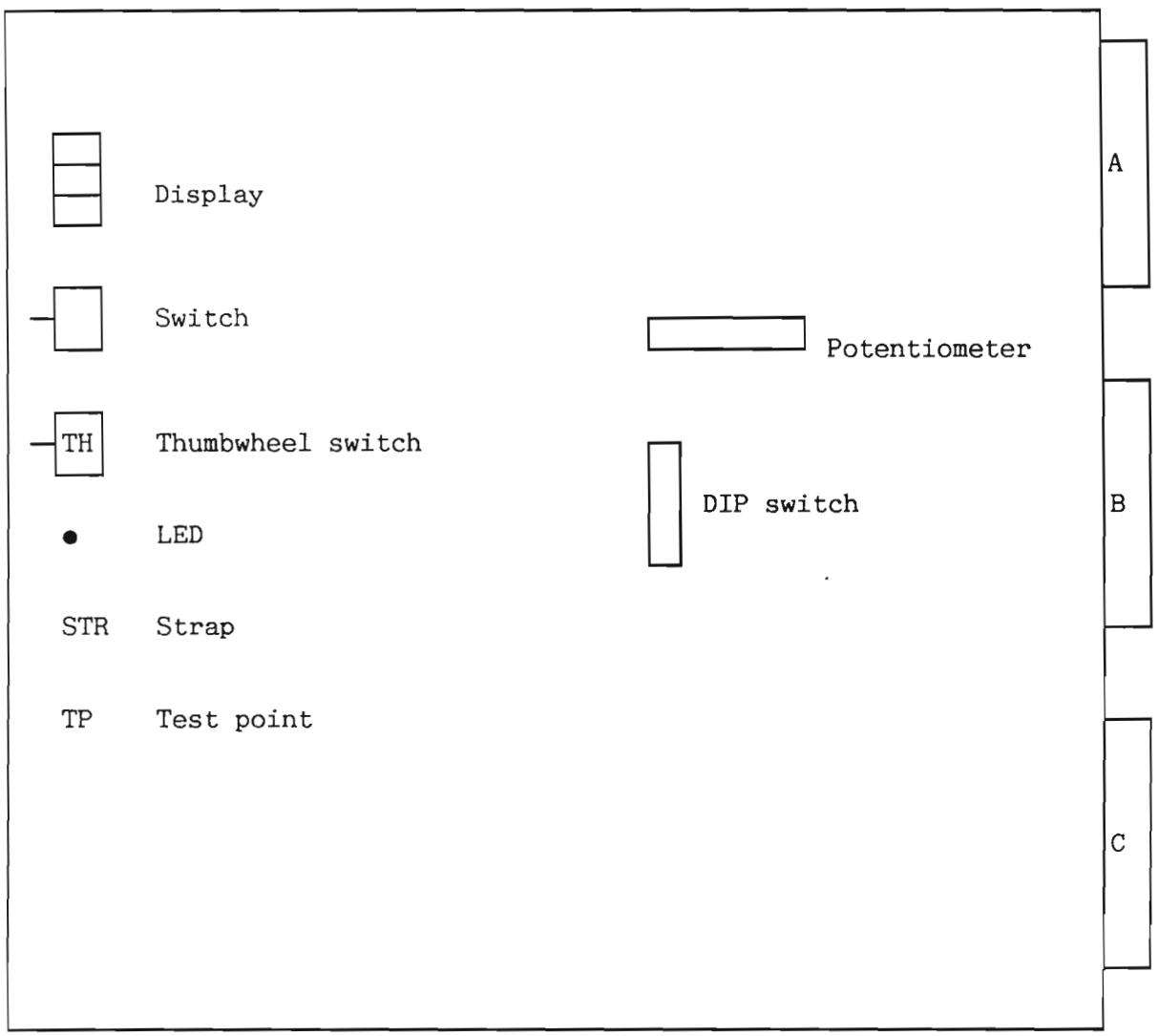


Figure 39. Summary of ND-100 card

8.1 CPU module (3002)

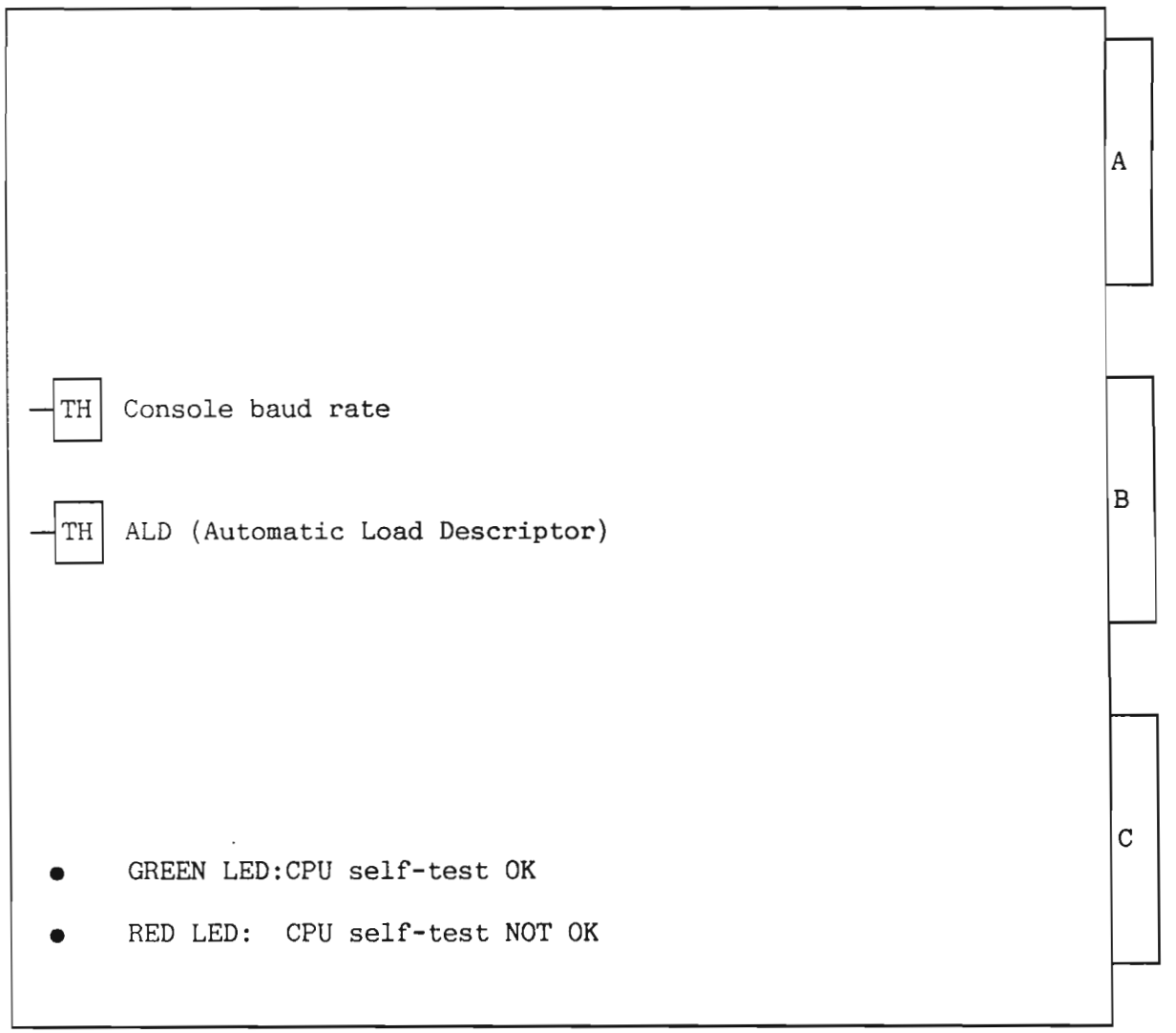


Figure 40. CPU Module (3002)

ALD:

ALD	I 12	LOCK and Standby Power OK	LOCK and Standby Power not OK	Unlock and Load
15	0	Start in address 20	Stop	Nothing
14	1560	Start in address 20	Binary load from 1560	Binary load from 1560
13	20500	Start in address 20	Mass load from 500	Mass load from 500
12	21540	Start in address 20	Mass load from 1540	Mass load from 1540
11	400	Start in address 20	Binary load from 400	Binary load from 400
10	1600	Start in address 20	Binary load from 1600	Binary load from 1600
9		Start in address 20		
8		Start in address 20		
7	100000	Stop	Stop	Nothing
6	101560	Binary load from 1560	Binary load from 1560	Binary load from 1560
5	120500	Mass load from 500	Mass load from 500	Mass load from 500
4	121540	Mass load from 1540	Mass load from 1540	Mass load from 1540
3	100400	Binary load from 400	Binary load from 400	Binary load from 400
2	101600	Binary load from 1600	Binary load from 1600	Binary load from 1600

Table 3. ALD on the CPU Module (3002)

BAUD RATE:

Switch-setting:	Baud rate:
0	110
1	150
2	300
3	2400
4	1200
5	1800
6	4800
7	9600
8	2400
9	600
10	200
11	134.5
12	75
13	50
14	ext.
15	ext.

Table 4. Baud Rate on the CPU (3002)

8.2 10 MB disk controller (3004)

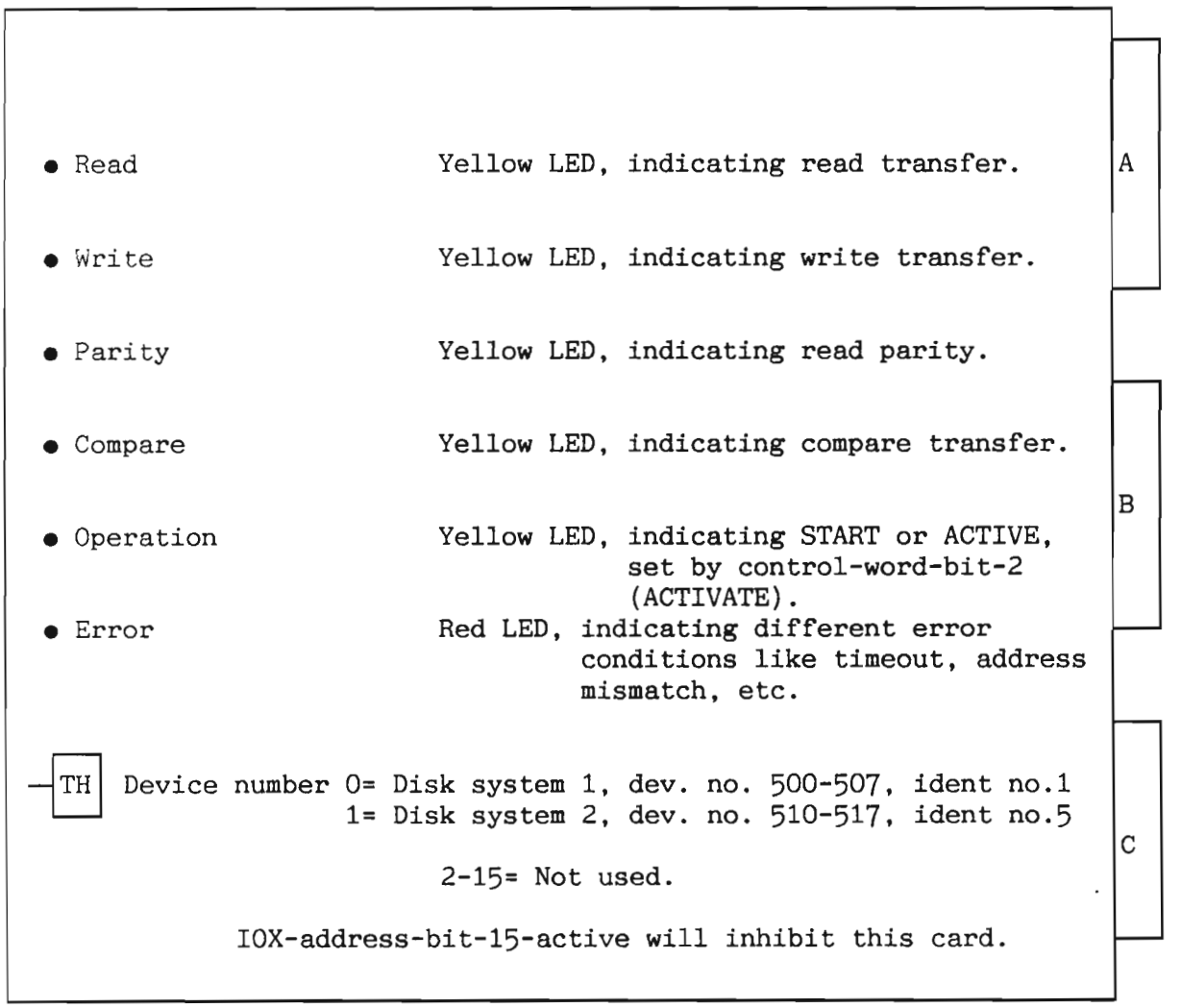


Figure 41. 10 Mb Disk Controller (3004)

8.3 Dynamic RAM (3005)

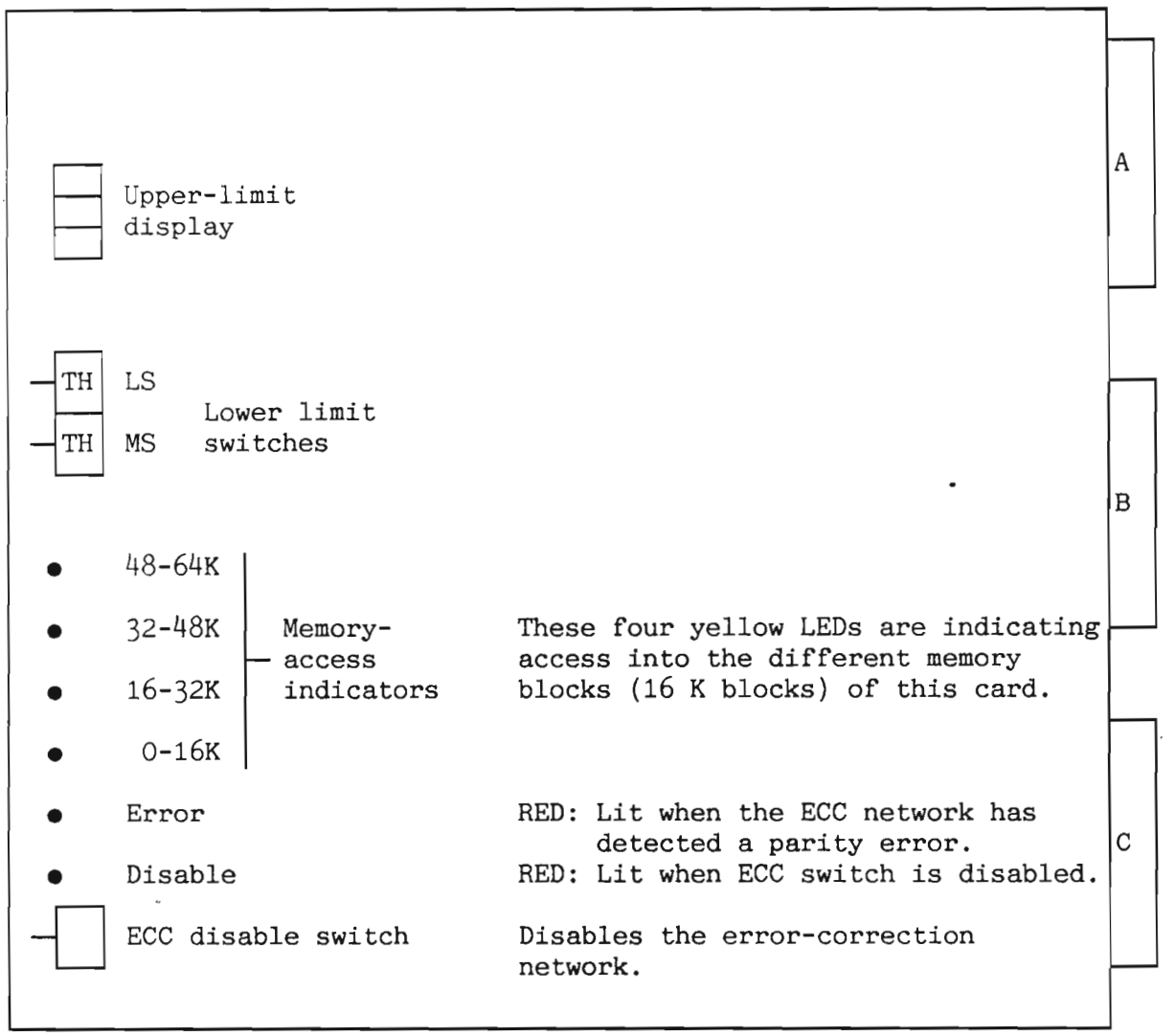


Figure 42. Dynamic RAM (3005)

THE LOWER LIMIT SWITCHES:

The lower-limit switches determine the lower memory address for this memory card. This is a two-digit hex thumbwheel, giving limit addresses in increments of 16K units, and only numbers 0-7 are used.

The upper limit for this card is automatically displayed on the upper limit display in octal representation.

NOTE

If the CPU is a ND-120, you must use the value displayed by the memory size indicator as lower limit on the first memory card.

EXAMPLES:

Lower-limit sw. setting	Memory size	Upper-limit display	Address
0 0	32 K	0 2	0- 32K
0 0	64 K	0 4	0- 64K
0 3	32 K	0 5	48- 80K
0 3	64 K	0 7	48-112K
3 4	64 K	4 0	448-512K

Table 5. Lower-Limit Switch-Setting on the Dynamic RAM (3005)

8.4 Pertec magnetic tape controller (3006)

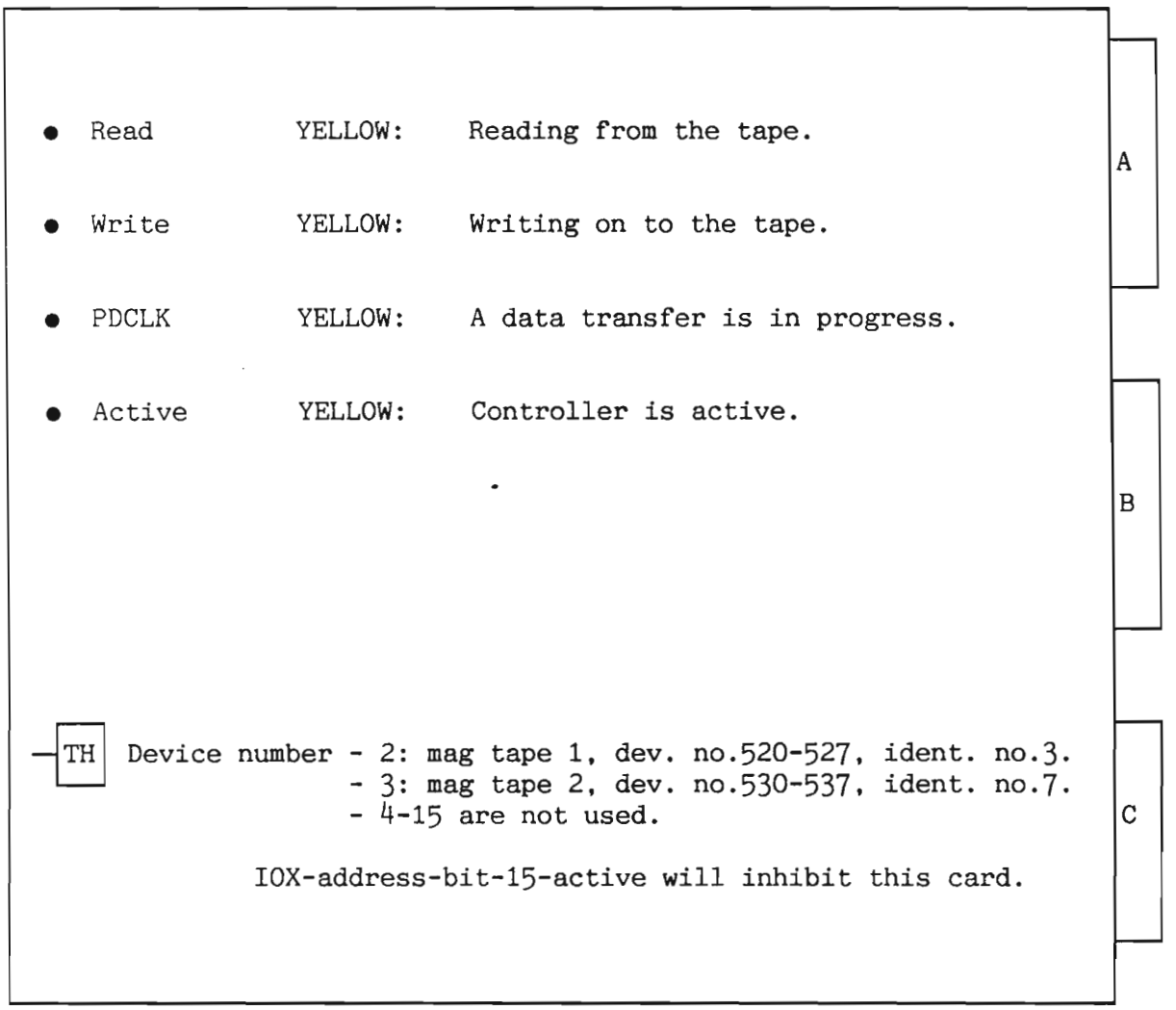


Figure 43. Pertec Magnetic Tape Controller (3006)

8.5 Euroline adapter (3008)

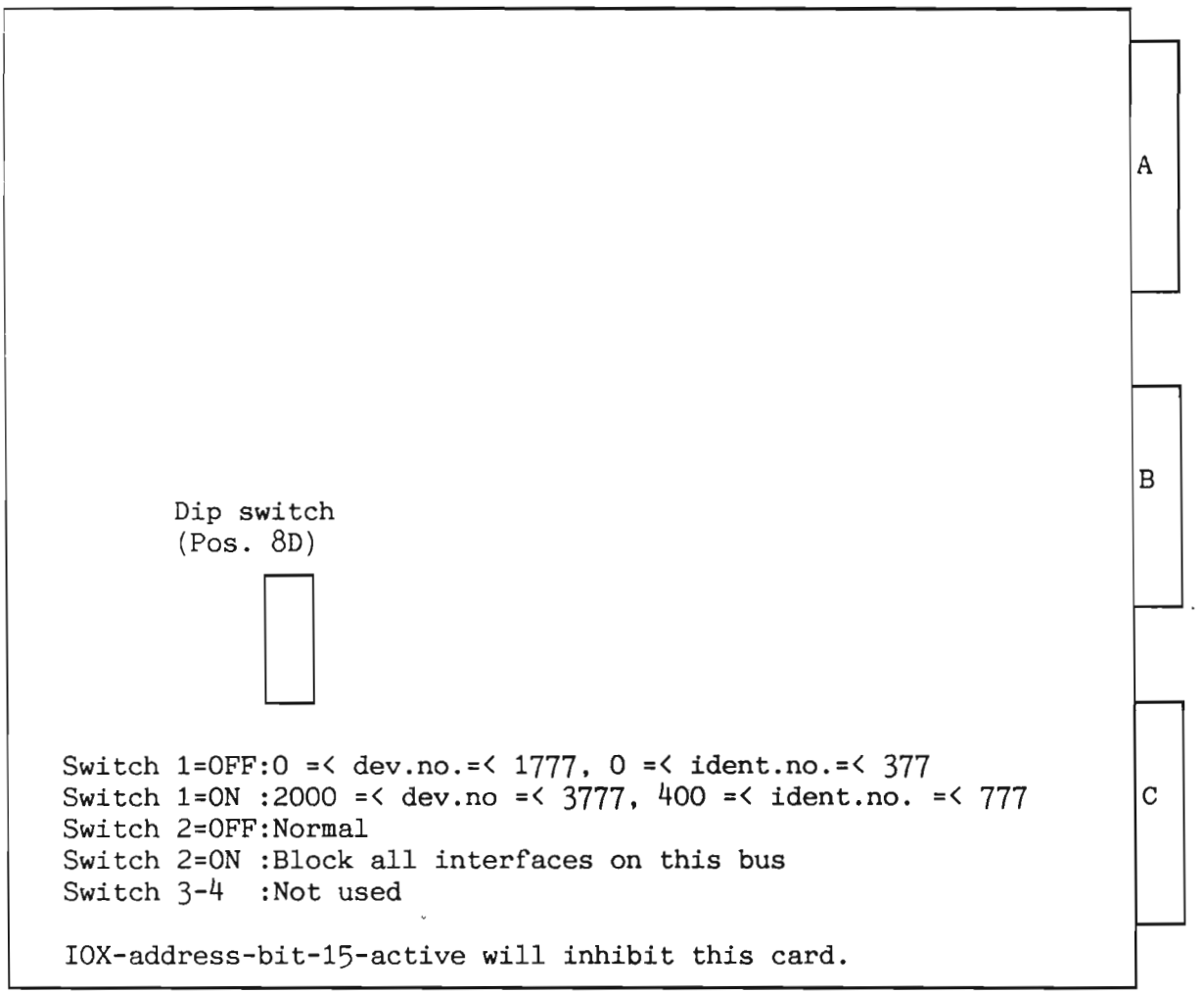


Figure 44. Euroline Adapter (3008)

8.6 Local I-O bus (3009)

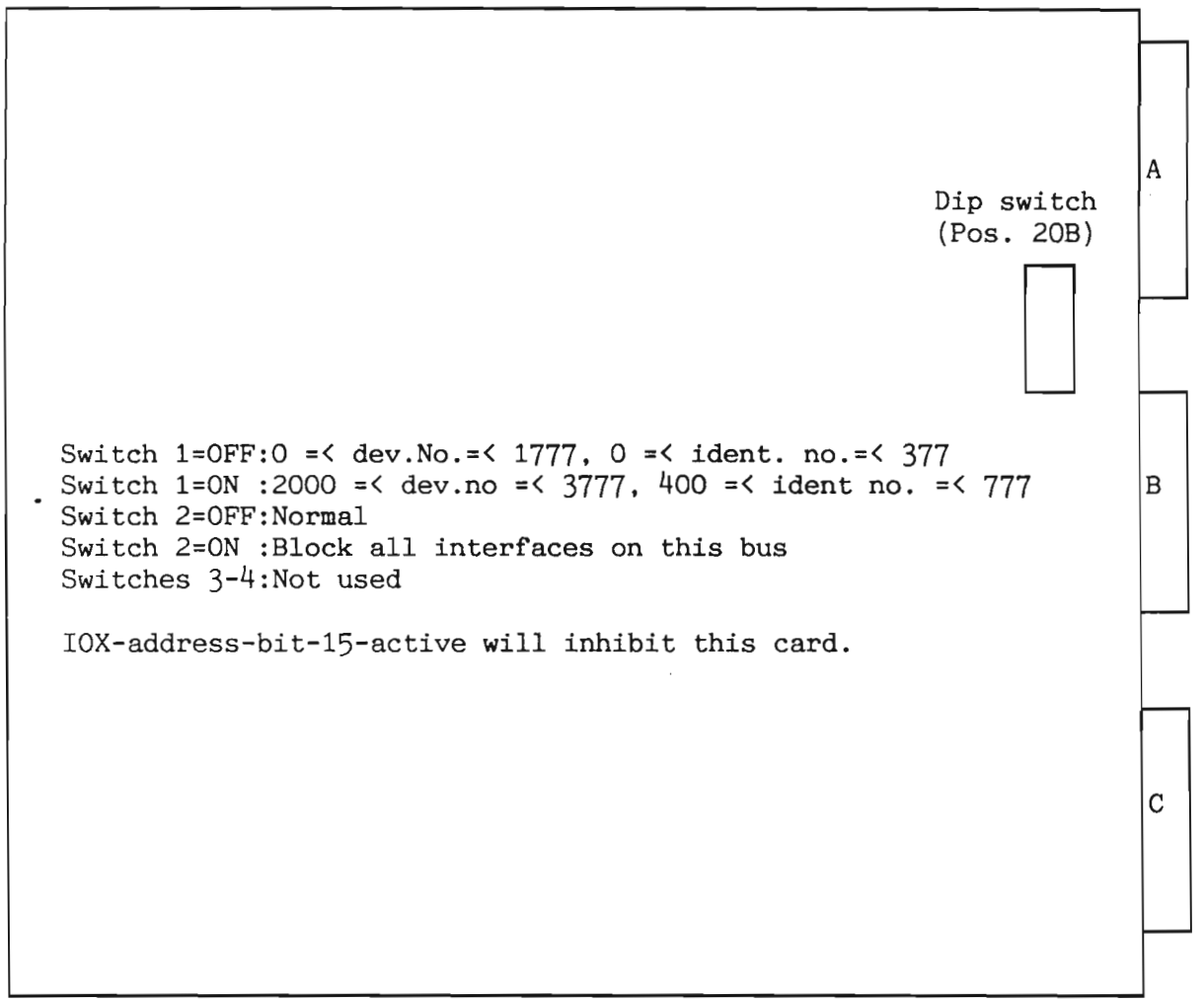


Figure 45. Local I/O Bus (3009)

8.7 Floppy and 4-terminals interface (3010)

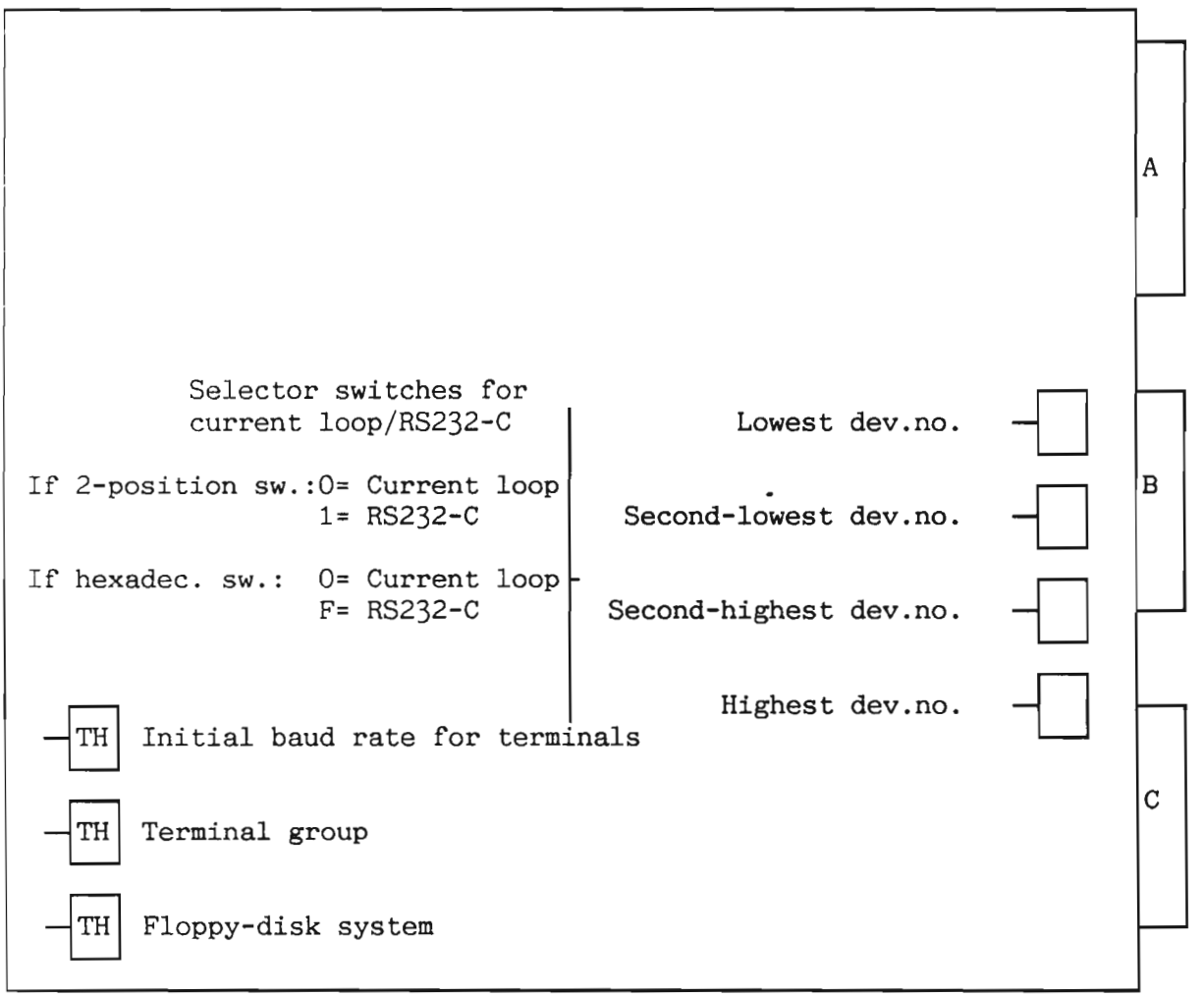


Figure 46. Floppy and 4-Terminals Interface (3010)

FLOPPY-DISK SYSTEM:

0= floppy system no. 1
(dev. no. 1560, IDENT = 21).

1= floppy system no. 2
(dev. no. 1570, IDENT = 22).

2-15 are unused, will answer on IOX 0-7.

TERMINAL GROUP:

Switch-setting:	Terminals:	Dev. no:	Ident.:
0	1- 4	300- 337	120-123
1	5- 8	340- 377	44- 47
2	9-12	1300-1337	50- 53
3	13-16	1340-1377	54- 57
4	33-36	640- 677	124-127
5	37-40	1100-1137	130-133
6	41-44	1140-1177	134-137
7	45-48	1400-1437	140-143
8	49-52	1500-1537	144-147
9	53-56	1640-1677	150-153
10	57-60	1700-1737	154-157
11	61-64	1740-1777	160-163
12	17-20	200- 237	60- 63
13	21-24	240- 277	64- 67
14	25-28	1200-1237	70- 73
15	29-32	1240-1277	74- 77

Table 6. Terminal Group on the Floppy and 4-Terminal Interface (3010)

BAUD RATE:

Switch-setting:	Baud rate:
0	110
1	150
2	300
3	2400
4	1200
5	1800
6	4800
7	9600
8	2400
9	600
10	200
11	134.5
12	75
13	50
14	unused
15	Split-speed

Table 7. Baud Rate on the Floppy and 4-Terminal Interface (3010)

SELECTOR SWITCH FOR CURRENT LOOP/RS232-C:

If 2-position switch: 0= Current loop
1= RS232-C

If hexadecimal switch: 0= Current loop
F= RS232-C

If component houses are used:

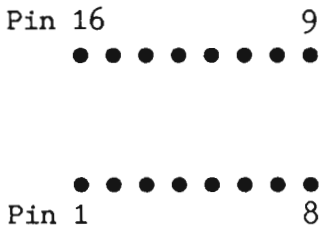
Current loop - Connection between:

pin 3 and pin 14
" 4 " " 13
" 6 " " 11
" 7 " " 10

RS232-C - Connection between:

pin 1 and pin 15
" 4 " " 14
" 6 " " 12
" 7 " " 9

COMPONENT HOUSE:



8.3 Memory management (3012)

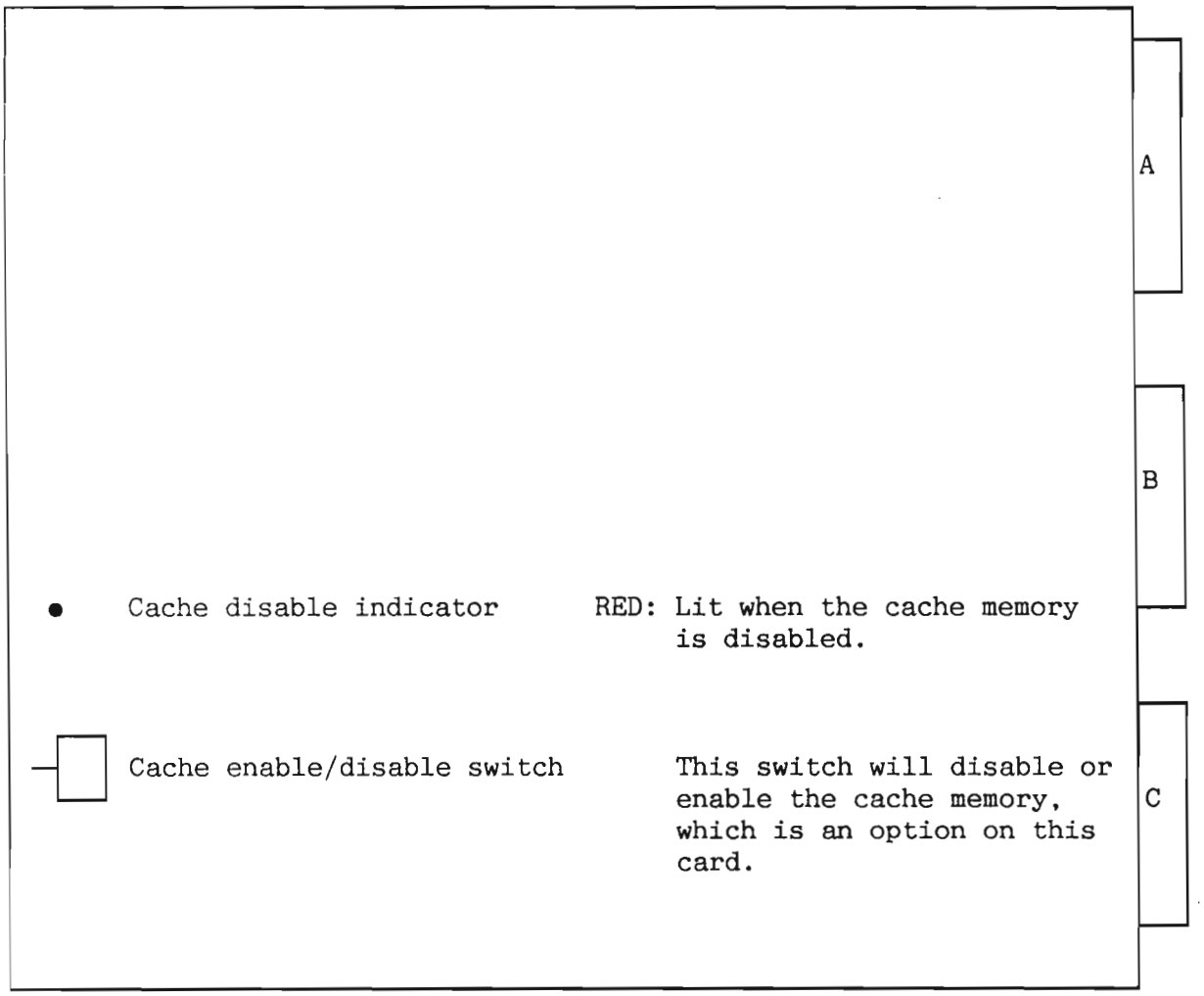


Figure 47. Memory Management (3012)

8.9 8-Terminal interface (3013)

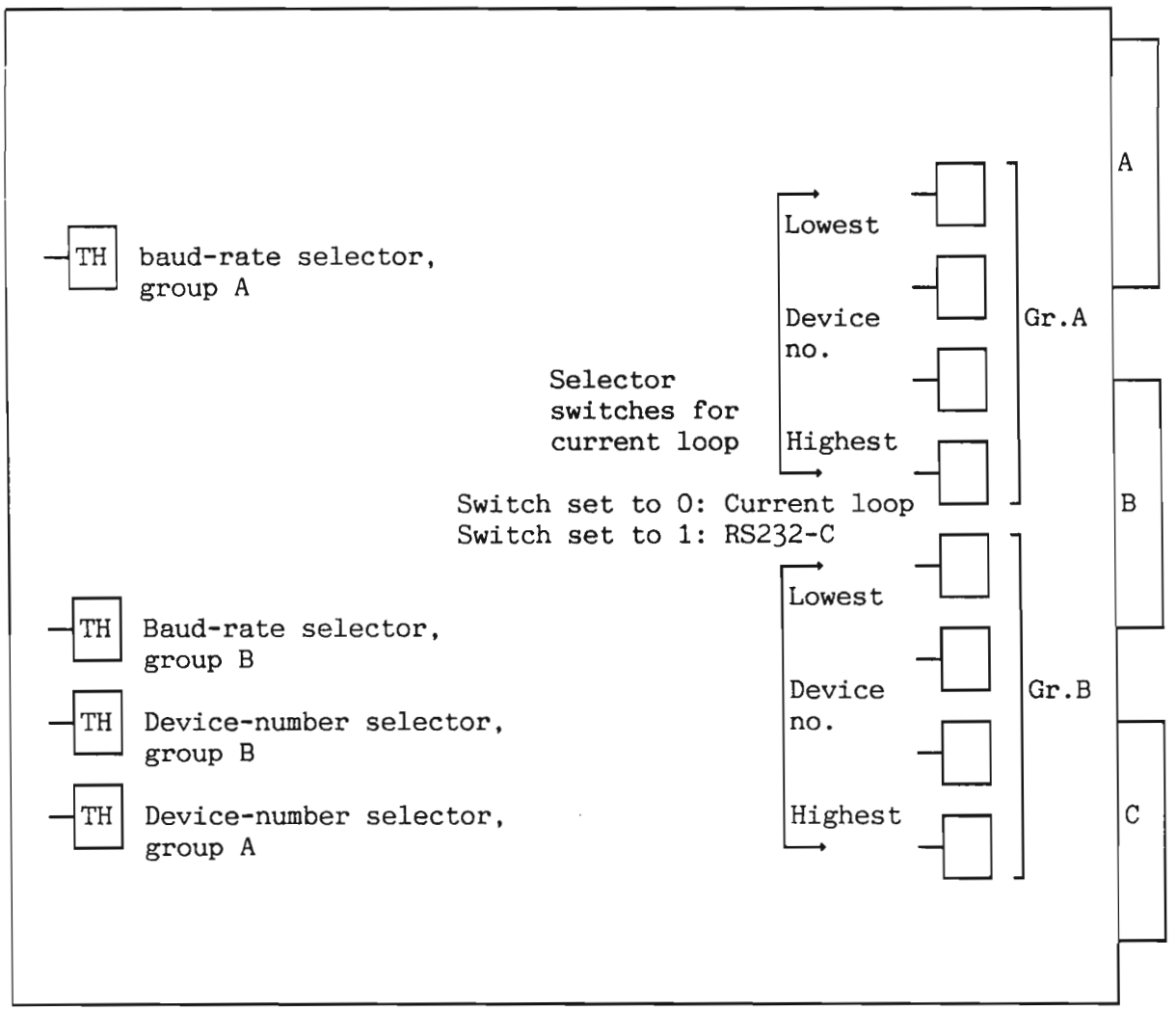


Figure 48. 8-Terminal Interface (3013)

DEVICE NUMBERS:

Terminals are divided into groups of four terminals. An 8-terminal card consists of two groups, group A and group B. Each group consists of four terminals with consecutive numbers and ident codes.

Switch-setting	Terminals	Dev. no	Ident
0	1- 4	300- 330	120-123
1	5- 8	340- 370	44- 47
2	9-12	1300-1330	50- 53
3	13-16	1340-1370	54- 57
4	33-36	640- 670	124-127
5	37-40	1100-1130	130-133
6	41-44	1140-1170	134-137
7	45-48	1400-1430	140-143
8	49-52	1500-1530	144-147
9	53-56	1640-1670	150-153
10	57-60	1700-1730	154-157
11	61-64	1740-1770	160-163
12	17-20	200- 230	60- 63
13	21-24	240- 270	64- 67
14	25-28	1200-1230	70- 73
15	29-32	1240-1270	74- 77

Table 8. Device Numbers on the 8-Terminal Interface (3013)

NOTE

If HDLC is connected, you must not use switch-setting 9 and 10 for terminals.

BAUD RATE:

Switch setting:	Baud rate:
0	110
1	150
2	300
3	2400
4	1200
5	1800
6	4800
7	9600
8	2400
9	600
10	200
11	134.5
12	75
13	50
14-15	Not used

Table 9. Baud Rate on the 8-Terminal Interface (3013)

8.10 HDLC + autoload (3015)

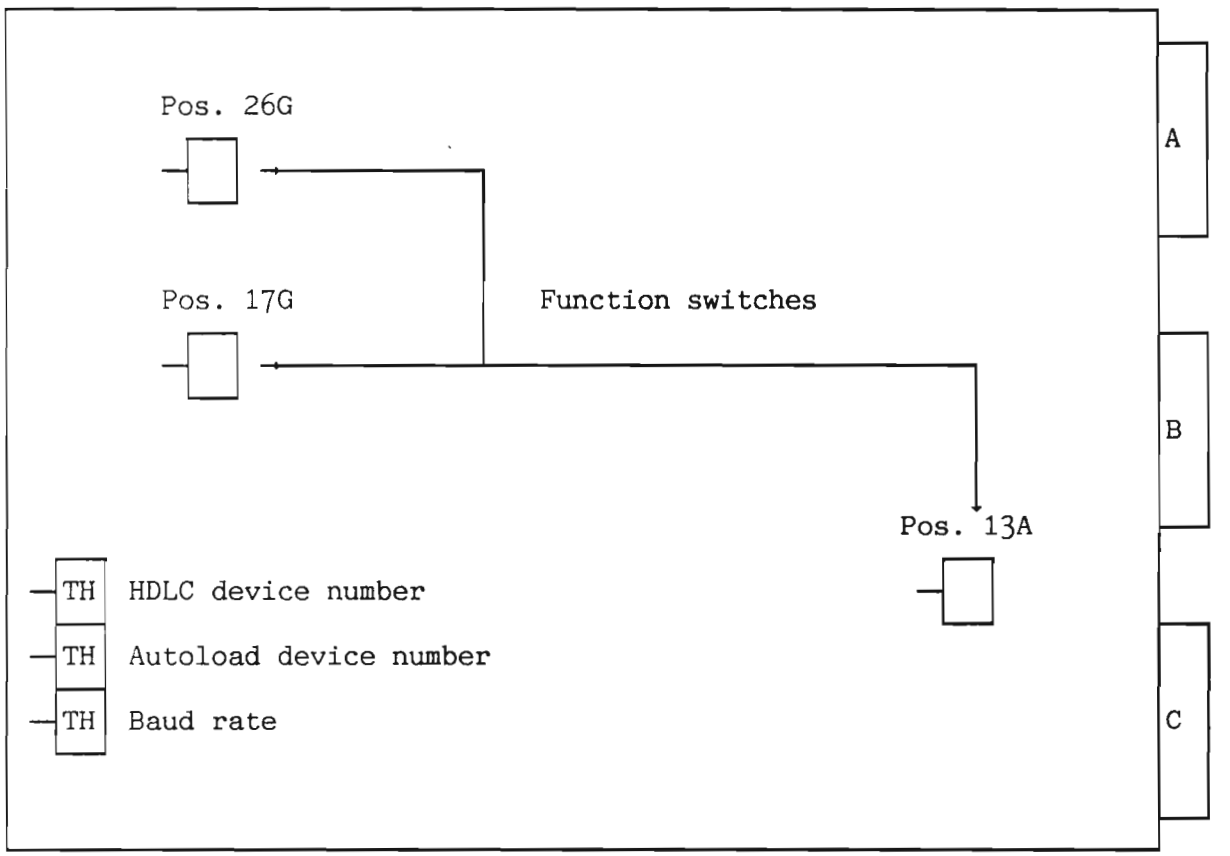


Figure 49. HDLC Controller (3015)

BAUD RATE:

Switch-setting	Baud rate (K baud)
0	307
3	1.2
6	9.6
7	38.4
8	153.6
9	76.8
11	19.2
13	4.8
14	2.4

Table 10. Baud Rate on the HDLC Controller (3015)

AUTOLOAD DEVICE NUMBER:

Device	Thumbwheel position	Device number
	0 Not allowed	1600
Autoload 1	1	1604
Autoload 2	2	1610
Autoload 3	3	1614
Autoload 4	4	1620
Autoload 5	5	1624
Autoload 6	6	1630
Autoload 7	7	1634
	8 - 15 Not allowed	

Table 11. Autoload Device Number on the HDLC Controller (3015)

NOTE

No ident codes!

HDLC DEVICE NUMBER:

Device	Thumbwheel position	Device number	Ident-code
HDLC 1	0	1640	140
HDLC 2	1	1660	151
HDLC 3	2	1700	152
HDLC 4	3	1720	153
HDLC 5	4	1740	154
HDLC 6	5	1760	155
HASP 1	6	560	156
HASP 2	7	620	157
HASP 3	8	700	160
HASP 4	9	720	161
HASP 5	10	1500	162
HASP 6	11	1520	163

Table 12. Device Number on the HDLC Controller (3015)

FUNCTION SWITCHES:

Switches in position 13A 4 3 2 1	Switches in position 17G 4 3 2 1	Switches in position 26G 4 3 2 1
X X 0 0: X21 X X 0 1: Computer link X X 1 0: V.35 X X 1 1: V.24/X.21 bis	X X X 0: Disable MCL X X 0 X: Disable LOAD X 0 X X: Disable RML 0 X X X: Disable CLOAD	X X 0 X: Disable baud rate osc. X 0 X X: Disable main clock

Table 13. Function Switches on the HDLC Controller (3015)

8.11 ECC disk controller (3018 and 3019)

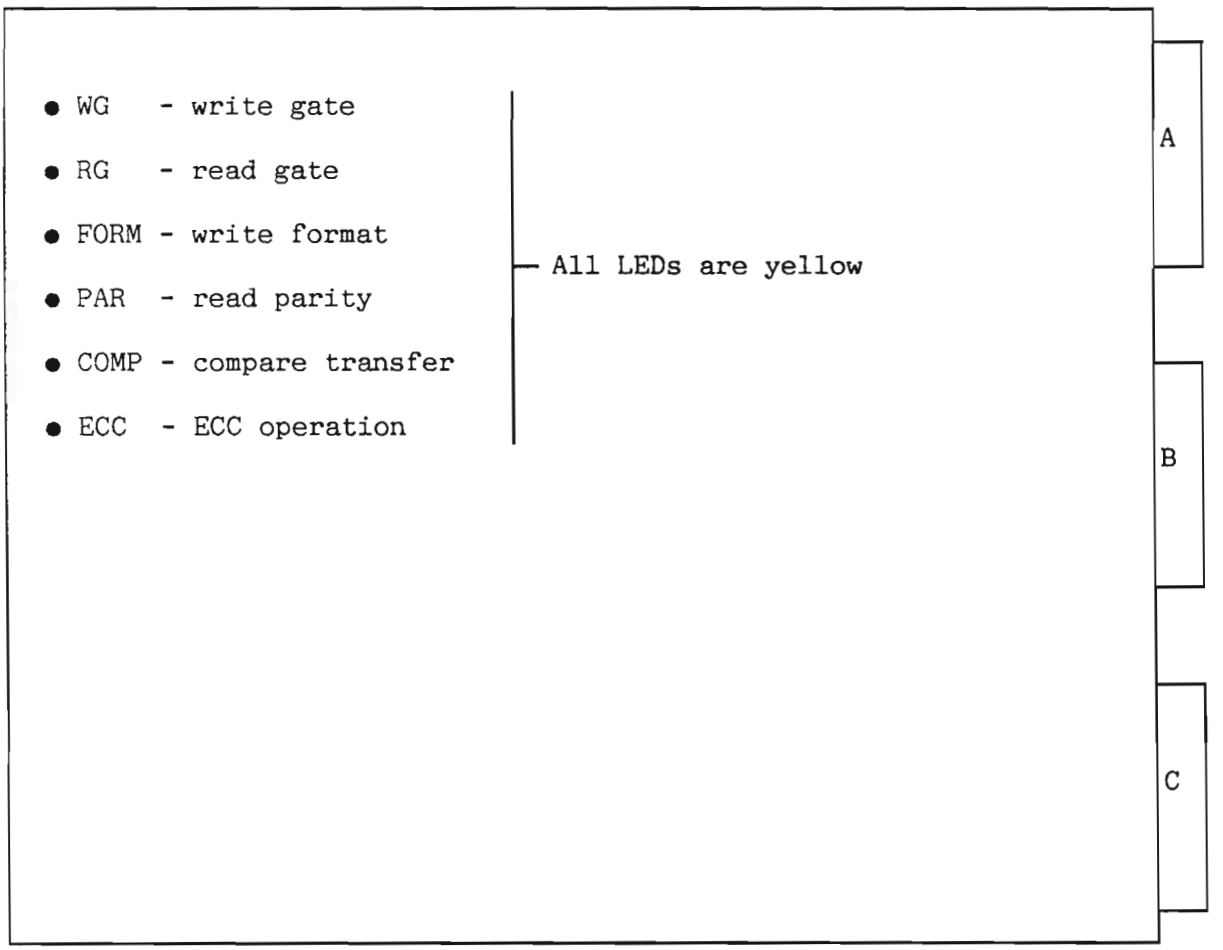


Figure 50. SMD Controller (3018)

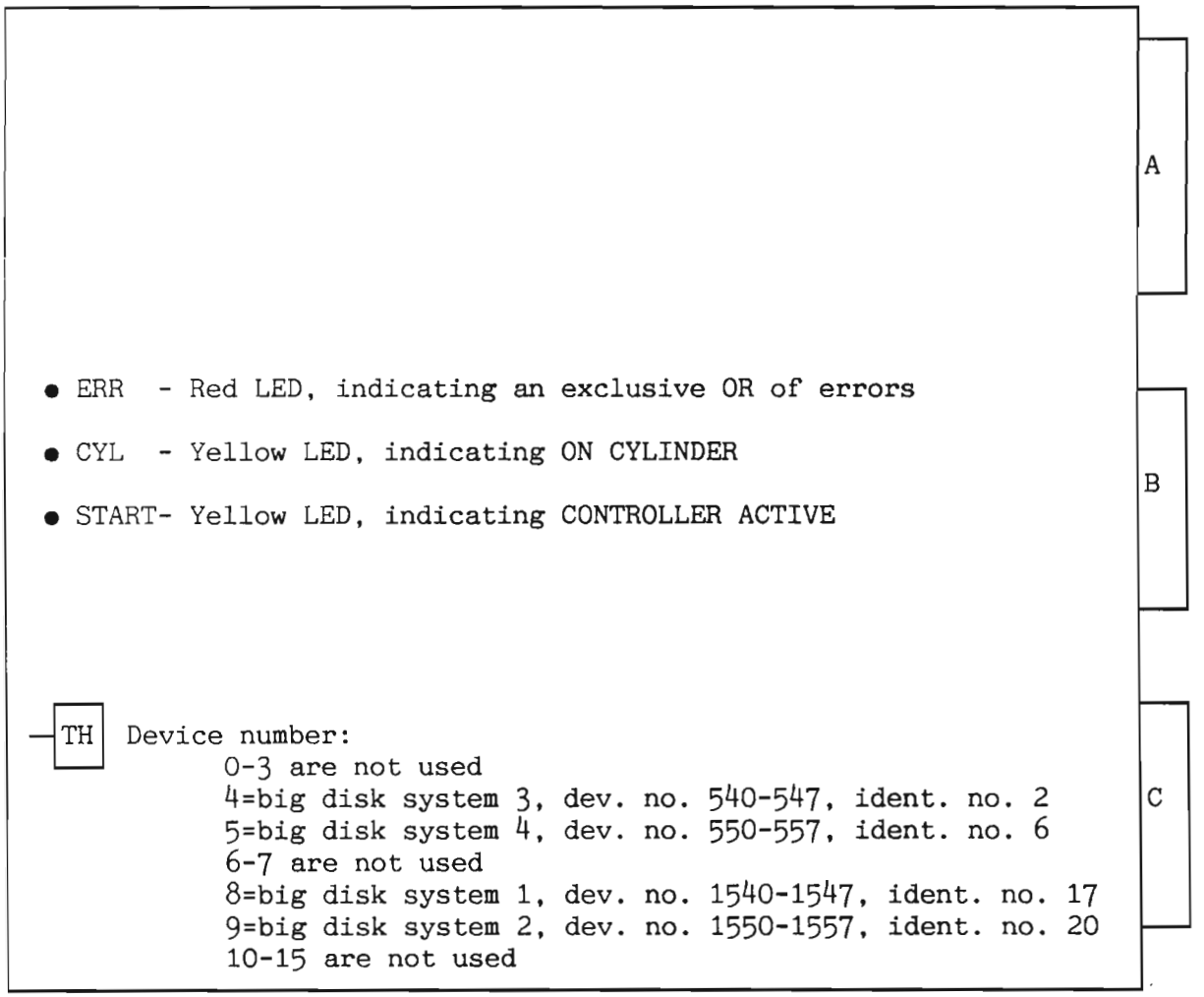


Figure 51. SMD Data (3019)

8.12 STC magtape controller (3020)

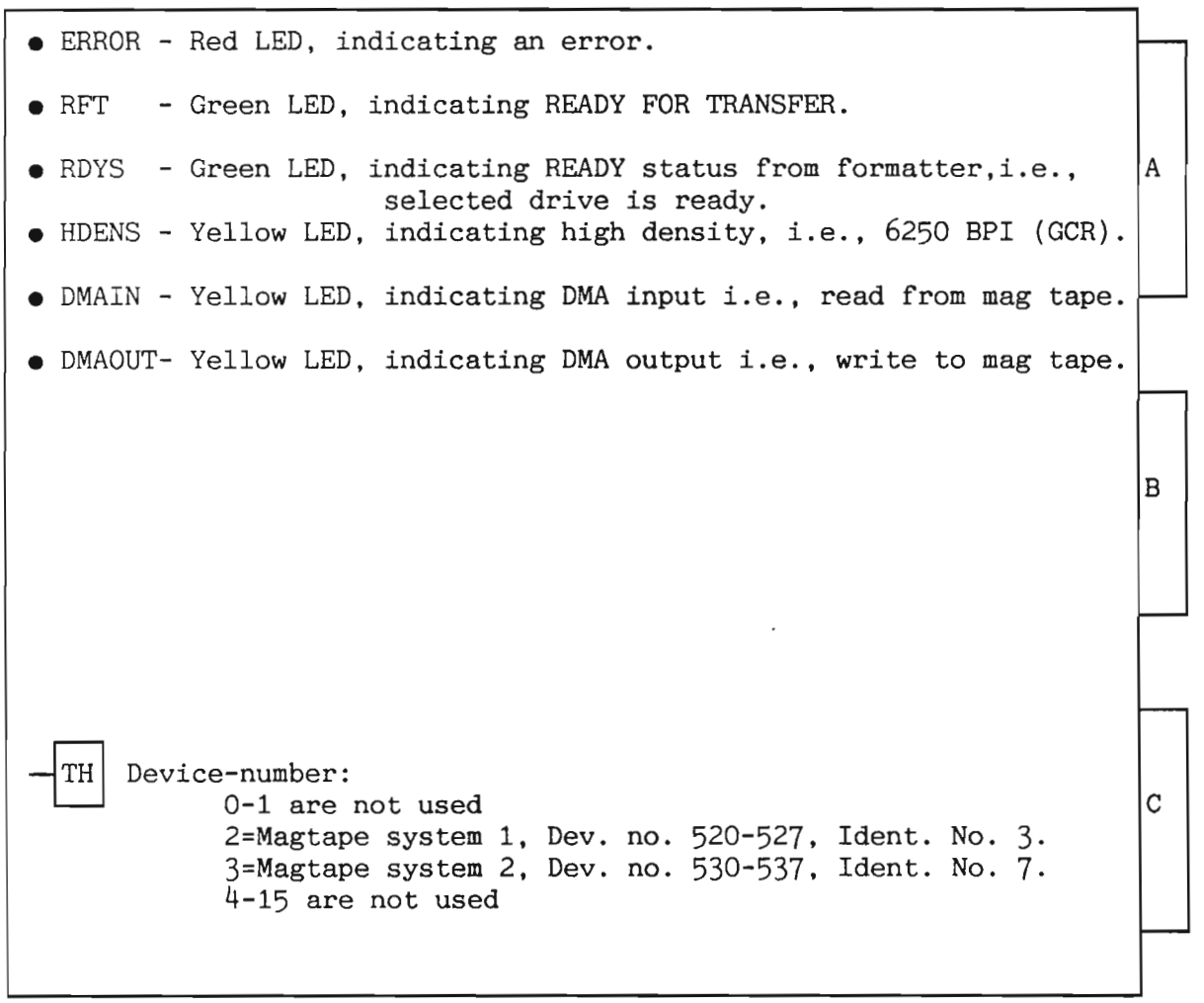


Figure 52. STC Magtape Controller (3020)

8.13 ND-500 interface (3022)

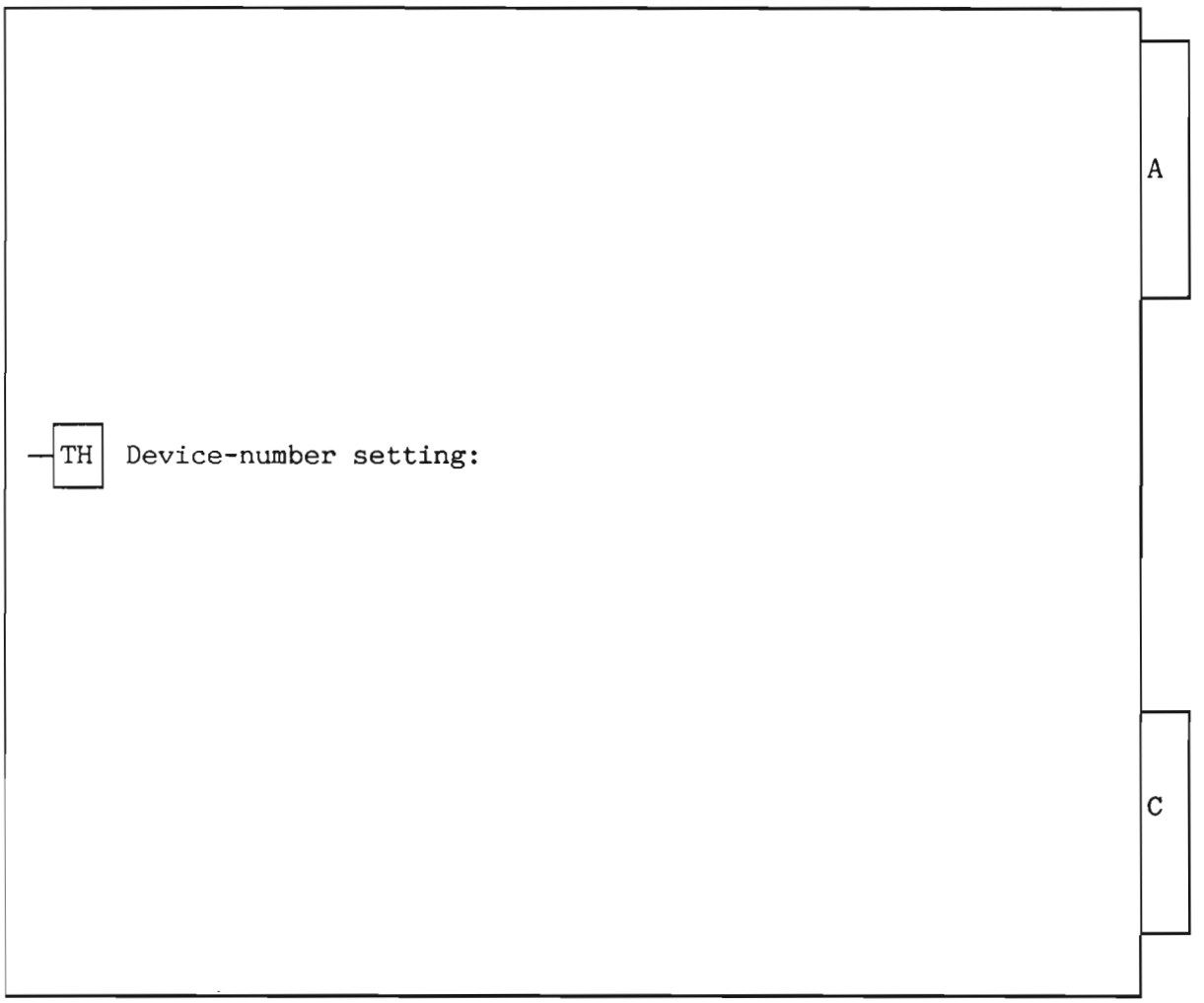


Figure 53. ND-500 Interface (3022)

DEVICE-NUMBER SWITCH-SETTING:

You may have a maximum number of five ND-500 computers connected to one ND-100, and each ND-500 computer requires a ND-500 interface.

If you connect three ND-500 computers to the ND-100, the first interface must have the thumbwheel set to 0, the second interface must be set to 1, and the third interface must be set to 2.

Thumbwheel setting	Device-number (Oct.)	Device-register address range (Oct.)	Ident. number
0	60	60 - 77	16
1	1060	1060 - 1077	116
2	660	660 - 677	36
3	760	760 - 777	114
4	560	560 - 577	76

Table 14. Device Numbers on the ND-500 Interface (3022)

NOTE

Thumbwheel settings 5 - 15 are not valid.

8.14 Megalink interface (3023)

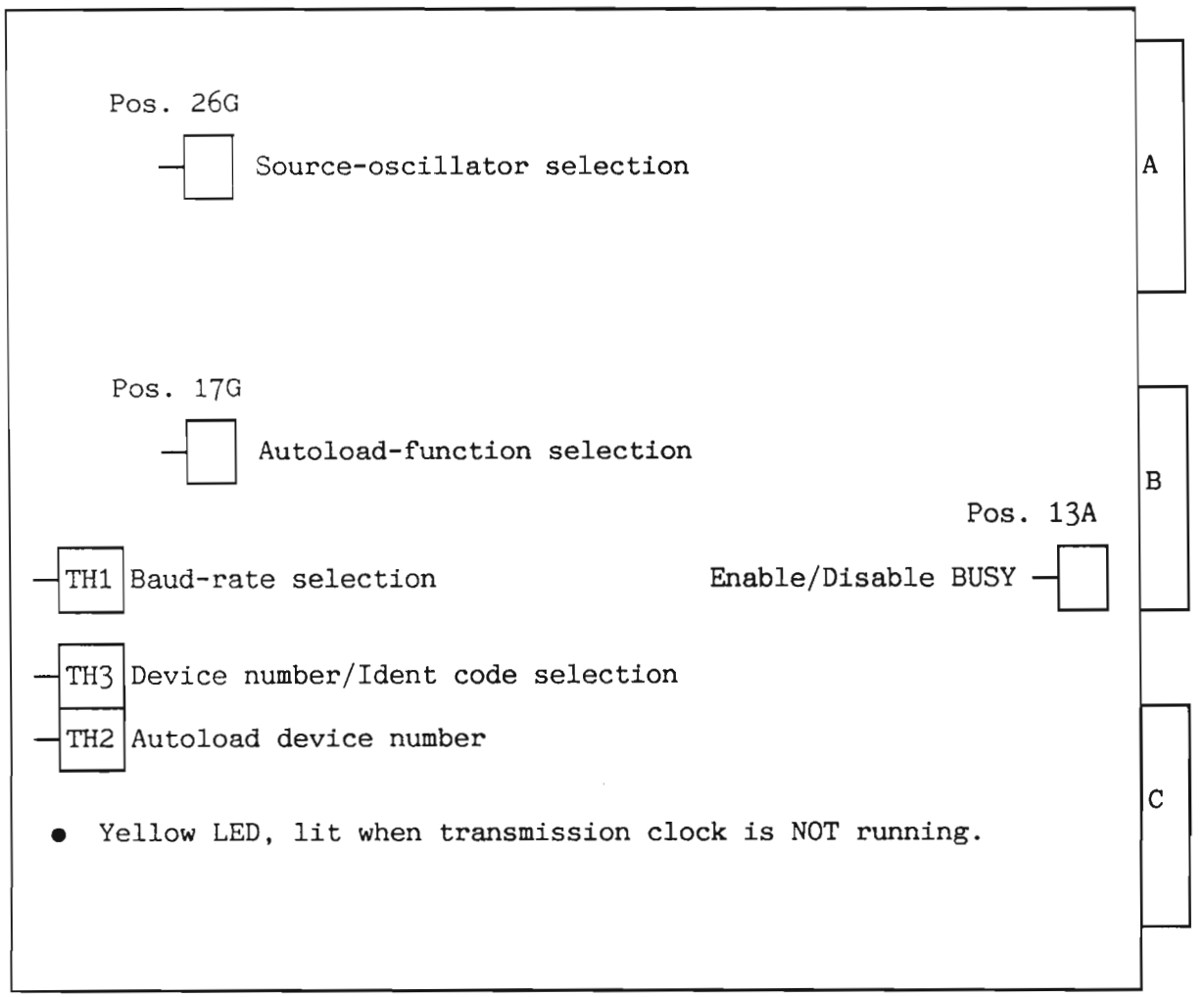


Figure 54. Megalink Interface (3023)

BAUD-RATE SELECTION (TH1):

This baud-rate selection is only relevant if the source-oscillator switches are set to "baud-rate selection" (see page 194).

Thumbwheel setting	Baud rate (Kbps)
0	307.2
3	1.2
6	9.6
7	38.4
8	153.6
9	76.8
11	19.2
13	4.8
14	2.4

Table 15. Baud Rate on the Megalink Interface (3023)

AUTOLOAD DEVICE NUMBER (TH2):

Thumbwheel setting	Autoload dev. no.	Device register address range (Oct)
0	*	1600 - 1603
1	1	1604 - 1607
2	2	1610 - 1613
3	3	1614 - 1617
4	4	1620 - 1623
5	5	1624 - 1627
6	6	1630 - 1633
7	7	1634 - 1637

*= Not allowed.

Table 16. Autoload Device Number on the Megalink Interface (3023)

DEVICE-REGISTER-ADDRESS RANGE
AND IDENT-CODE SELECTION (TH3):

Th.wheel setting:	Megalink number:	Dev-reg-addr-range (Oct.)	Ident code: (Oct.)
0	1	1640-1657	150
1	2	1660-1677	151
2	3	1700-1717	152
3	4	1720-1737	153
4	5	1740-1757	154
5	6	1760-1777	155

Table 17. Device Register on the Megalink Interface (3023)

NOTE

Extension to more than 6 megalinks is possible on special request.

THE SOURCE-OSCILLATOR SWITCH: OFF=0

Switch No. 6 5 4 3 2 1	Function:
1 1 0 0 1 X	Special 983 Kbps, normal operation
0 1 0 1 1 X	Baud rate via TH1
0 1 1 0 1 X	Special 614.4 Kbps

X=irrelevant
ON=1

Table 18. The Source Oscillator Switch on the Megalink Interface (3023)

NOTE

When the card is tested in a card tester, you can disable the processor clock (set switches 5 to 0), and disable the baud-rate oscillator (set switches 2 to 0).

THE AUTOLOAD-FUNCTION SELECTOR:

Switch No. 4 3 2 1	Function:
0 0 0 0	Normal operation, auto-load operation disabled
0 1 1 1	Only if remote load from line is used

ON=1
OFF=0

Table 19. The Autoload Function Selector on the 3023 Card

BUSY ENABLE/DISABLE SWITCH:

Switch No. 4 3 2 1	Function:
X X 0 1	Normal operation
X X 1 0	BUSY disabled

X=irrelevant
ON=1
OFF=0

Table 20. Busy Enable/Disable Switch on the Megalink Interface (3023)

8.15 N10 bus adapter (3024)

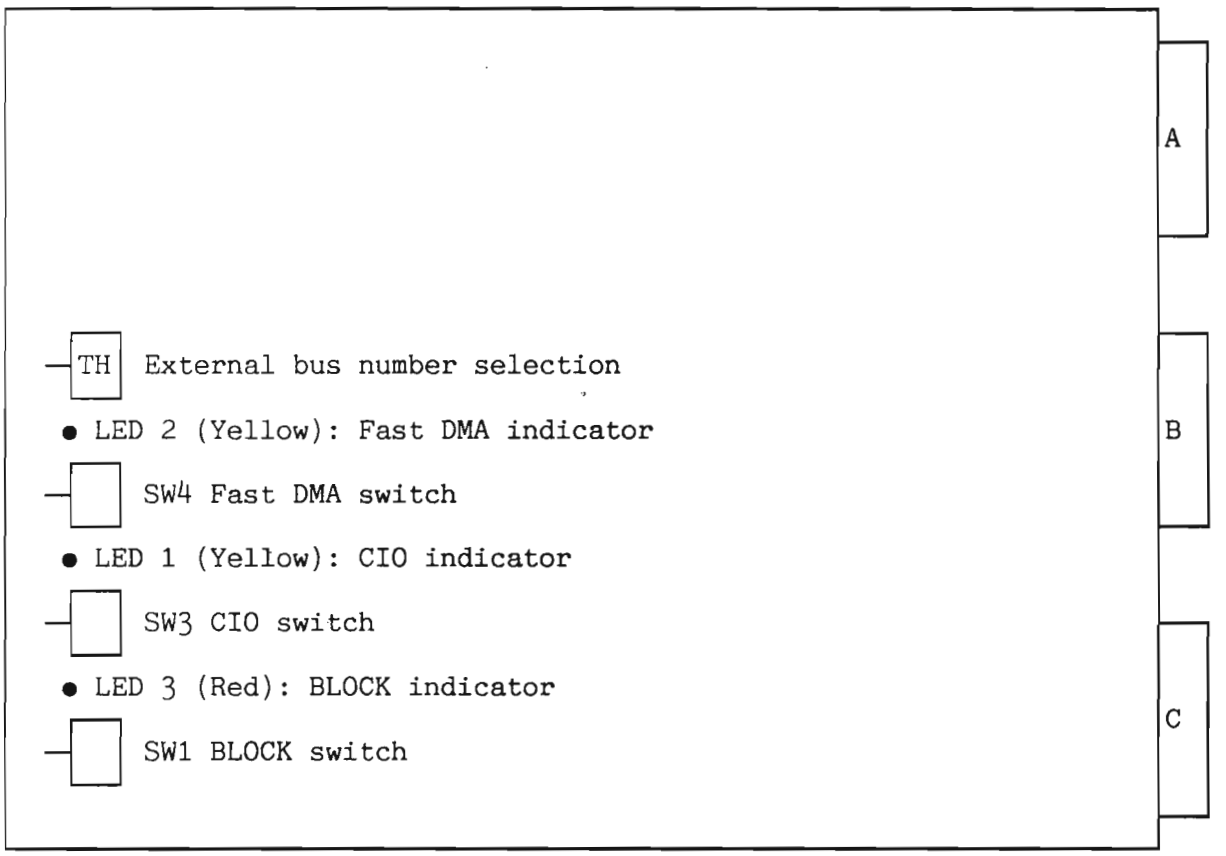


Figure 55. N10 Bus Adapter (3024)

EXTERNAL BUS NUMBER SELECTION:

Thumbwheel setting:	External bus number:
0	0
1	1
2	2
3	3
.	.
.	.
13	13
14	14
15	15

Table 21. External BUS Number Selection on the Bus Adapter (3024)

BLOCK SWITCH-SETTING (SW1):

The switch has two positions:

0 - DISABLE: LED3 is lit. The block switch inhibits all incoming/outgoing signals to/from the external bus.

1 - ENABLE: LED3 is not lit. A MASTER CLEAR pulse is sent to the external bus when switching from disable to enable.

Bit 13 in the programmable register simulates the block switch.

CIO SWITCH SETTING (SW3):

The switch has two positions:

0 - LED1 is not lit. All IOX addresses (0-077777) will pass and all the ident. codes are read, (the 3008 module forced bits 8-15 in the ident codes to 0 (zero) when the switch was inactive).

1 - LED1 is lit. Customer I/O enables only IOX addresses 2000-3777 to the external bus. Bit 8 in the ident. code is set to 1. Ident code bits 9-15 are forced to 0 (zero).

FAST DMA SWITCH SETTING (SW4):

The switch has two positions:

0 - LED2 is not lit. The ND-100 bus is kept reserved until the external bus has finished the DMA cycle (CONNECT no longer true).

1 - LED2 is lit. The ND-100 bus is released to CPU or DMA devices as soon as the necessary DMA data exchange on the ND-100 bus is finished (arrival of DRY) and while the external bus is ending its DMA cycle.

The switch must be set to 0 if the DMA bandwidth of the external bus is very critical (the bus needs every DMA cycle in periods). Otherwise, the switch should be set to 1, which gives optimum usage of the ND-100 bus.

To be compatible with the 3008 module, the switch must be set to 0.

8.16 GPIB controller (3026)

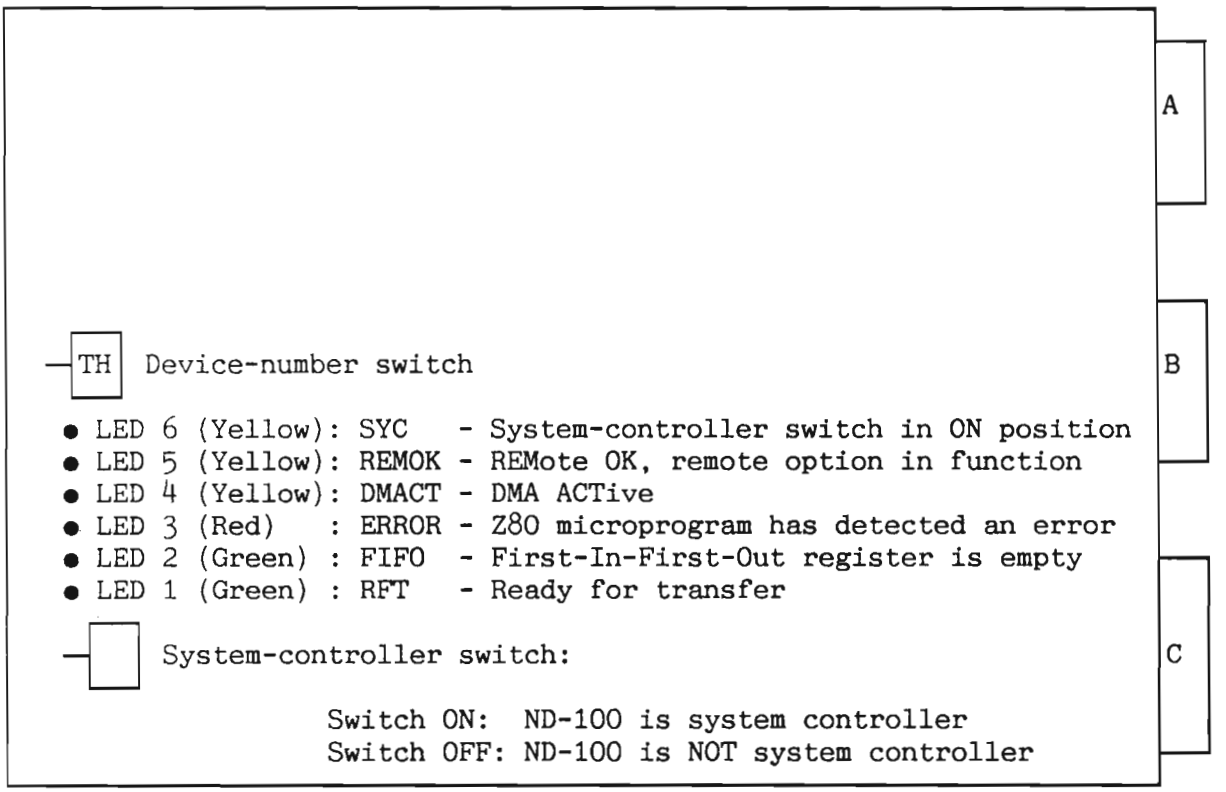


Figure 56. GPIB Controller (3026)

DEVICE-NUMBER SELECTION:

Thumbwheel setting:	Device/ Dev. No: (1)	Ident code: (1)	PROM addresses odd (2) (1)	even (2) (1)
1	0/140000	140000	00 000	00 000
2	1/140010	140001	01 001	01 001
3	0/141400	140140	60 140	60 140
4	0/141410	140141	61 141	61 141
5	0/141420	140142	62 142	62 142
6	0/141430	140143	63 143	63 143
7	0/141440	140144	64 144	64 144
8	0/141450	140145	65 145	65 145

(1) : Octal
(2) : Hexadecimal

Table 22. Device Number Selection on the GPIB Controller (3026)

8.17 Floppy disk controller for DMA (3027)

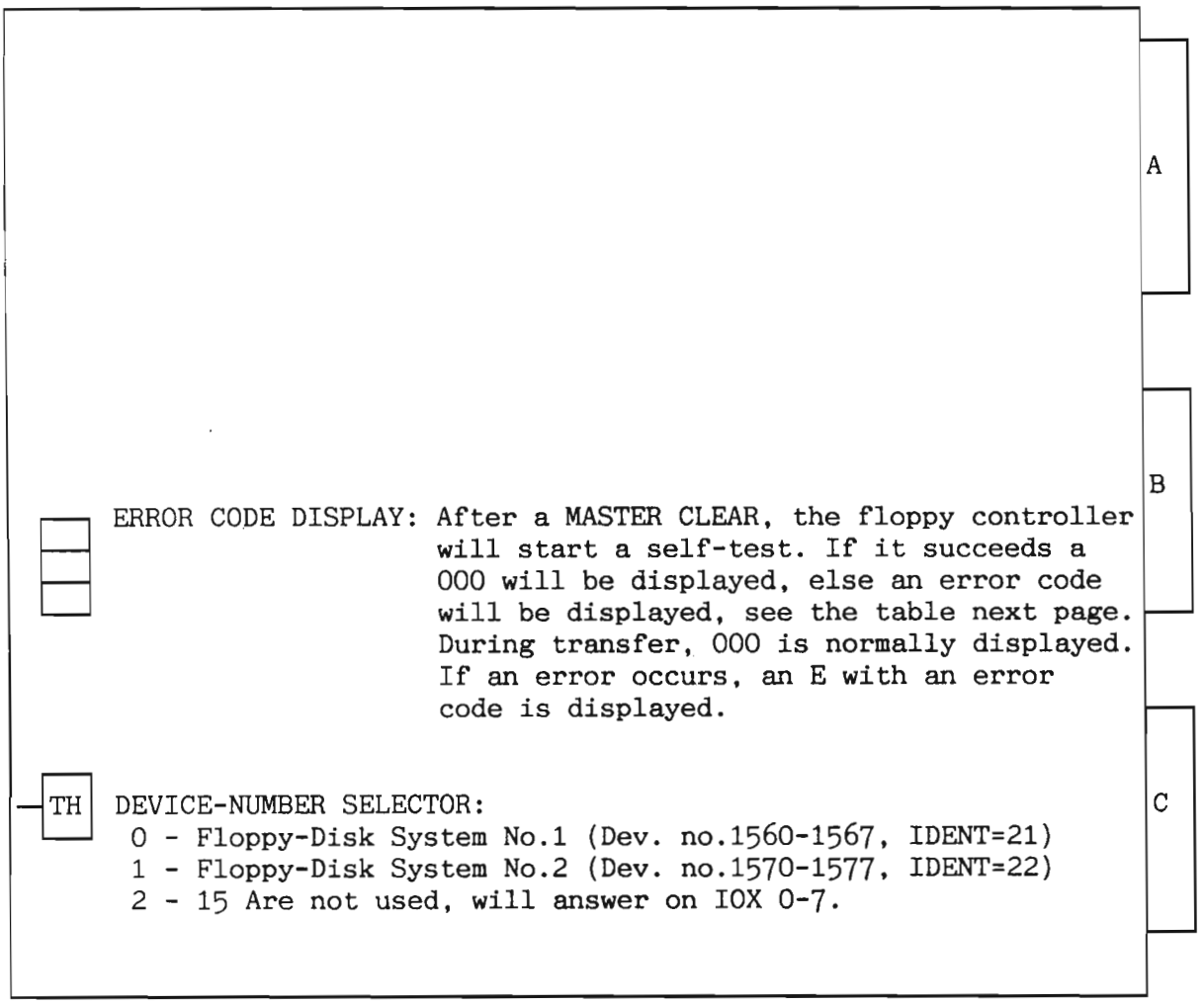


Figure 57. Floppy Disk Controller for DMA (3027)

ERROR CODE DISPLAY:

Display:	Meaning:	
000	OK	
001-004	Not used	
005	CRC error	
006	Sector not found	
007	Track not found	
010	Format not found	
011	Diskette defect (impossible to format)	
012	Format mismatch	
013	Illegal format specified	
014	Single-sided diskette inserted	
015	Double-sided diskette inserted	
016	Write-protected diskette	
017	Deleted record	
020	Drive not ready	
021	Controller busy on start	
022	Lost data (over or underrun)	
023	Track zero not detected	
024	VCO (Voltage-Controlled Oscillator) frequence out of range	
025	Microprogram out of range	
026	Timeout	
027	Undefined error	
030	Track out of range	
031	RAM error	
032	Compare error (during compare of data)	
033	Internal DMA errors	
040	ND-100 Bus-error during command fetch	
041	ND-100 Bus-error during status transfer	
042	ND-100 Bus-error during data transfer	
043	Illegal command	
044	Word count not zero	
050	No bootstrap found on diskette	Error during
051	Wrong bootstrap (too old flo-mon version)	autoload
070	PROM checksum error	
071	RAM error	
072	CTC error	
073	DMACTRL error	
074	VCO error	
075	Floppy-controller error	

8.18 Bus expander (3028)

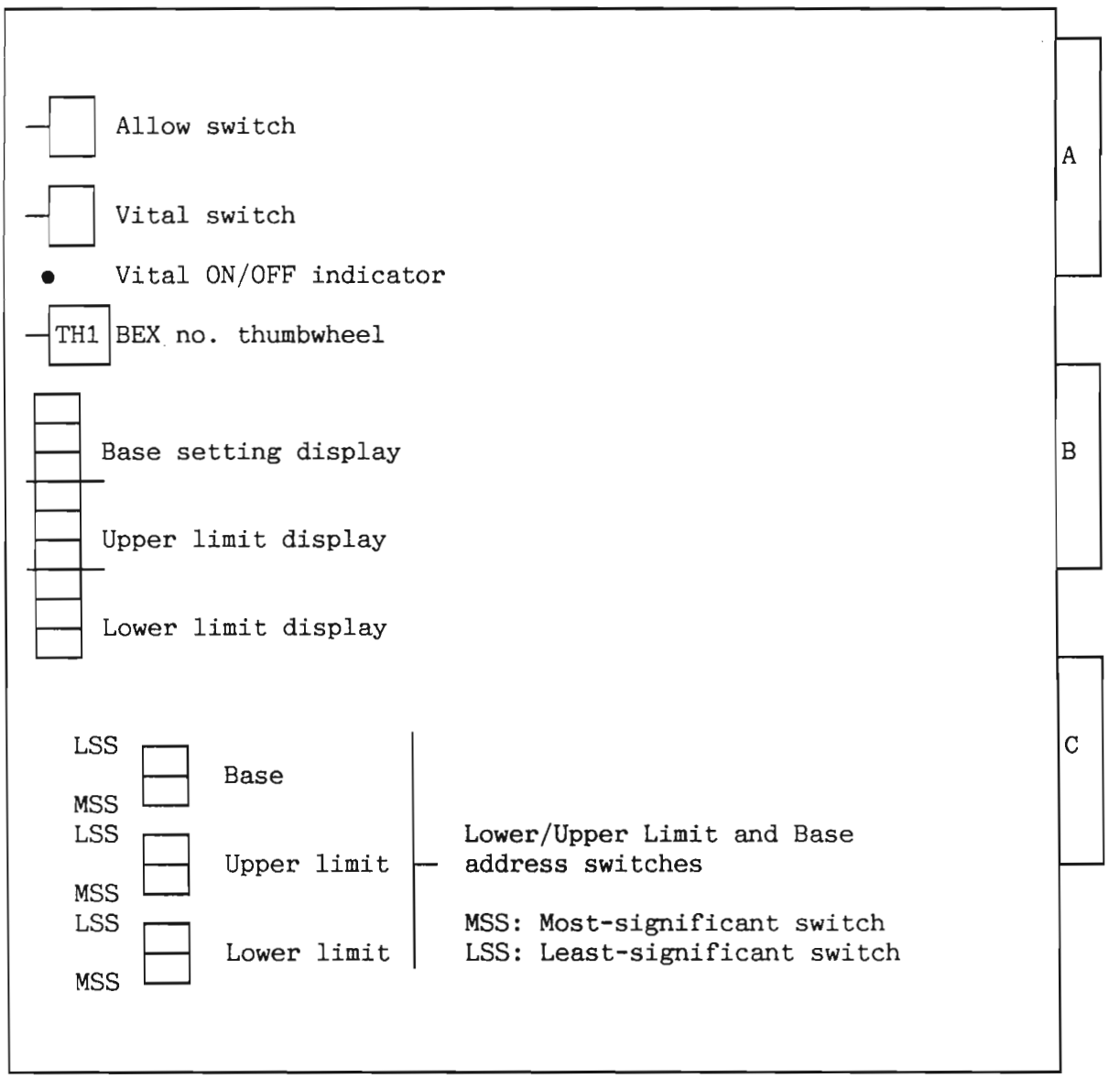


Figure 58. Bus Expander (BEX) (3028)

LIMIT SWITCHES:

On each BEX connected to a crate containing memory, the limit switches are used to specify the memory area covered by the crate. These values could also be set by a program.

LOWER LIMIT: Two hex switches for the setting of lower memory boundaries for this crate.

UPPER LIMIT: Two hex switches for the setting of upper memory boundaries for this crate.

BASE : The purpose of the base register is to give a positive offset to the address presented to a card crate.

For addresses below 1 M word, lower limit is set equal to the base.

The resolution of the switches is 64 K words per step turn on the least-significant limit switch.

DISPLAYS:

The displays will always show the currently used limit/base setting. Thus, corresponding display and pair of switches will be equal if none of the limit registers have been programmed to another value than set by the switches.

BEX NUMBERS SWITCH-SETTING (TH1): Eight BEX numbers are defined, and the device number thumbwheel may thus take values from 0,1,...7.

Thumbwheel setting	Dev.No.	Int.level	Ident. Code
0*	1000000	13	10
1	1000004	13	11
2	1000010	13	12
3	1000014	13	13
4	1000020	13	14
5	1000024	13	15
6	1000030	13	16
7	1000034	13	17

*BEX No. 0 is defined as MASTER BEX and should be placed in the A crate.

Table 23. BEX Number Setting on the Bus Expander (BEX) (3028)

VITAL SWITCH AND INDICATOR: The Vital switch controls how a BEX (BEX No=>1) will report a power-fail interrupt:

ON - Power failure in the crate will be reported as a level 14 interrupt to the CPU.

OFF- Power failure in the crate will be reported as a level-13 interrupt to the CPU. The Yellow LED will be lit when the Vital switch is in the OFF position.

ALLOW SWITCH: This function is not applicable, and the switch should always be in the ON position on all BEXs.

8.19 Universal DMA controller (3029)

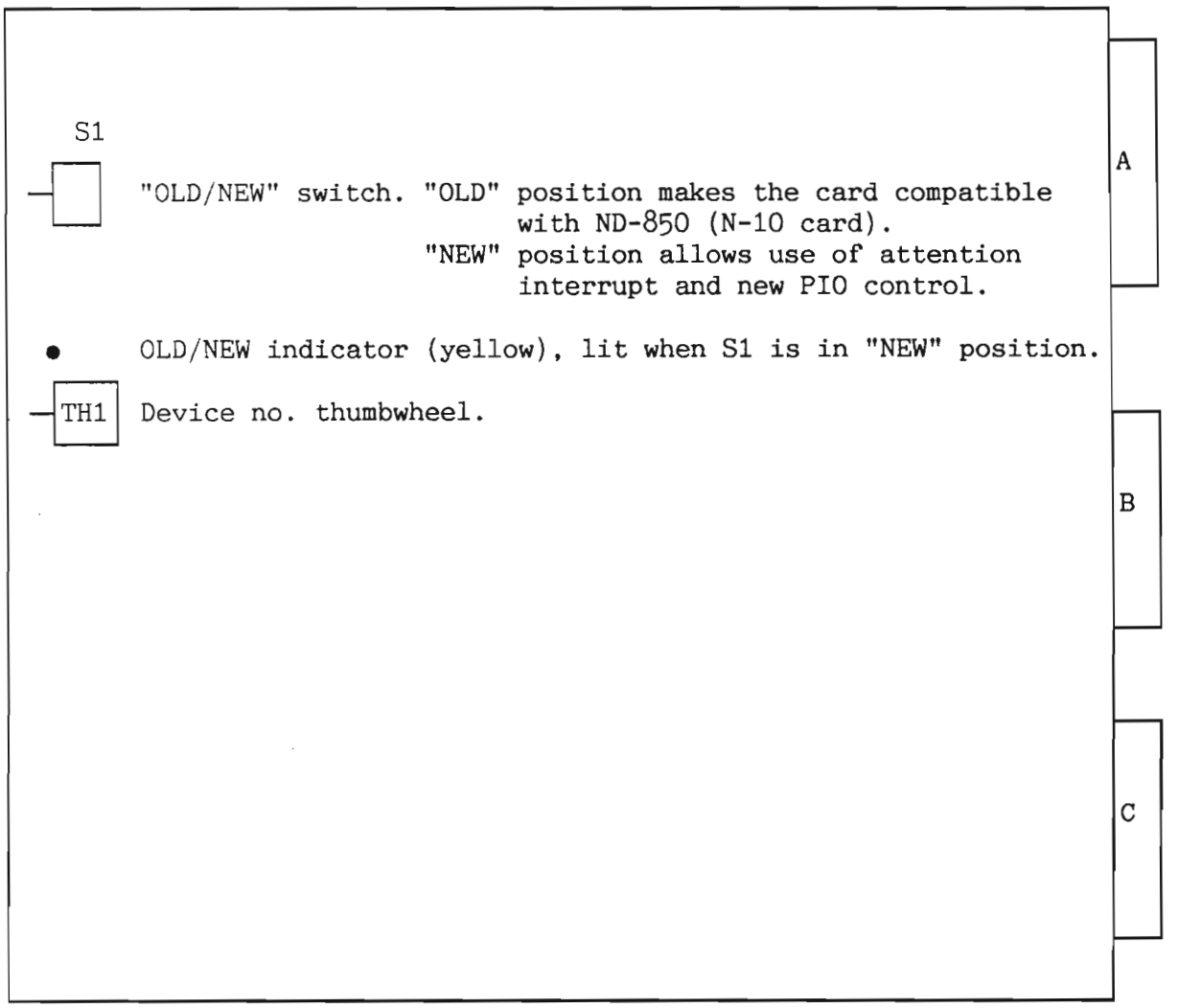


Figure 59. Universal DMA Controller (3029)

DEVICE NUMBERS:

TH1-setting	Device number	Ident-code
0	140050-14057	14010
1	140060-14067	14011
2	140070-14077	14012
3	140100-14107	14013
4	140110-14117	14014
5	140120-14127	14015
6	140130-14137	14016
7	140140-14147	14017
8	140150-14157	14020
9	140160-14167	14021
10	140170-14177	14022
11	140200-14207	14023
12	140210-14217	14024
13	140220-14227	14025
14	140230-14237	14026
15	140240-14247	14027

Table 24. Device Numbers on the Universal DMA (3029)

8.20 N100 bus controller (3031)

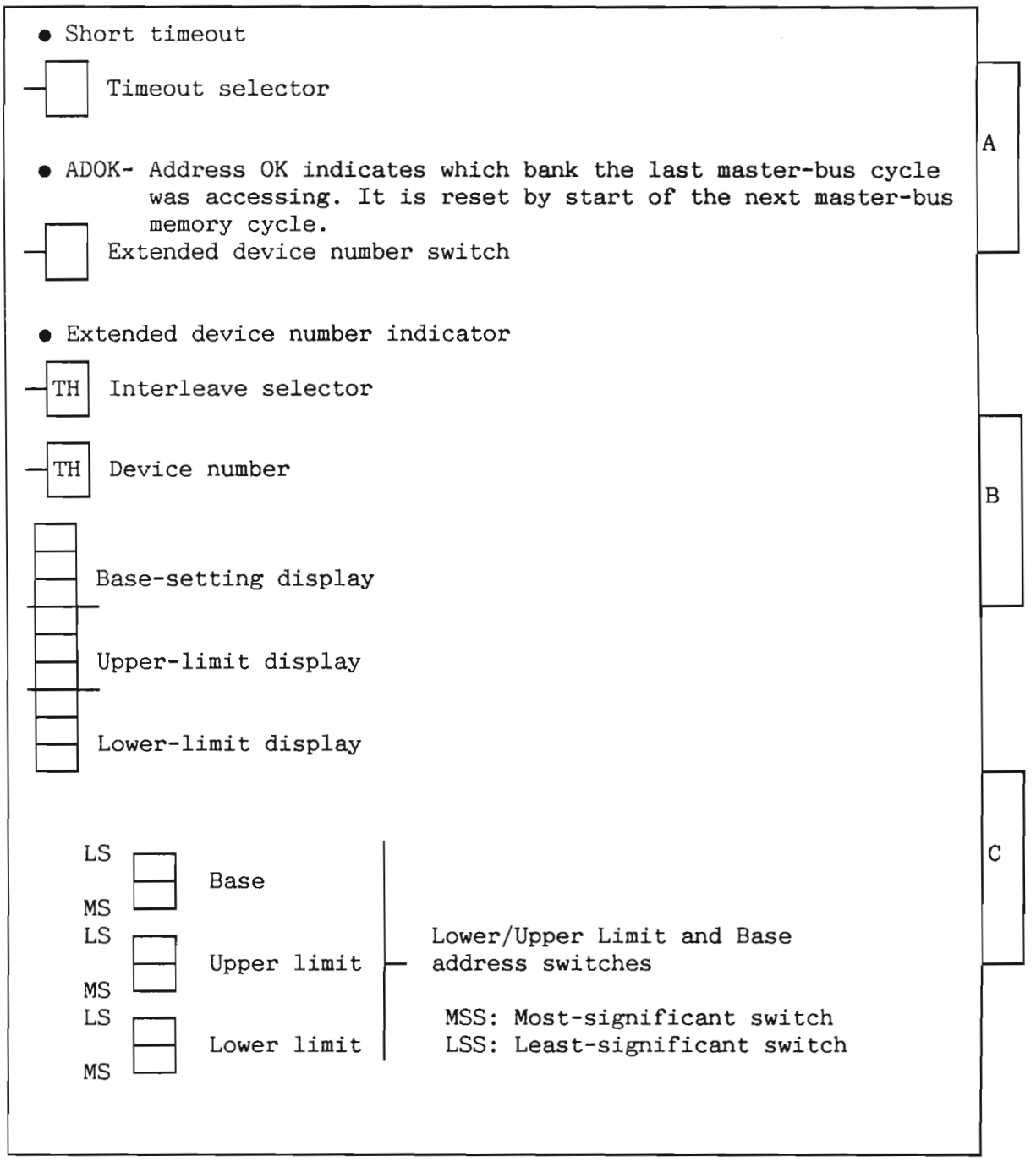


Figure 60. ND-100 Bus Controller (3031)

DEVICE NUMBERS:

There are 32 device-numbers allocated for the ND-100 Bus Controller, but the Device-Number Thumbwheel has only 16 positions.

To allow for 32 Bus Controllers, we must use the extended device-number Switch. A unique device number and Ident Code correspond to each position, in accordance with table 24.

Ext.device no. switch	Thumbwheel setting	Dev. No.	Ident level 13
OFF	0	100200	20
OFF	1	100204	21
OFF	2	100210	22
OFF	3	100214	23
OFF	4	100220	24
OFF	5	100224	25
OFF	6	100230	26
OFF	7	100234	27
OFF	8	100240	30
OFF	9	100244	31
OFF	10	100250	32
OFF	11	100254	33
OFF	12	100260	34
OFF	13	100264	35
OFF	14	100270	36
OFF	15	100274	37
ON	0	100300	40
ON	1	100304	41
ON	2	100310	42
ON	3	100314	43
ON	4	100320	44
ON	5	100324	45
ON	6	100330	46
ON	7	100334	47
ON	8	100340	50
ON	9	100344	51
ON	10	100350	52
ON	11	100354	53
ON	12	100360	54
ON	13	100364	55
ON	14	100370	56
ON	15	100374	57

Table 25. Device Numbers on the ND-100 Bus Controller (3031)

LIMIT DISPLAYS:

The switch settings are octally displayed in three-digit displays. Each switchsetting will be shown in the corresponding display in 64K-word increments.

The following table gives the correspondence between switch settings and display presentation.

	MOST 0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
LEAST																
0	000	020	040	060	100	120	140	160	200	220	240	260	300	320	340	360
1	001	021	041	061	101	121	141	161	201	221	241	261	301	321	341	361
2	002	022	042	062	102	122	142	162	202	222	242	262	302	322	342	362
3	003	023	043	063	103	123	143	163	203	223	243	263	303	323	343	363
4	004	024	044	064	104	124	144	164	204	224	244	264	304	324	344	364
5	005	025	045	065	105	125	145	165	205	225	245	265	305	325	345	365
6	006	026	046	066	106	126	146	166	206	226	246	266	306	326	346	366
7	007	027	047	067	107	127	147	167	207	227	247	267	307	327	347	367
8	010	030	050	070	110	130	150	170	210	230	250	270	310	330	350	370
9	011	031	051	071	111	131	151	171	211	231	251	271	311	331	351	371
A	012	032	052	072	112	132	152	172	212	232	252	272	312	332	352	372
B	013	033	053	073	113	133	153	173	213	233	253	273	313	333	353	373
C	014	034	054	074	114	134	154	174	214	234	254	274	314	334	354	374
D	015	035	055	075	115	135	155	175	215	235	255	275	315	335	355	375
E	016	036	056	076	116	136	156	176	216	236	256	276	316	336	356	376
F	017	037	057	077	117	137	157	177	217	237	257	277	317	337	357	377

Table 26. The Limit Displays on the ND-100 Bus Controller (3031)

INTERLEAVE:

Thumbwheel setting	Interleave	Vital	Delay
0	None	Yes	No
1	2-way	Yes	No
2	4-way	Yes	No
3	8-way	Yes	No
4	None	No	No
5	2-way	No	No
6	4-way	No	No
7	8-way	No	No
8	None	Yes	Yes
9	2-way	Yes	Yes
10	4-way	Yes	Yes
11	8-way	Yes	Yes
12	None	No	Yes
13	2-way	No	Yes
14	4-way	No	Yes
15	8-way	No	Yes

Table 27. Interleave on the ND-100 Bus Controller (3031)

VITAL: If Vital=YES, a locally detected PFI (Power-Fail Interrupt) will be sent to the Master ND-100 (the CPU is detecting this as a regular power -fail interrupt).

If Vital=NO, the PFI will result in a level-13 interrupt, which will be sent to the Master ND-100.

DELAY: If the bus controlled by the Bus Controller contains MPM-4 Ports only, the delay is not necessary.

It is only necessary if the Bus contains regular DMA devices.

TIMEOUT SELECTOR:

The timeout selector is used to select two different timeouts:

- short timeout (2 mS)

or

- long timeout (8 mS)

A BUSC controlling a memory bank should have a short timeout.

A BUSC controlling an I/O bus should have a long timeout.

The timeout indicator will be lit if short timeout is selected.

LIMIT SWITCHES:

The address area for a bus controller is decided by the setting of lower and upper address limit. The limit-address increments are 64 K units.

LOWER LIMIT: Two hex switches for setting of lower-memory boundaries.

UPPER LIMIT: Two hex switches for setting of upper-memory boundaries.

BASE : Two hex switches for setting the base.

8.21 Memory port - MPM-4 (3032)

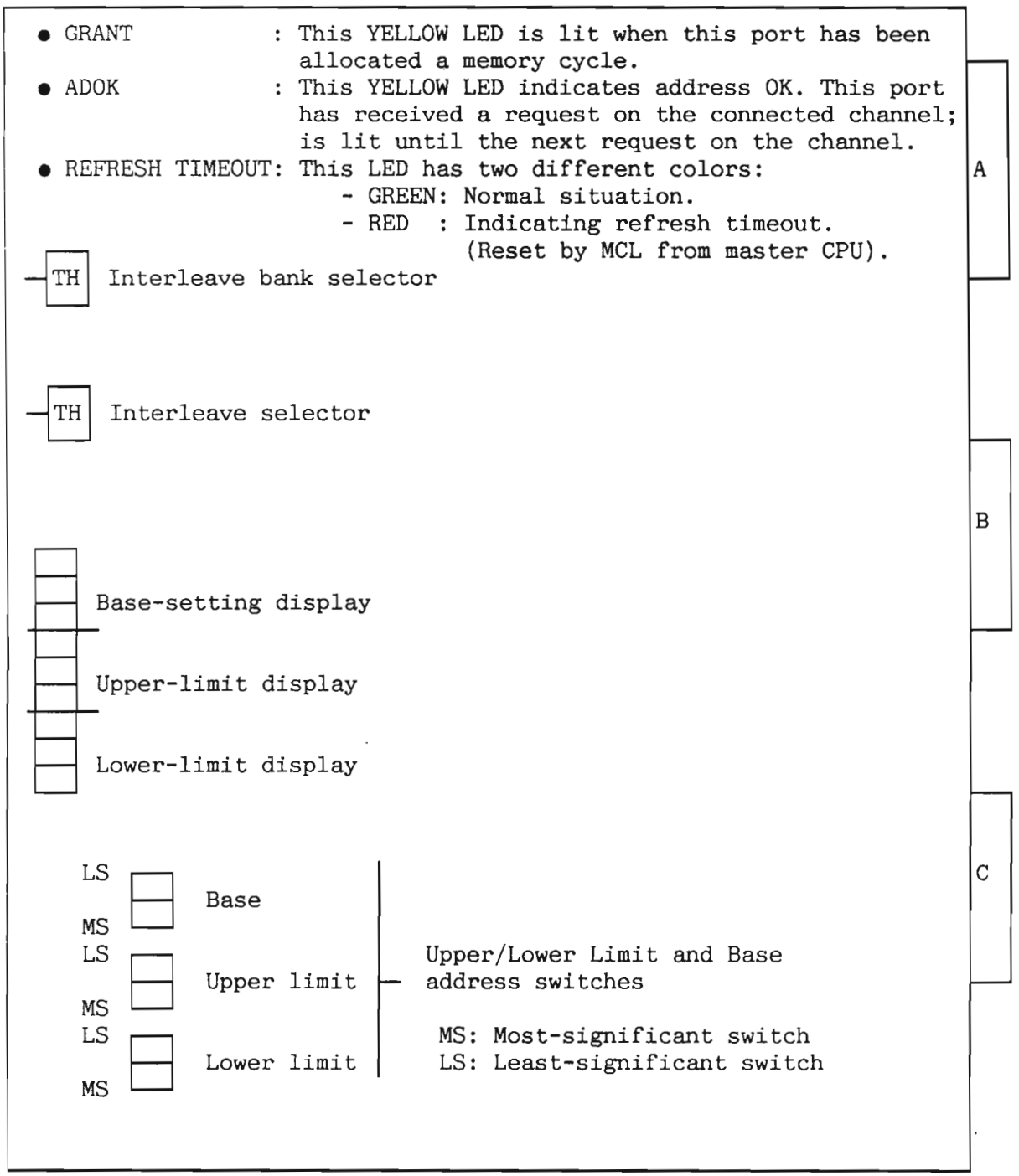


Figure 61. Memory Port — MPM4 (3032)

LIMIT SWITCHES:

The address area for a PORT is decided by the setting of lower and upper-address limits. The limit-address increments are 64 K units.

LOWER LIMIT: Two hex switches for setting of lower memory boundaries.

UPPER LIMIT: Two hex switches for the setting of upper memory boundaries.

BASE : Two hex switches for setting the base.

INTERLEAVE:

Thumbwheel setting	Interleave	Speed-up	Write parity
0	None	No	No
1	2-way	No	No
2	4-way	No	No
3	8-way	No	No
4	None	Yes	No
5	2-way	Yes	No
6	4-way	Yes	No
7	8-way	Yes	No
8	None	No	Yes
9	2-way	No	Yes
10	4-way	No	Yes
11	8-way	No	Yes
12	None	Yes	Yes
13	2-way	Yes	Yes
14	4-way	Yes	Yes
15	8-way	Yes	Yes

Table 28. Interleave on the Memory Port — MPM4 (3032)

SPEEDUP:

Speedup=0: Address not ready prior to the request.

Speedup=1: Address ready 50 nS prior to the request.

WRITE PARITY:

Might be set to YES when the source generates ODD byte parity when writing into memory.

INTERLEAVE BANK SELECTOR:

This thumbwheel uses 8 positions (0-7), and is used in connection with the interleave-selector thumbwheel.

The least significant bits of the channel address are used to select the bank, and this thumbwheel selects these bits like this:

2-ways interleave:

- Bit 0 of the channel address selects one of two banks.

4-ways interleave:

- Bits 0 and 1 of the channel address select one of four banks.

8-ways interleave:

- Bits 0, 1 and 2 of the channel address select one of eight banks.

8.22 CPU module (3033)

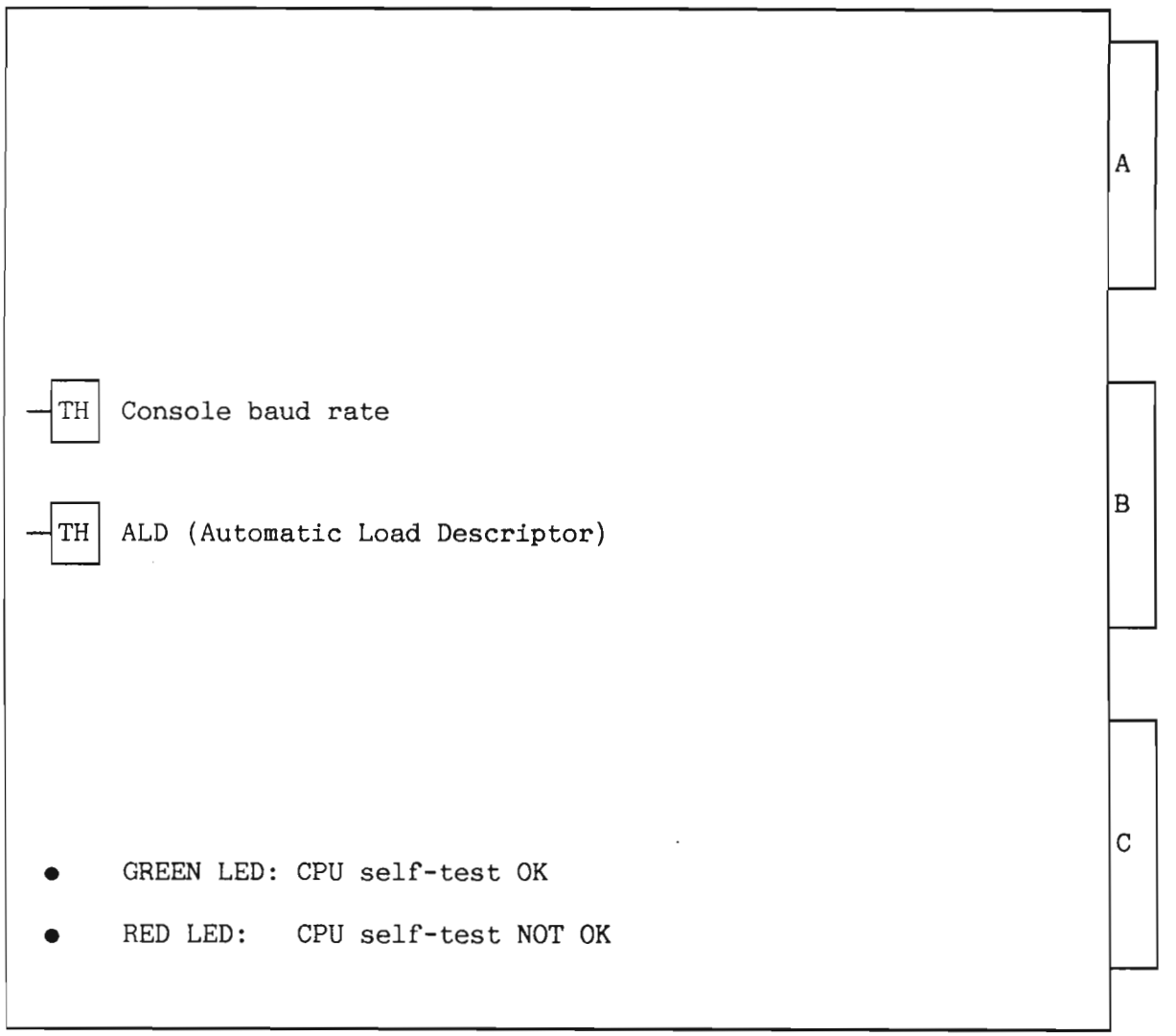


Figure 62. CPU Module (3033)

ALD THUMBWHEEL:

ALD	I 12	LOCK and Standby Power OK	LOCK and Standby Power not OK	UNLOCK and Load
15	0	Start in address 20	Stop	Nothing
14	1560	Start in address 20	Binary load from 1560	Binary load from 1560
13	20500	Start in address 20	Mass load from 500	Mass load from 500
12	21540	Start in address 20	Mass load from 1540	Mass load from 1540
11	400	Start in address 20	Binary load from 400	Binary load from 400
10	1600	Start in address 20	Binary load from 1600	Binary load from 1600
9		Start in address 20		
8		Start in address 20		
7	100000	Stop	Stop	Nothing
6	101560	Binary load from 1560	Binary load from 1560	Binary load from 1560
5	120500	Mass load from 500	Mass load from 500	Mass load from 500
4	121540	Mass load from 1540	Mass load from 1540	Mass load from 1540
3	100400	Binary load from 400	Binary load from 400	Binary load from 400
2	101600	Binary load from 1600	Binary load from 1600	Binary load from 1600

Table 29. ALD on the CPU Module (3033)

BAUD RATE:

Switch-setting:	Baud rate:
0	110
1	150
2	300
3	2400
4	1200
5	1800
6	4800
7	9600
8	2400
9	600
10	200
11	134.5
12	75
13	50
14	ext.
15	ext.

Table 30. Baud Rate on the CPU Module (3033)

8.23 256 K memory module (3034)

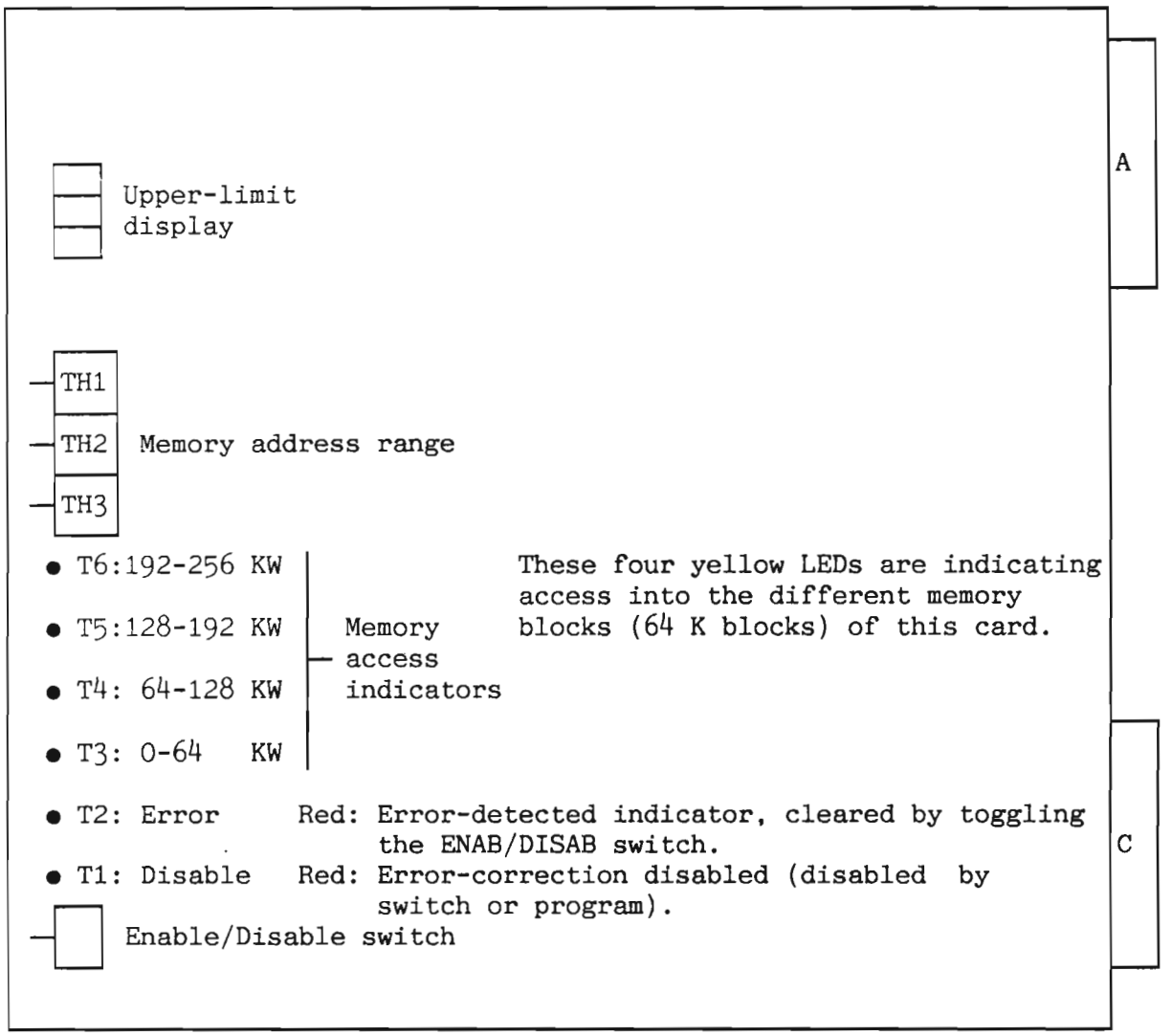


Figure 63. 256 K Memory Module (3034)

MEMORY-ADDRESS-RANGE SETTING AND UPPER-LIMIT DISPLAY:

NOTE

If the CPU is a ND-120, you must use the value displayed by the MEMORY SIZE INDICATOR as lower limit on the first memory card.

Thumbwheel setting (octal) TH3	TH2	TH1	Upper-limit display (octal)	Memory addr. range in KW lower-upper
0	0	0-3	020	0- 256
0	0	4-7	024	64- 320
0	1	0-3	030	128- 384
0	1	4-7	034	192- 448
0	2	0-3	040	256- 512
0	2	4-7	044	320- 576
0	3	0-3	050	384- 640
.	.	.	.	.
.	.	.	.	.
1	0	0-3	120	1024-1280
1	0	4-7	124	1088-1344
1	1	0-3	130	1152-1408
.	.	.	.	.
.	.	.	.	.
7	7	4-7	720	6784-7040

Table 31. Memory Address Range on the 256 K Memory Module (3034)

SETTING THE ENABLE/DISABLE SWITCH: Switch in position 0 (DISAB):

- Disables the ERROR CORRECTION .
- Clears the ERROR-DETECTED indicator.

Switch in position 1 (ENAB):

- Enables the ERROR CORRECTION.

8.24 64 K memory module (3036)

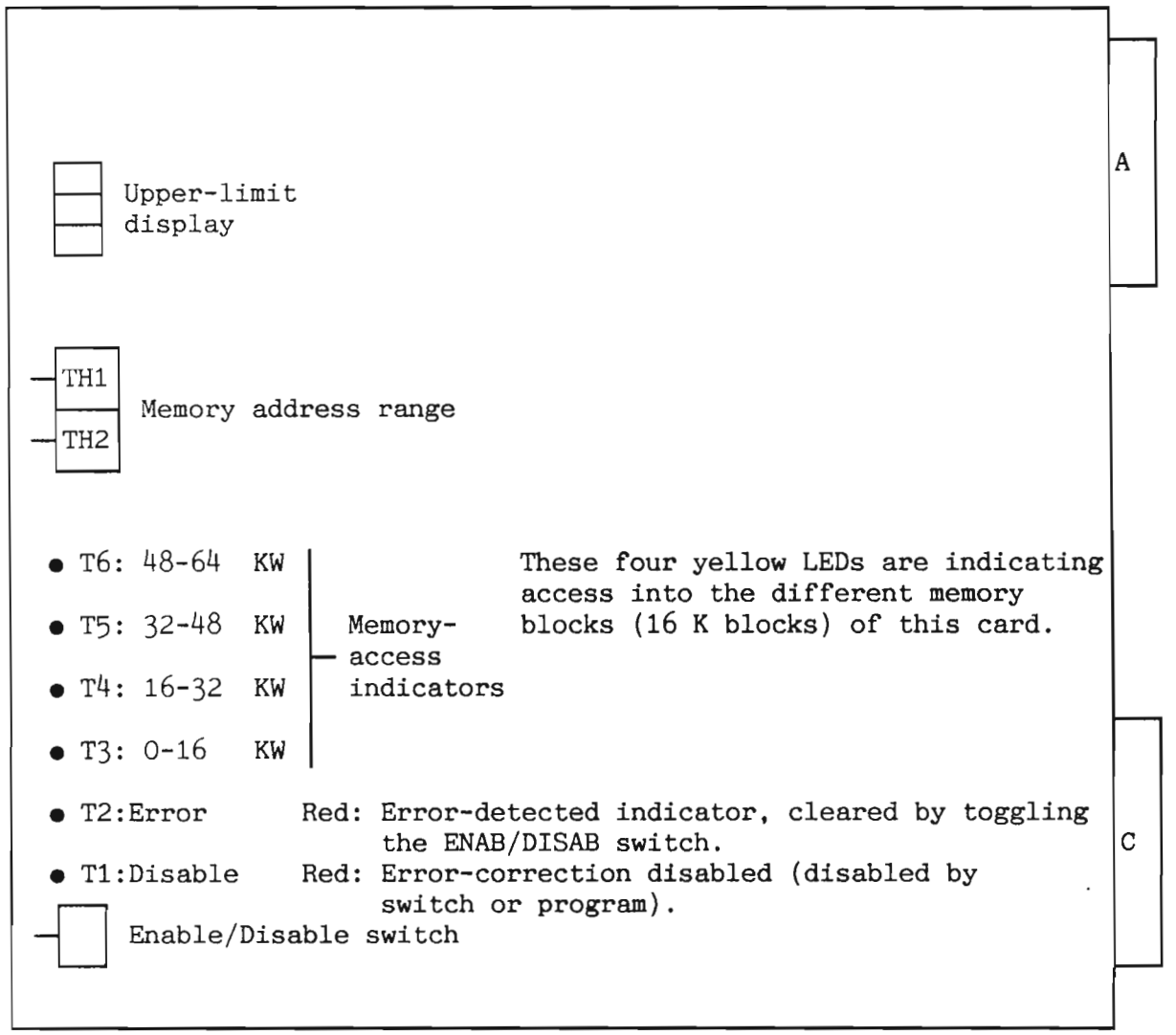


Figure 64. 64 K Memory Module (3036)

MEMORY-ADDRESS-RANGE SETTING AND UPPER-LIMIT DISPLAY:

NOTE

If the CPU is a ND-120, you must use the value displayed by the MEMORY SIZE INDICATOR as lower limit on the first memory card.

Thumbwheel setting (octal) TH2 TH1	Upper-limit display (octal)	Memory addr. range in KW lower-upper
0 0	04	0- 64
0 1	05	16- 80
0 2	06	32- 96
. .	.	.
. .	.	.
1 0	14	128- 192
1 1	15	144- 208
. .	.	.
. .	.	.
7 3	77	944-1008

Table 32. Memory Address Range on the 64 K Memory Module (3036)

SETTING THE ENABLE/DISABLE SWITCH: Switch in position 0 (DISAB):

- Disables the ERROR-CORRECTION.
- Clears the ERROR-DETECTED indicator.

Switch in position 1 (ENAB):

- Enables the ERROR CORRECTION.

8.25 8" disk controller (3038)

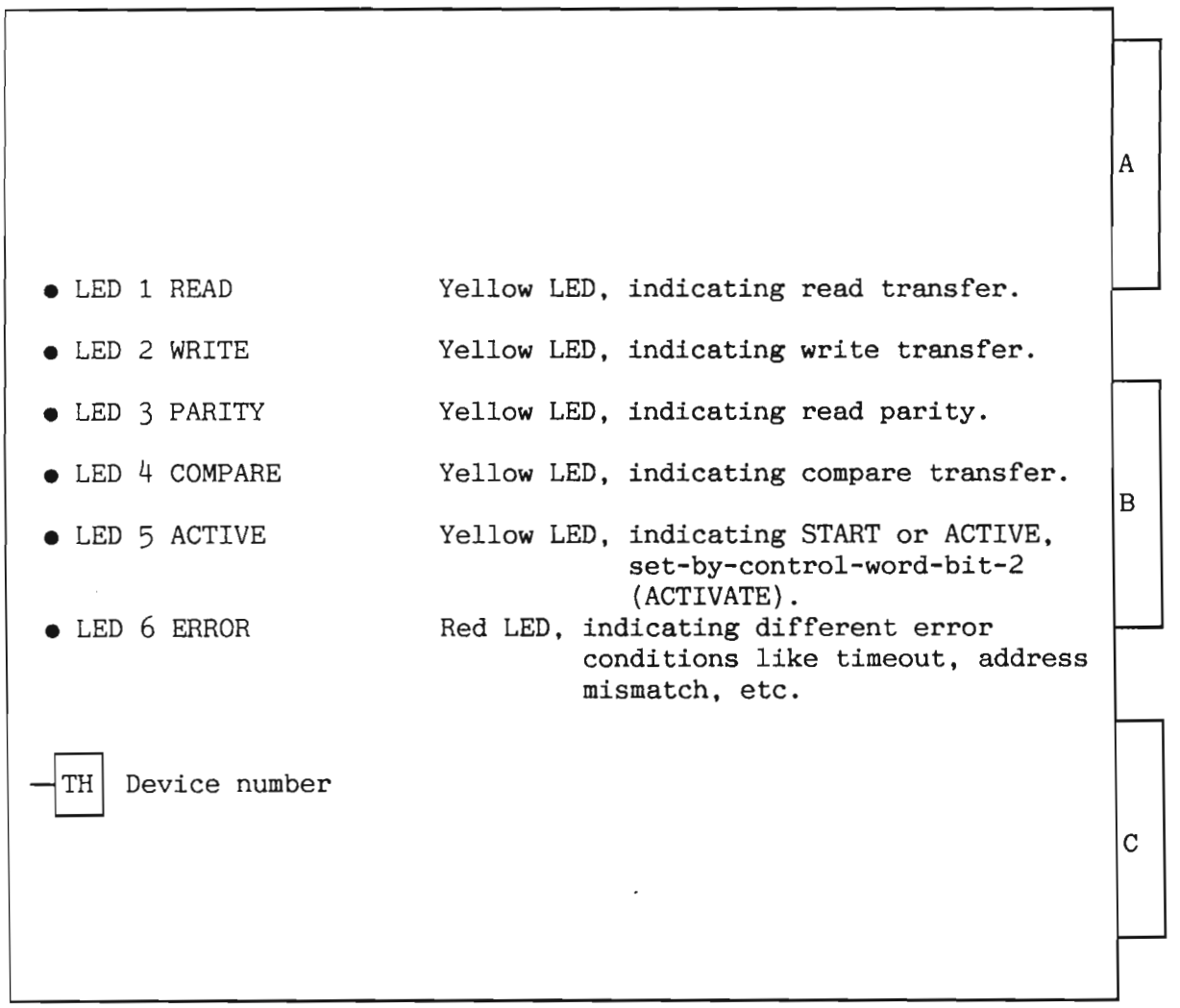


Figure 65. 8" Disk Controller (3038)

DEVICE-REGISTER ADDRESS RANGE:

Thumbwheel setting	Device-register address range	Ident Code (Octal)	Device name
0	500-507	1	Disk system 1
1	510-517	5	Disk system 2

Table 33. Device-Register Address Range on the 8" Disk Controller (3038)

8.26 ND-100 bus controller (3039)

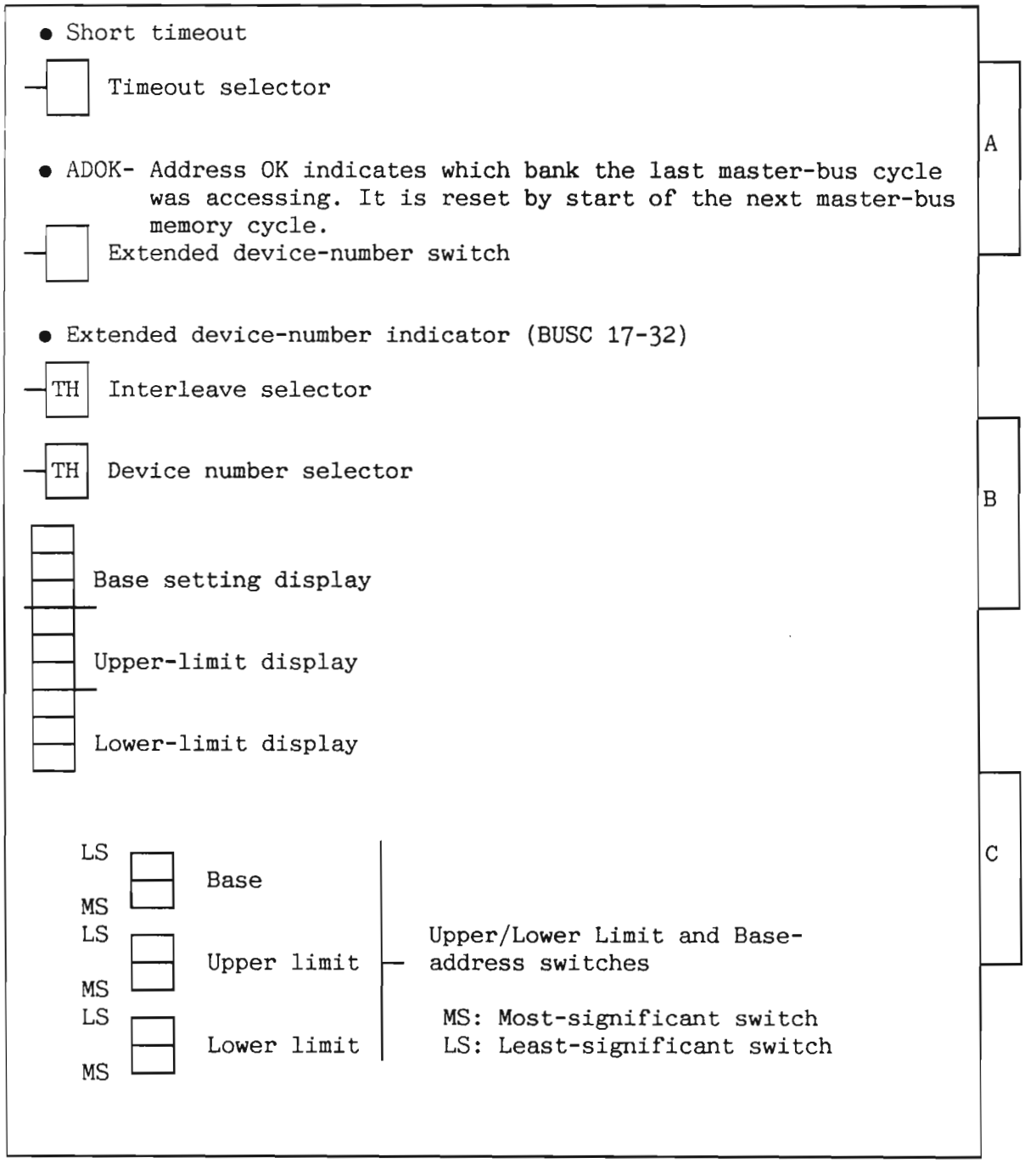


Figure 66. ND-100 Bus Controller (3039)

LIMIT SWITCHES:

The address area for a bus controller is decided by the setting of lower and upper address limit. The limit-address increments are 64 K units.

LOWER LIMIT: Two hex switches for the setting of lower-memory boundaries.

UPPER LIMIT: Two hex switches for the setting of upper-memory boundaries.

BASE : Two hex switches for setting the base.

DEVICE NUMBERS:

There are 32 device numbers allocated for the ND—100 Bus Controller, but the Device-Number Thumbwheel has only 16 positions.

To allow for 32 bus controllers, we must use the Extended Device-Number Switch. A unique device number and ident code correspond to each position, in accordance with the table on page 223.

External device-number switch	Thumbwheel setting	Device number	Ident code
OFF	0	100200-100203	20
OFF	1	100204-100207	21
OFF	2	100210-100213	22
OFF	3	100214-100217	23
OFF	4	100220-100223	24
OFF	5	100224-100227	25
OFF	6	100230-100233	26
OFF	7	100234-100237	27
OFF	8	100240-100243	30
OFF	9	100244-100247	31
OFF	10	100250-100253	32
OFF	11	100254-100257	33
OFF	12	100260-100263	34
OFF	13	100264-100267	35
OFF	14	100270-100273	36
OFF	15	100274-100277	37
ON	0	100300-100303	40
ON	1	100304-100307	41
ON	2	100310-100313	42
ON	3	100314-100317	43
ON	4	100320-100323	44
ON	5	100324-100327	45
ON	6	100330-100333	46
ON	7	100334-100337	47
ON	8	100340-100343	50
ON	9	100344-100347	51
ON	10	100350-100353	52
ON	11	100354-100357	53
ON	12	100360-100363	54
ON	13	100364-100367	55
ON	14	100370-100373	56
ON	15	100374-100377	57

Table 34. External Device Number Switch on the ND-100 BUSC (3039)

LIMIT DISPLAYS:

The switch settings are octally displayed in three-digit displays. Each switch-setting will be shown in the corresponding display in 64K-word increments.

The following table gives the correspondence between switch settings and display presentation.

	MOST 0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
LEAST																
0	000	020	040	060	100	120	140	160	200	220	240	260	300	320	340	360
1	001	021	041	061	101	121	141	161	201	221	241	261	301	321	341	361
2	002	022	042	062	102	122	142	162	202	222	242	262	302	322	342	362
3	003	023	043	063	103	123	143	163	203	223	243	263	303	323	343	363
4	004	024	044	064	104	124	144	164	204	224	244	264	304	324	344	364
5	005	025	045	065	105	125	145	165	205	225	245	265	305	325	345	365
6	006	026	046	066	106	126	146	166	206	226	246	266	306	326	346	366
7	007	027	047	067	107	127	147	167	207	227	247	267	307	327	347	367
8	010	030	050	070	110	130	150	170	210	230	250	270	310	330	350	370
9	011	031	051	071	111	131	151	171	211	231	251	271	311	331	351	371
A	012	032	052	072	112	132	152	172	212	232	252	272	312	332	352	372
B	013	033	053	073	113	133	153	173	213	233	253	273	313	333	353	373
C	014	034	054	074	114	134	154	174	214	234	254	274	314	334	354	374
D	015	035	055	075	115	135	155	175	215	235	255	275	315	335	355	375
E	016	036	056	076	116	136	156	176	216	236	256	276	316	336	356	376
F	017	037	057	077	117	137	157	177	217	237	257	277	317	337	357	377

Table 35. The Limit Displays on the ND-100 Bus Controller (3039)

INTERLEAVE:

Thumbwheel setting	Interleave	Vital	Delay
0	None	Yes	No
1	2-way	Yes	No
2	4-way	Yes	No
3	8-way	Yes	No
4	None	No	No
5	2-way	No	No
6	4-way	No	No
7	8-way	No	No
8	None	Yes	Yes
9	2-way	Yes	Yes
10	4-way	Yes	Yes
11	8-way	Yes	Yes
12	None	No	Yes
13	2-way	No	Yes
14	4-way	No	Yes
15	8-way	No	Yes

Table 36. Interleave on the ND-100 Bus Controller (3039)

VITAL:

If Vital=YES, a locally detected PFI (Power-Fail Interrupt) will be sent to the Master ND-100 (the CPU detecting this is a regular power fail interrupt).

If Vital=NO, the PFI will result in a level-13 interrupt which will be sent to the Master ND-100.

DELAY:

If the bus controlled by the bus Controller contains MPM-4 Ports only, the delay is not necessary.

It is only necessary if the bus contains regular DMA-devices.

TIMEOUT SELECTOR:

The timeout selector is used to select two different timeouts:

- short timeout (2 mS)

or

- long timeout (8 mS).

A BUSC controlling a memory bank should have a short timeout.

A BUSC controlling an I/O bus should have a long timeout.

The timeout indicator will be lit if short timeout is selected.

8.27 5.25" disk controller (3041)

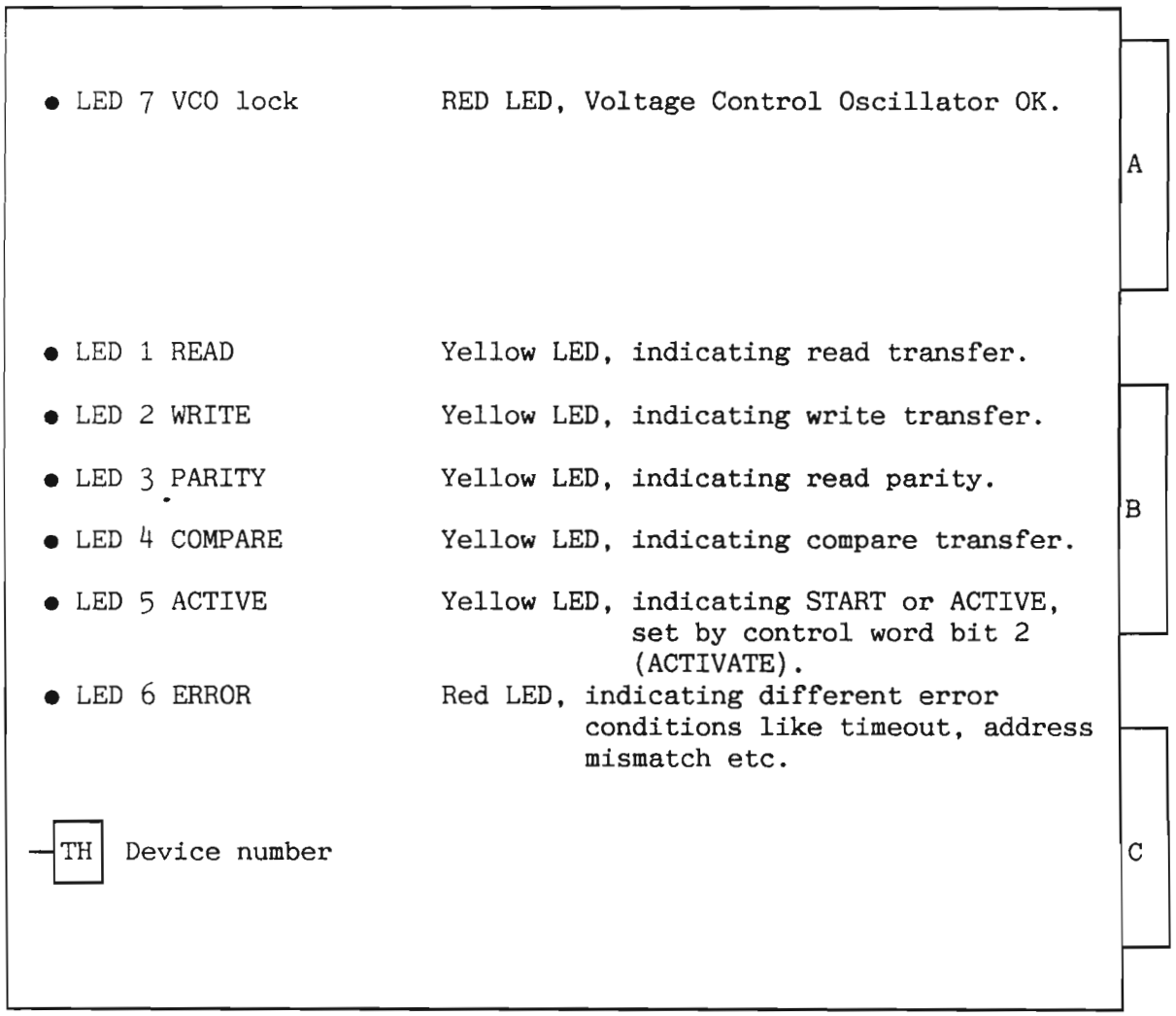


Figure 67. 5.25" Disk Controller (3041)

DEVICE-REGISTER ADDRESS RANGE:

Thumbwheel setting	Device-register address range	Ident Code (Octal)	Device name
0	500-507	1	Disk system 1
1	510-517	5	Disk system 2

Table 37. Device-Register Address Range on the 5.25" Disk Controller (3041)

8.28 2 MB memory module (3042)

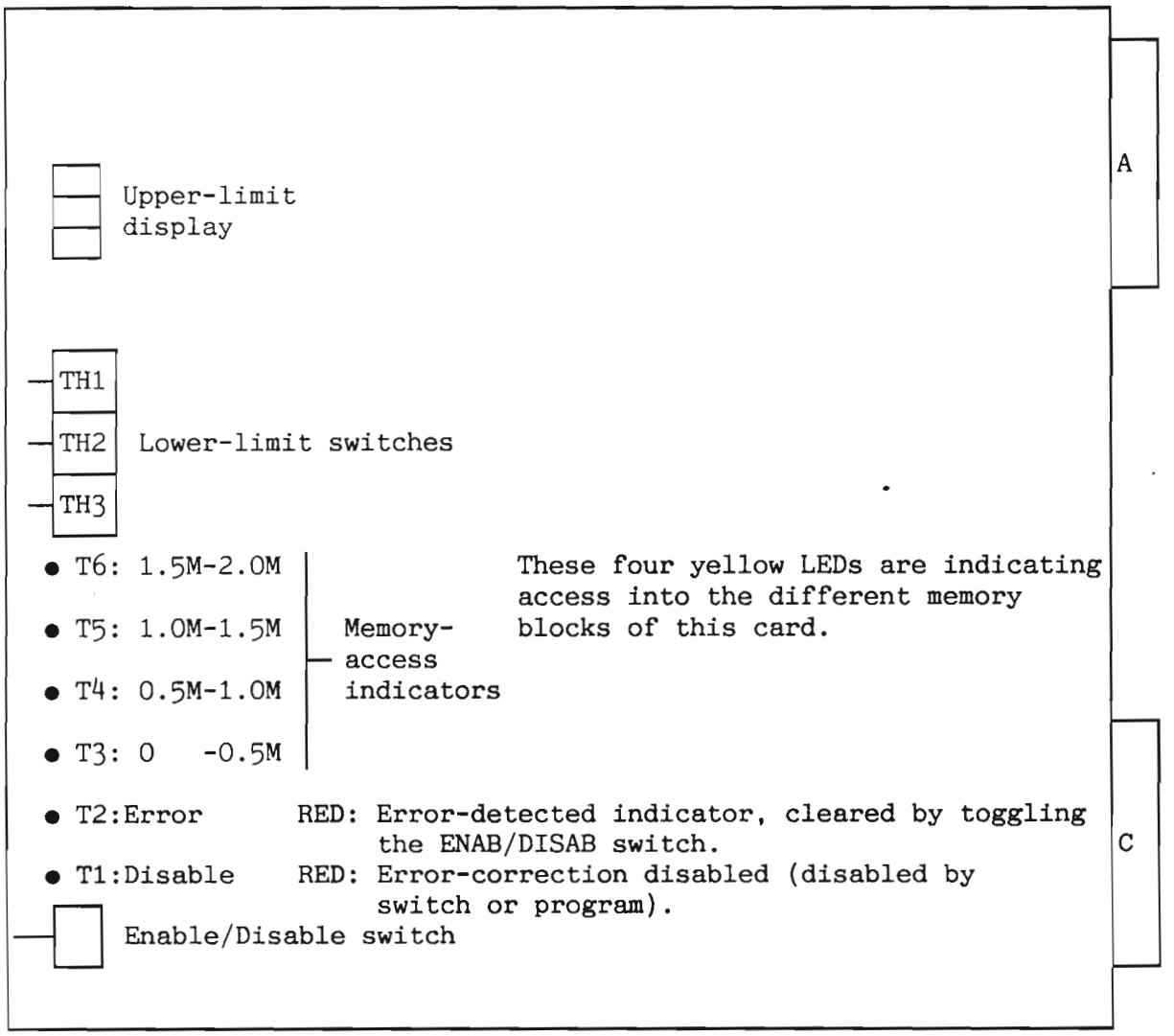


Figure 68. 2 MB Memory Module (3042)

LOWER-LIMIT SWITCH SETTING AND UPPER-LIMIT DISPLAY:

NOTE

If the CPU is a ND-120, you must use the value displayed by the MEMORY SIZE INDICATOR as lower limit on the first memory card.

Thumbwheel setting (octal) TH2	TH1	TH3	Upper limit display	Memory addr. range in KW lower-upper
0	0	0	100	0- 1024
0	2	0	120	256- 1280
0	4	0	140	512- 1536
0	6	0	160	768- 1792
1	0	0	200	1024- 2048
1	2	0	220	1280- 2304
1	4	0	240	1536- 2560
1	6	0	260	1792- 2816
2	0	0	300	2048- 3072
3	0	0	400	3072- 4096
4	0	0	500	4096- 5120
5	0	0	600	5120- 6144
6	0	0	700	6144- 7168

Table 38. Memory Address Range on the 2 MB Memory Module (3042)

SETTING THE ENABLE/DISABLE SWITCH: Switch in position 0 (DISAB):

- Disables the ERROR-CORRECTION.
- Clears the ERROR-DETECTED indicator.

Switch in position 1 (ENAB):

- Enables the ERROR CORRECTION.

8.29 15 MHZ ECC disk controller (3043 and 3044)

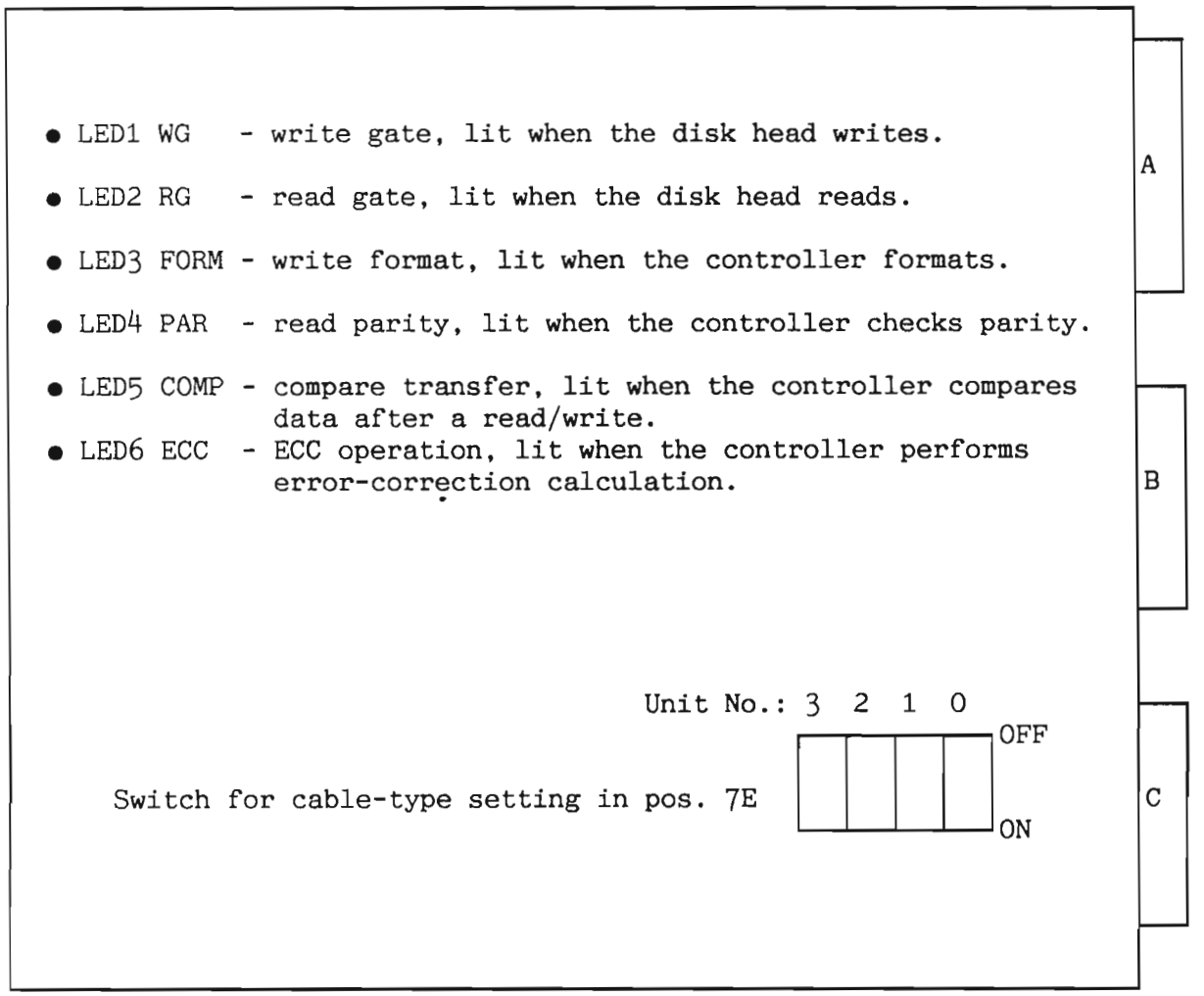


Figure 69. SMD Controller (3043)

CABLE TYPE SWITCH-SETTING (POS.7E): The switch-setting concerns B-cables only (B-cables are the cables going directly from the computer to the disk unit).

The daisy-chain cable may be flat or round.

Switch 7E consists of four switches, one for each disk unit (units 0-3).

The switch must be OFF when the B-cable is round, and ON when the B-cable is flat.

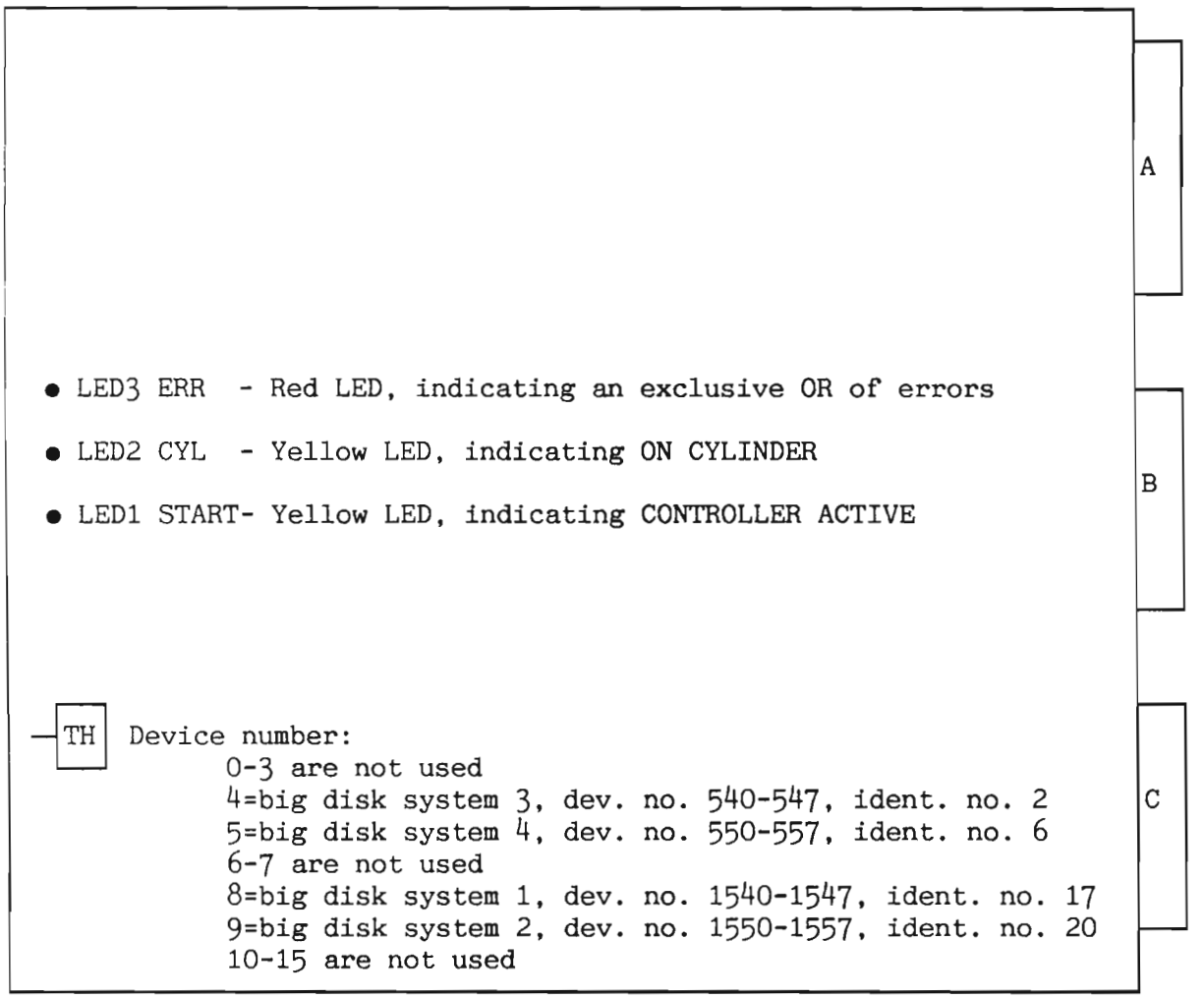


Figure 70. SMD Data (3044)

8.30 ND-110 CPU module (3090/3095)

NOTE

The ALD and Baud-Rate switches have changed places compared to the former ND-100 CPU card.

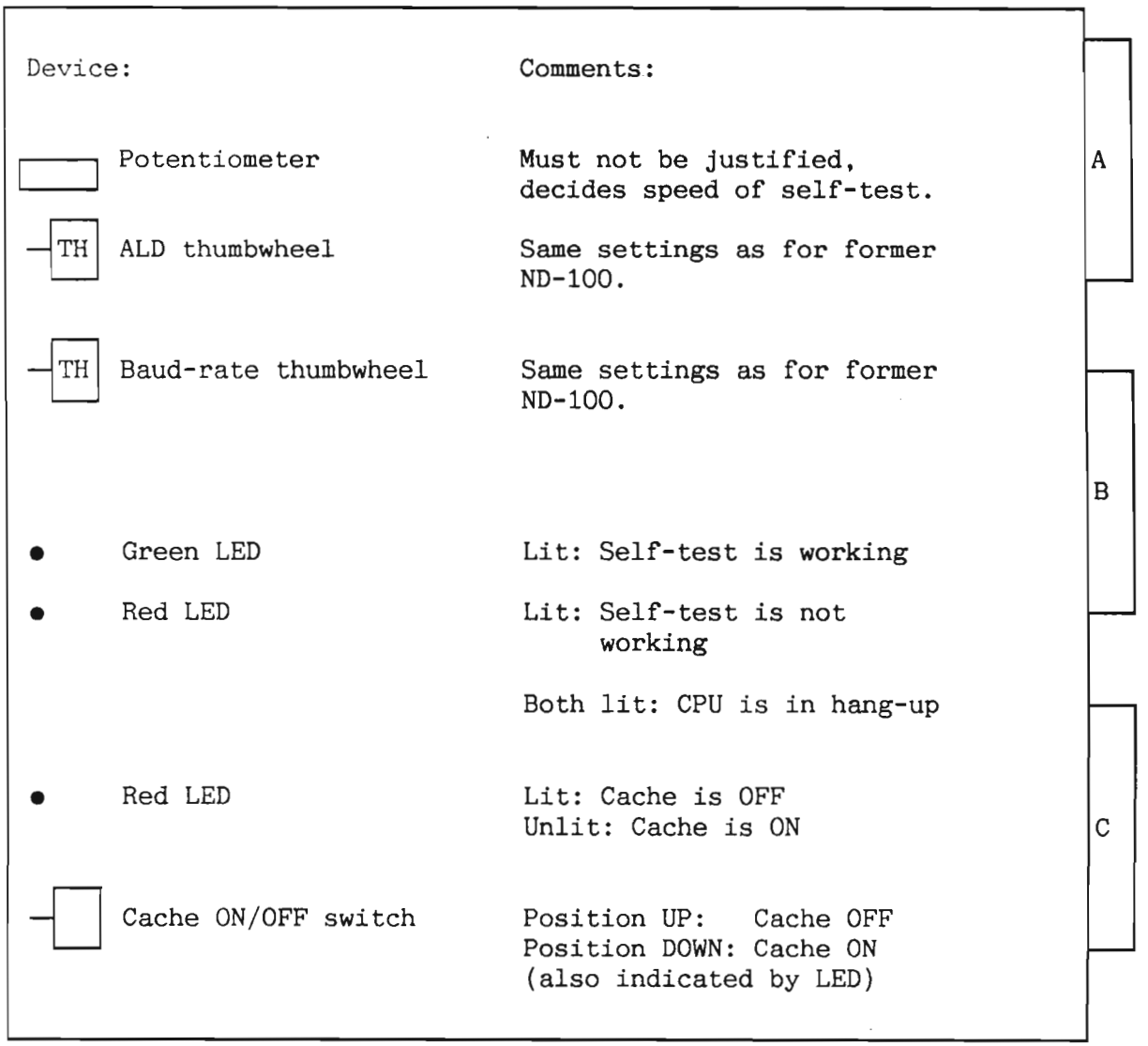


Figure 71. ND-110 CPU Module (3090/3095)

8.31 PIOC interface (3101)

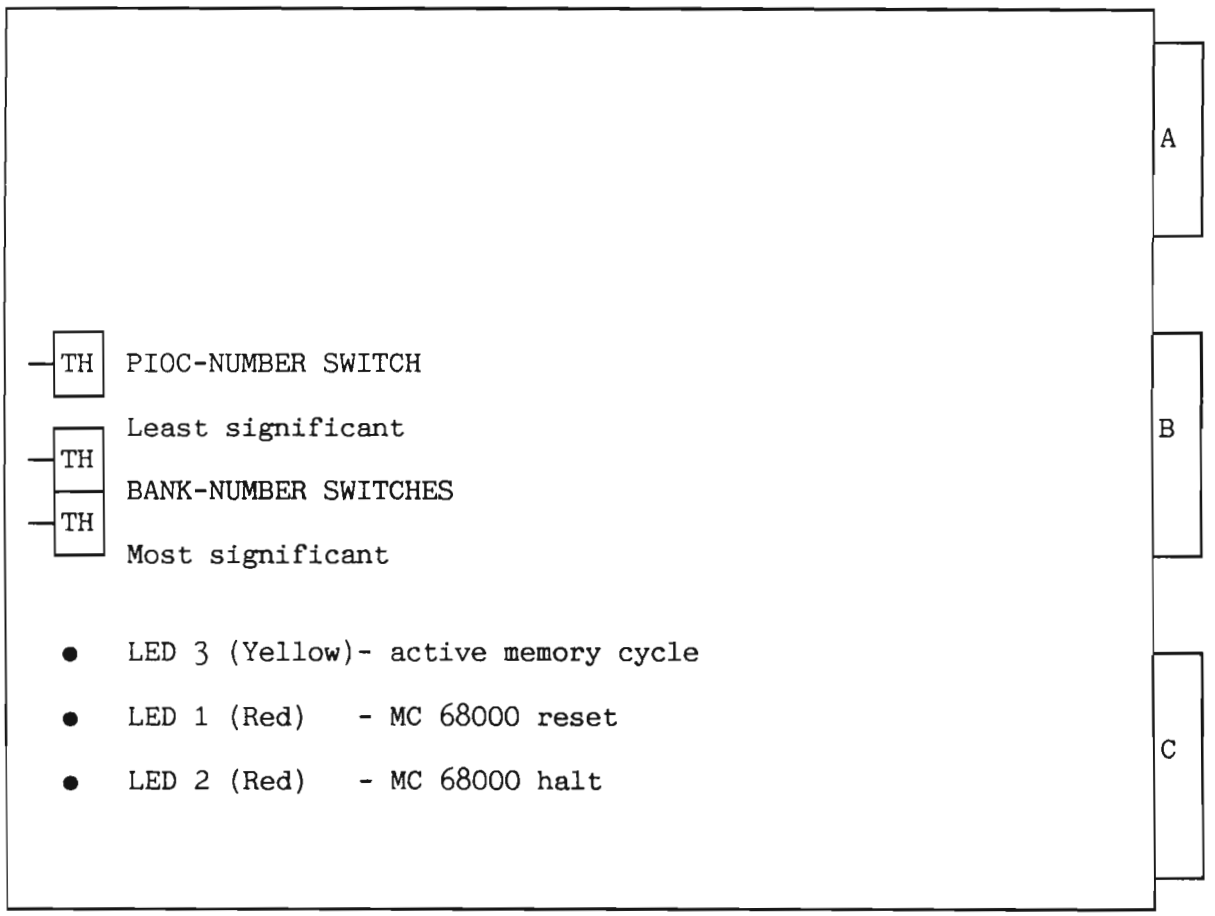


Figure 72. PIOC (3101)

THE PIOC-NUMBER SETTING:

PIOC number	Device number (Octal)	Ident code (Octal)
0	140020-140023	140002
1	140024-140027	140003
2	140030-140033	140004
3	140034-140037	140005
4	140040-140043	140006
5	140044-140047	140007
6-15	Not used	Not used

Table 39. The Switch Setting on the PIOC Interface (3101)

THE BANK-NUMBER SELECTION:

NOTE

If the CPU is a ND-120, the CPU-board contains 2, 4 or 6 Mb memory. This must be considered when selecting the address range for the PIOC.

Thumbwheel 7J	9J	128-Kbyte bank no.	PIOC address space (bytes)
0	0	0	0- 64K
0	1	1	64- 128K
0	2	2	128- 172K
.	.	.	. .
.	.	.	. .
0	15	15	960-1024K
1	0	16	1024-1088K
.	.	.	. .

Table 40. Thumbwheel Setting on the PIOC Interface (3101)

LOWEST-ADDRESS SELECTION:

The lowest address in PIOC seen from the ND-100 is set/found by using the following formula:

LOWEST ADDRESS: (MS setting*2048K) + (LS setting*128K)

EXAMPLE: MS is set to 3, LS is set to 4

LOWEST ADDRESS: (3*2048K) + (4*128K)= 6656K

THE LED INDICATORS:

LED 3: (Yellow) is lit when a memory cycle is performed in the PIOC memory either by the MC68000, by ND-100, or by internal PIOC-DMA transfer.

LED 1: (Red) is lit when the RESET signal is given to the MC68000, and after pushing the ND-100 MCL button.

The LED is NOT lit when MC68000 executes the programs.

LED 2: (Red) is lit when the HALT (stop) is given to MC68000, and after pushing the ND-100 MCL button.

The LED is NOT lit when the MC68000 executes programs.

8.32 Ethernet master (3102)

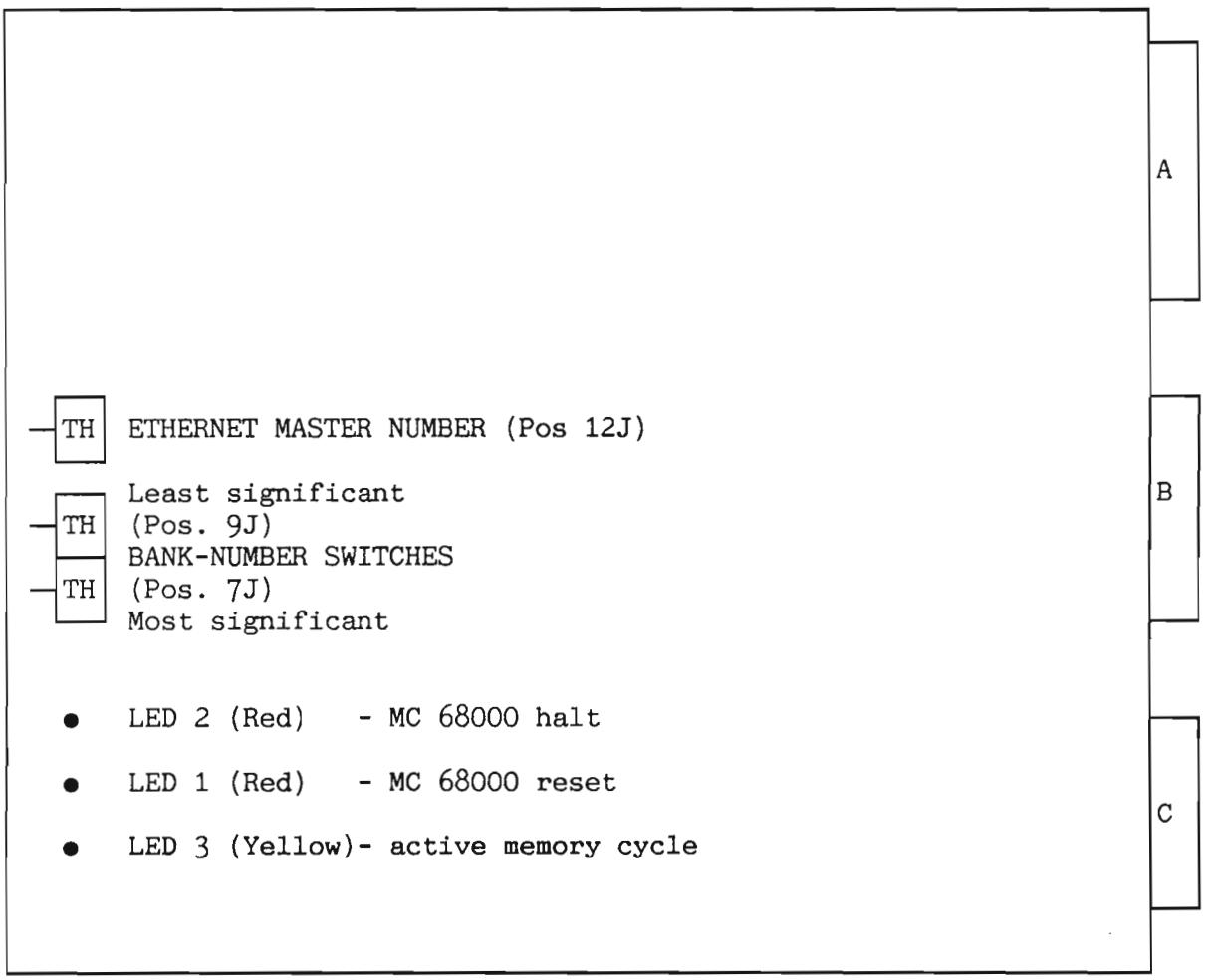


Figure 73. Ethernet Master (3102)

BANK-NUMBER RECOGNITION:

NOTE

If the CPU is a ND-120, the CPU-board contains 2, 4 or 6 Mb memory. This must be considered when selecting the address range for the ETHERNET MASTER.

The two hexadecimal thumbwheels in position 7J (most significant) and 9J (least significant) select which bank number the ETHERNET MASTER occupies in the ND-100 address range. Each step on the thumbwheel has the value of 128 Kbytes (64 Kwords).

Thumbwheel 7J	9J	128-Kbyte bank no.	ADDRESS space (bytes)	Physical page no. (octal)
0	0	0	0-128K	0-77
0	1	1	128-256K	100-177
0	2	2	256-384K	200-277
0	3	3	384-512K	300-377
0	4	4	512-640K	400-477
0	5	5	640-768K	500-577
0	6	6	768-896K	600-677
0	7	7	896-1024K	700-777
0	8	8	1024-1152K	1000-1077
0	9	9	1152-1280K	1100-1177
0	10	10	1280-1408K	1200-1277
.	.	.	. .	. .
.	.	.	. .	. .
.	.	.	. .	. .
0	15	15	1920-2048K	1700-1777
1	0	16	2048-2176K	2000-2077
.	.	.	. .	. .
.	.	.	. .	. .
.	.	.	. .	. .

Table 41. Thumbwheel Setting on the Ethernet Master (3102)

8.33 Memory management ii (3104)

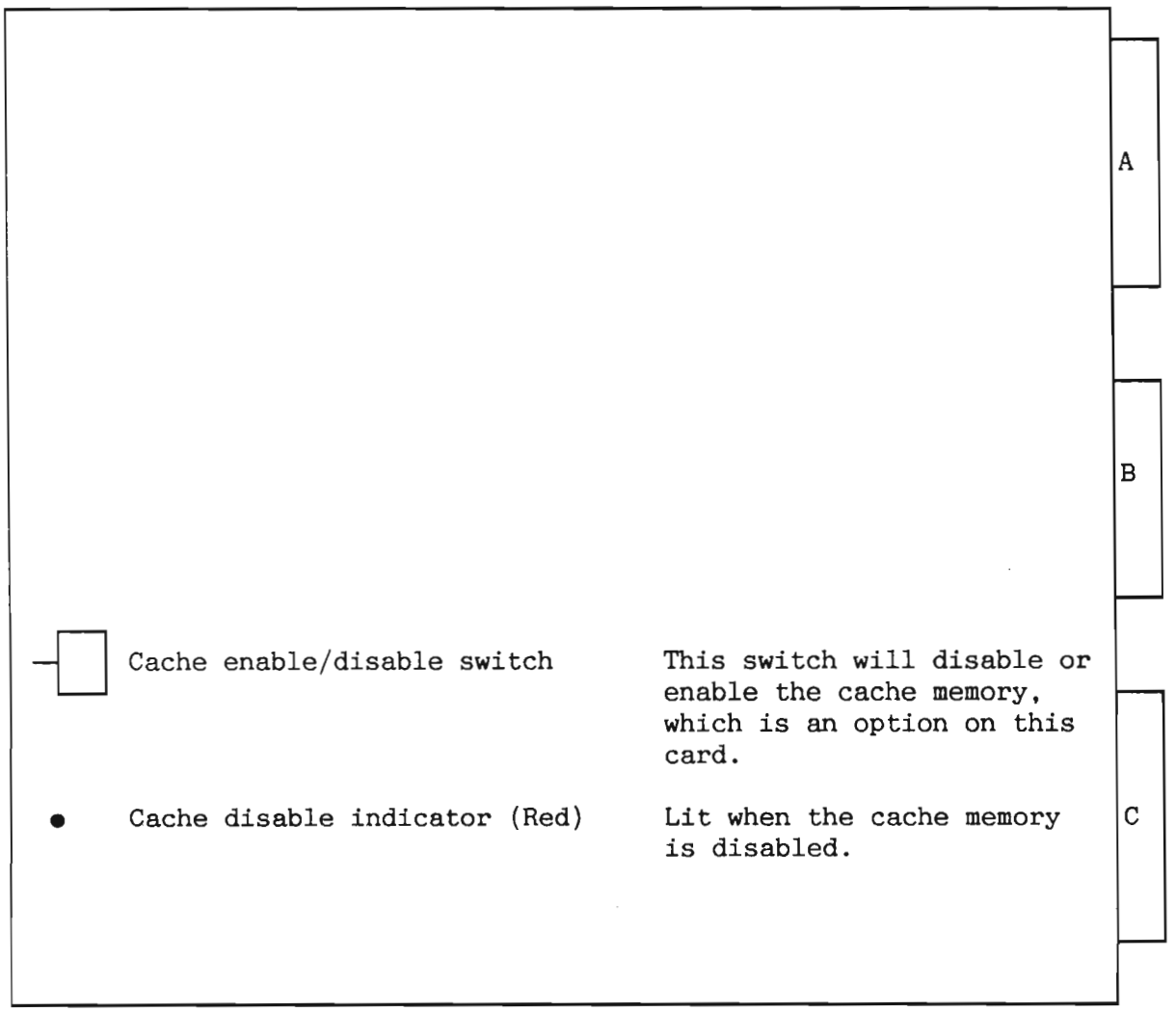


Figure 74. Memory Management II (3104)

8.34 8-telex interface (3105)

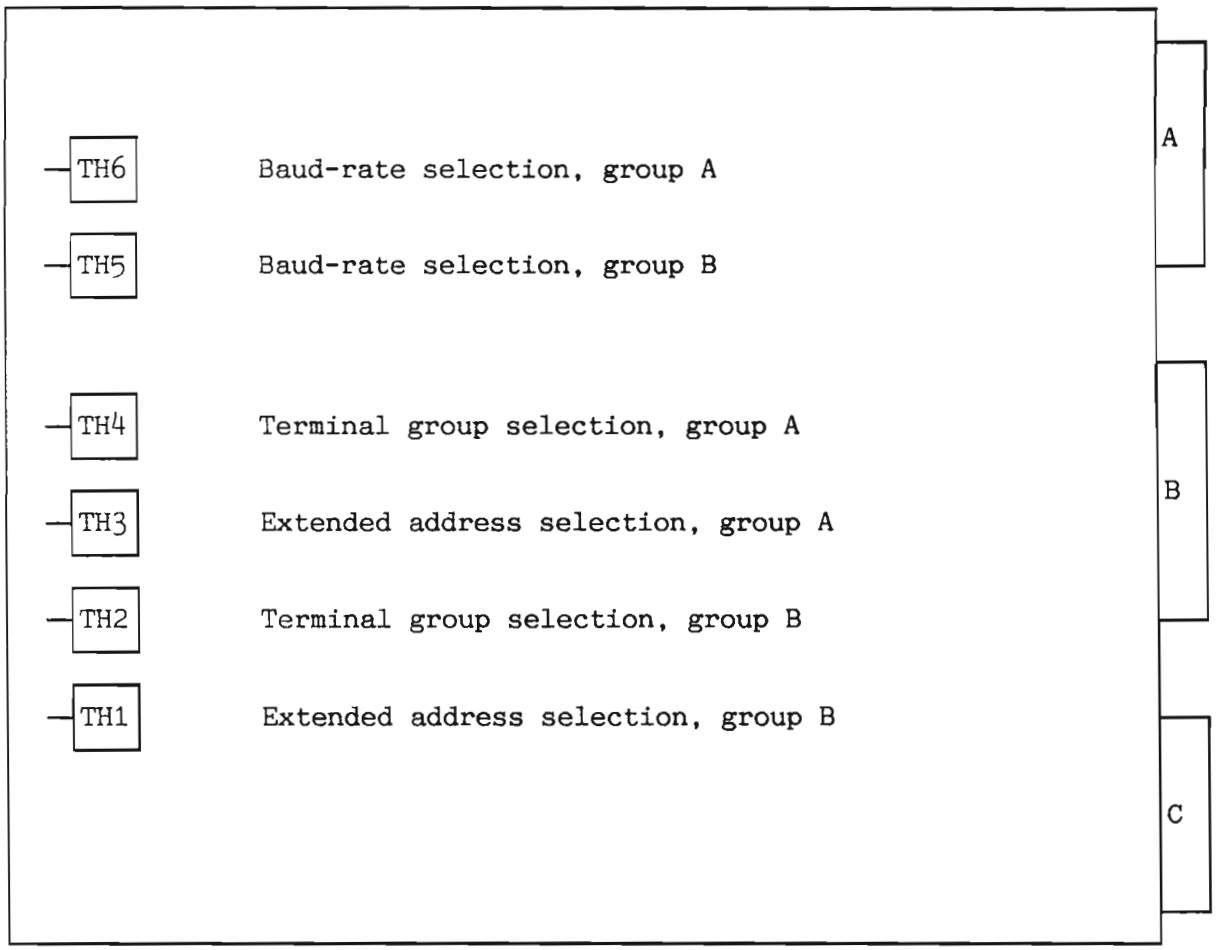


Figure 75. 8-Telex Interface (3105)

EXTENDED ADDRESS SELECTION:

These thumbwheels (TH1 and TH3) have only two valid positions:

0 - normal address range
1 - extended address range

Extended address means terminals 65 to 128. These terminals are reached only by using the ND-100 instruction, IOXT.

TERMINAL GROUP SELECTION (TH2, TH4): Normal address range selected (terminals 1-64).

Switch-setting:	Terminals:	Device number:	Group:
0	1- 4	300- 337	0
1	5- 8	340- 377	1
2	9-12	1300-1337	2
3	13-16	1340-1377	3
4	33-36	640- 677	4
5	37-40	1100-1137	5
6	41-44	1140-1177	6
7	45-48	1400-1437	7
8	49-52	1500-1537	8
9	53-56	1640-1677	9
10	57-60	1700-1737	10
11	61-64	1740-1777	11
12	17-20	200- 237	12
13	21-24	240- 277	13
14	25-28	1200-1237	14
15	29-32	1240-1277	15

Table 42. Normal Address Range Setting on the 8-Telex Interface (3105)

Extended address range selected (terminals 65-128).

Switch-Setting:	Terminals	Dev. no:	Group
0	65- 68	140400 - 140437	0
1	69- 72	140440 - 140477	1
2	73- 76	140500 - 140537	2
3	77- 80	140540 - 140577	3
4	81- 84	140600 - 140637	4
5	85- 88	140640 - 140677	5
6	89- 92	140700 - 140737	6
7	93- 96	140740 - 140777	7
8	97-100	141000 - 141037	8
9	101-104	141040 - 141077	9
10	105-108	141100 - 141137	10
11	109-112	141140 - 141177	11
12	113-116	141200 - 141237	12
13	117-120	141240 - 141277	13
14	121-124	141300 - 141337	14
15	125-128	141340 - 141377	15

Table 43. Extended Address Range on the 8-Telex Interface (3105)

BAUD-RATE SELECTION (TH5, TH6):

Switch-setting:	Baud rate:
0	110
1	150
2	300
3	2400
4	1200
5	1800
6	4800
7	9600
8	2400
9	600
10	200
11	134.5
12	75
13	50
14	100
15	100

Table 44. Baud Rate Selection on the 8-Telex Interface (3105)

8.35 Floppy and streamer interface (3106)

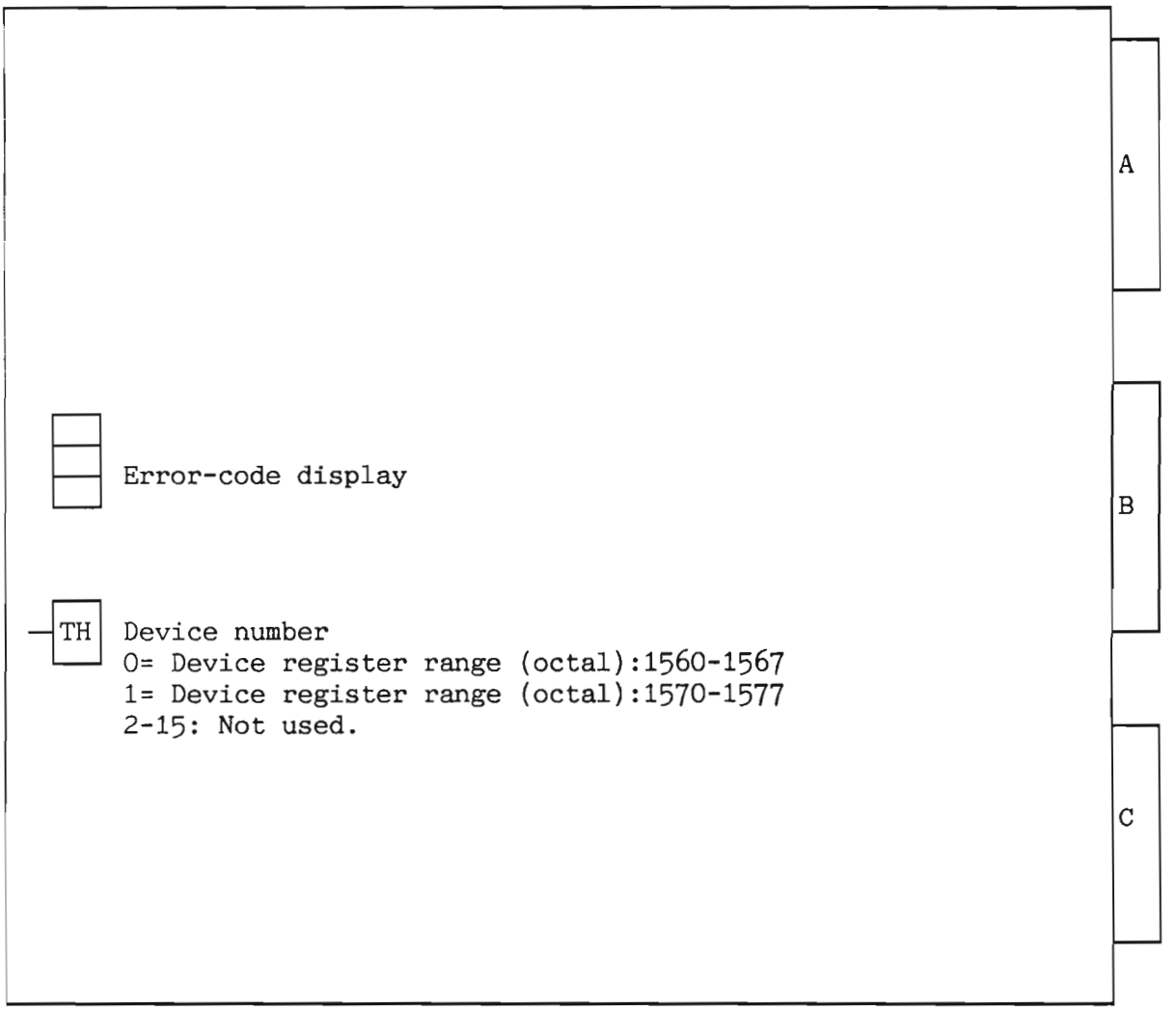


Figure 76. Floppy and Streamer Interface (3106)

ERROR CODE DISPLAY:

Display:	Meaning:	
000	OK	
001-004	Not used	
005	CRC error	
006	Sector not found	
007	Track not found	
010	Format not found	
011	Diskette defect (impossible to format)	
012	Format mismatch	
013	Illegal format specified	
014	Single-sided diskette inserted	
015	Double-sided diskette inserted	
016	Write-protected diskette	
017	Deleted record	
020	Drive not ready	
021	Controller busy on start	
022	Lost data (over or underrun)	
023	Track zero not detected	
024	VCO (Voltage-Controlled Oscillator) frequence out of range	
025	Microprogram out of range	
026	Timeout	
027	Undefined error	
030	Track out of range	
031	Not used	
032	Compare error (during compare of data)	
033	Internal DMA errors	
034-037	Not used	
040	ND-Bus-error command fetch	
041	ND-100 Bus-error status transfer	
042	ND-100 Bus-error data transfer	
043	Illegal command	
044	Word count not zero	
045	Illegal completion (count. transfer)	
046	Address register error	
047	Not used	
050	No bootstrap found on diskette	Error during
051	Wrong bootstrap (too old flo-mon version)	autoload
052-057	Not used	
060	Streamer-handshake error	
061	Streamer-status transfer error	
062	Bad cartridge	
063	No cartridge installed	
064	End of tape, cartridge full	Streamer errors
065	Streamer-drive error	
066	Unidentified exception	
067	Illegal command to streamer	
070	PROM-checksum error	
071	RAM error	
072	CTC error	
073	DMACTRL error	Self-test error
074	VCO error	
075	Floppy-controller error	
076	Streamer-Data register error	
077	ND-100 register error	

Table 45. Error Code Display on the Floppy Streamer Interface (3106)

8.36 8-terminal interface (3107)

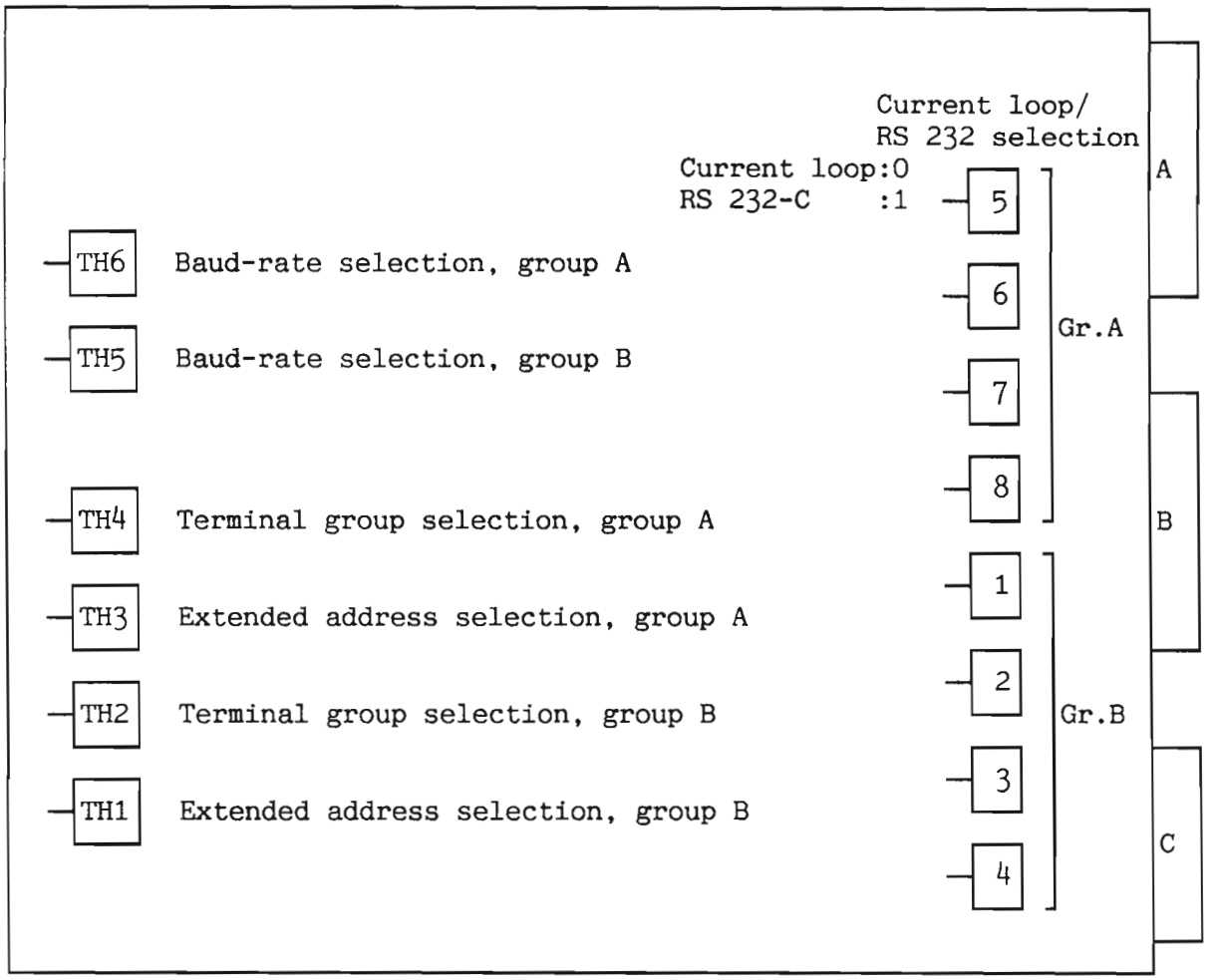


Figure 77. 8-Terminal Interface (3107)

EXTENDED ADDRESS SELECTION:

These thumbwheels (TH 1 and TH 3) have only two valid positions:

0 - normal address range
1 - extended address range

Extended address means terminals 65 to 128. These terminals are reached only by using the ND-100 instruction, IOXT.

TERMINAL GROUP SELECTION (TH2, TH4): Normal address range selected (terminals 1-64).

Switch-setting:	Terminals:	Device register address range:	Group:
0	1- 4	300- 337	0
1	5- 8	340- 377	1
2	9-12	1300-1337	2
3	13-16	1340-1377	3
4	33-36	640- 677	4
5	37-40	1100-1137	5
6	41-44	1140-1177	6
7	45-48	1400-1437	7
8	49-52	1500-1537	8
9	53-56	1640-1677	9
10	57-60	1700-1737	10
11	61-64	1740-1777	11
12	17-20	200- 237	12
13	21-24	240- 277	13
14	25-28	1200-1237	14
15	29-32	1240-1277	15

Table 46. Normal Address Range on the 8— Terminal Interface (3107)

Extended address range selected (terminals 65-128).

Switch-setting:	Terminals:	Device register address range:	Group
0	65- 68	140400 - 140437	0
1	69- 72	140440 - 140477	1
2	73- 76	140500 - 140537	2
3	77- 80	140540 - 140577	3
4	81- 84	140600 - 140637	4
5	85- 88	140640 - 140677	5
6	89- 92	140700 - 140737	6
7	93- 96	140740 - 140777	7
8	97-100	141000 - 141037	8
9	101-104	141040 - 141077	9
10	105-108	141100 - 141137	10
11	109-112	141140 - 141177	11
12	113-116	141200 - 141237	12
13	117-120	141240 - 141277	13
14	121-124	141300 - 141337	14
15	125-128	141340 - 141377	15

Table 47. Extended Address Range on the 8— Terminal Interface (3107)

BAUD-RATE SELECTION:

Switch-setting:	Baud rate:
0	110
1	150
2	300
3	2400
4	1200
5	1800
6	4800
7	9600
8	2400
9	600
10	200
11	134.5
12	75
13	50
14	100
15	100

Table 48. Baud Rate on the 8-Terminal Interface (3107)

8.37 Expanded PIOC Interface (3108)

The new PIOC print, number 3108, is called PIOC-EXPANDED. The added function is X21 Clear Detection in hardware for lines 0 and 1.

The print is produced in two versions:

- PIOC/64 (64 Kbit memory chips)
- PIOC/256 (256 Kbit memory chips)

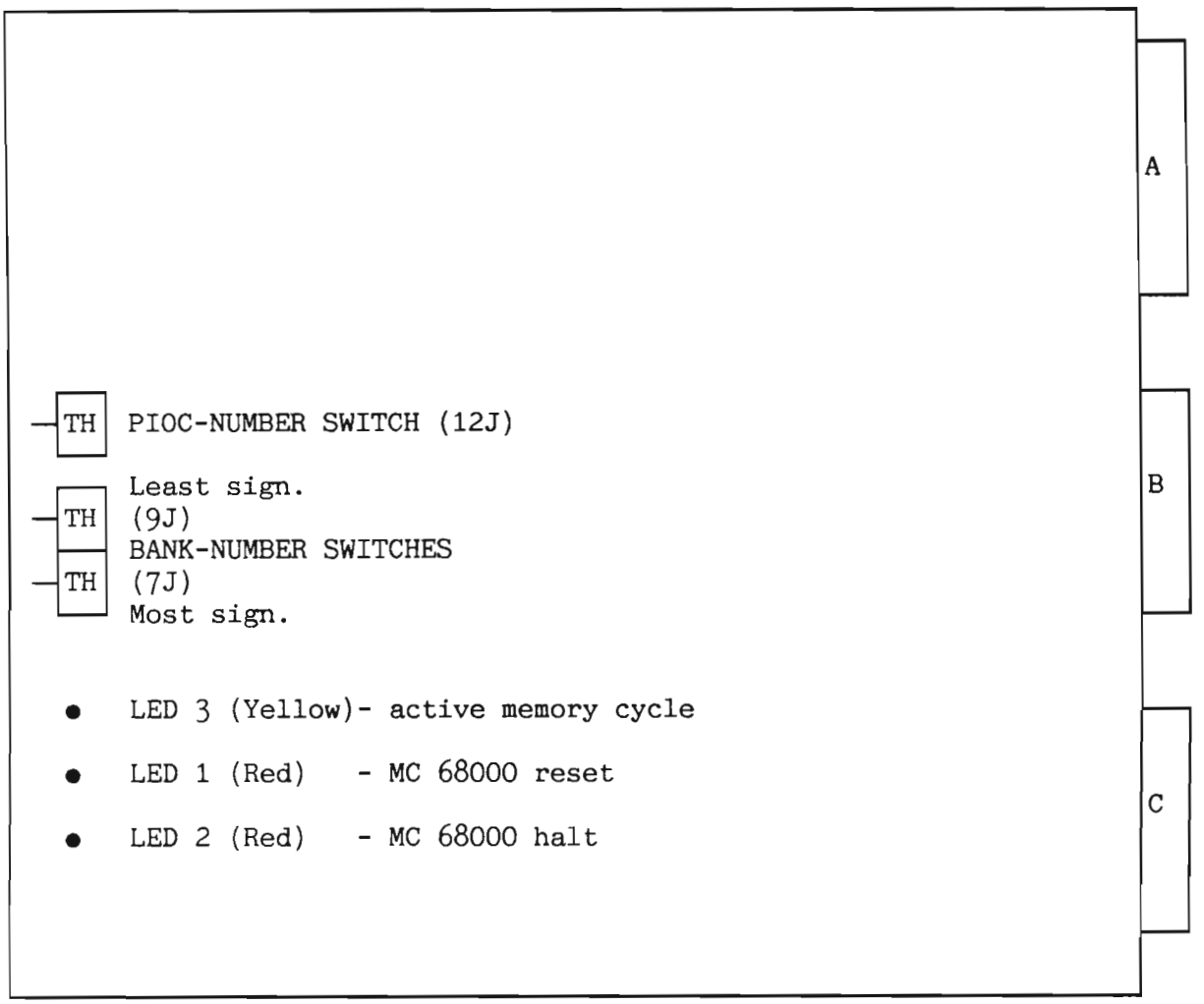


Figure 78. Expanded PIOC (3108)

THE PIOC-NUMBER SETTING (12J):

PIOC number	Device number (Octal)	Ident code (Octal)
0	140020	140002
1	140024	140003
2	140030	140004
3	140034	140005
4	140040	140006
5	140044	140007
6-15	Not used	Not used

Table 49. Switch Setting on the Expanded PIOC (3108)

BANK NUMBER SELECTION ON PIOC/64 (9J, 7J):

The bank number is found by using the formula:

BANK NUMBER= (MS setting*16) + LS setting

EXAMPLE: MS is set to 3, LS is set to 4
BANK NUMBER=(3*16) + 4 = 52

BANK NUMBER SELECTION ON PIOC/256: On PIOC/256, the thumbwheel in position 7J is used to select megaword number as on the PIOC/64. The lower two bits of the thumbwheel in position 9J are used differently from the PIOC/64.

When the thumbwheel in position 9J is set to an odd number, only the lower half of the PIOC/256's local RAM can be reached from the ND-100 CPU or from the DMA devices. The upper 256 K bytes in PIOC/256 will be private. The lowest bank number in PIOC/256 seen from the ND-100 bus is a multiple of two.

When the thumbwheel (9J) is set to an even number, the lower two bank-number bits from the ND-100 backplane are ignored. This means that the lowest bank-number in PIOC/256 is a multiple of four.

Least-sign. thumbwheel setting (9J)	K words	ND-100 hex address	ND-100 octal address
0	0- 256	0-3FFFF	0-777777
2	0- 256	0-3FFFF	0-777777
4	256- 512	40000-7FFFF	1000000-1777777
6	256- 512	40000-7FFFF	1000000-1777777
8	512- 768	80000-BFFFF	2000000-2777777
10	512- 768	80000-BFFFF	2000000-2777777
12	768-1024	C0000-FFFFF	3000000-3777777
14	768-1024	C0000-FFFFF	3000000-3777777
1	0- 128	0-1FFFF	0-377777
3	128- 256	20000-3FFFF	400000-777777
5	256- 384	40000-5FFFF	1000000-1377777
7	384- 512	60000-7FFFF	1400000-1777777
9	512- 640	80000-9FFFF	2000000-2377777
11	640- 768	A0000-BFFFF	2400000-2777777
13	768- 896	C0000-DFFFF	3000000-3377777
15	896-1024	E0000-FFFFF	3400000-3777777

Table 50. Bank-Number Selection on the Expanded PIOC Interface (3108)

LOWEST ADDRESS SELECTION:

The lowest address in PIOC seen from the ND-100 is set/found by using the following formula:

LOWEST ADDRESS: (MS setting*2048K) + (LS setting*128K)

EXAMPLE: MS is set to 3, LS is set to 4

LOWEST ADDRESS: (83*2048K) + (4*128K)= 6656K

THE LED INDICATORS:

LED 3: (Yellow) is lit when a memory cycle is performed in the PIOC memory either by the MC68000, by ND-100 or by internal PIOC-DMA transfer.

LED 1: (Red) is lit when the RESET signal is given to the MC68000, and after pushing the ND-100 MCL button.

The LED is not lit when MC68000 executes the programs.

LED 2: (Red) is lit when the HALT (stop) is given to MC68000, and after pushing the ND-100 MCL button.

The LED is not lit when the MC68000 executes programs.

8.38 8-terminal interface with buffer (3111)

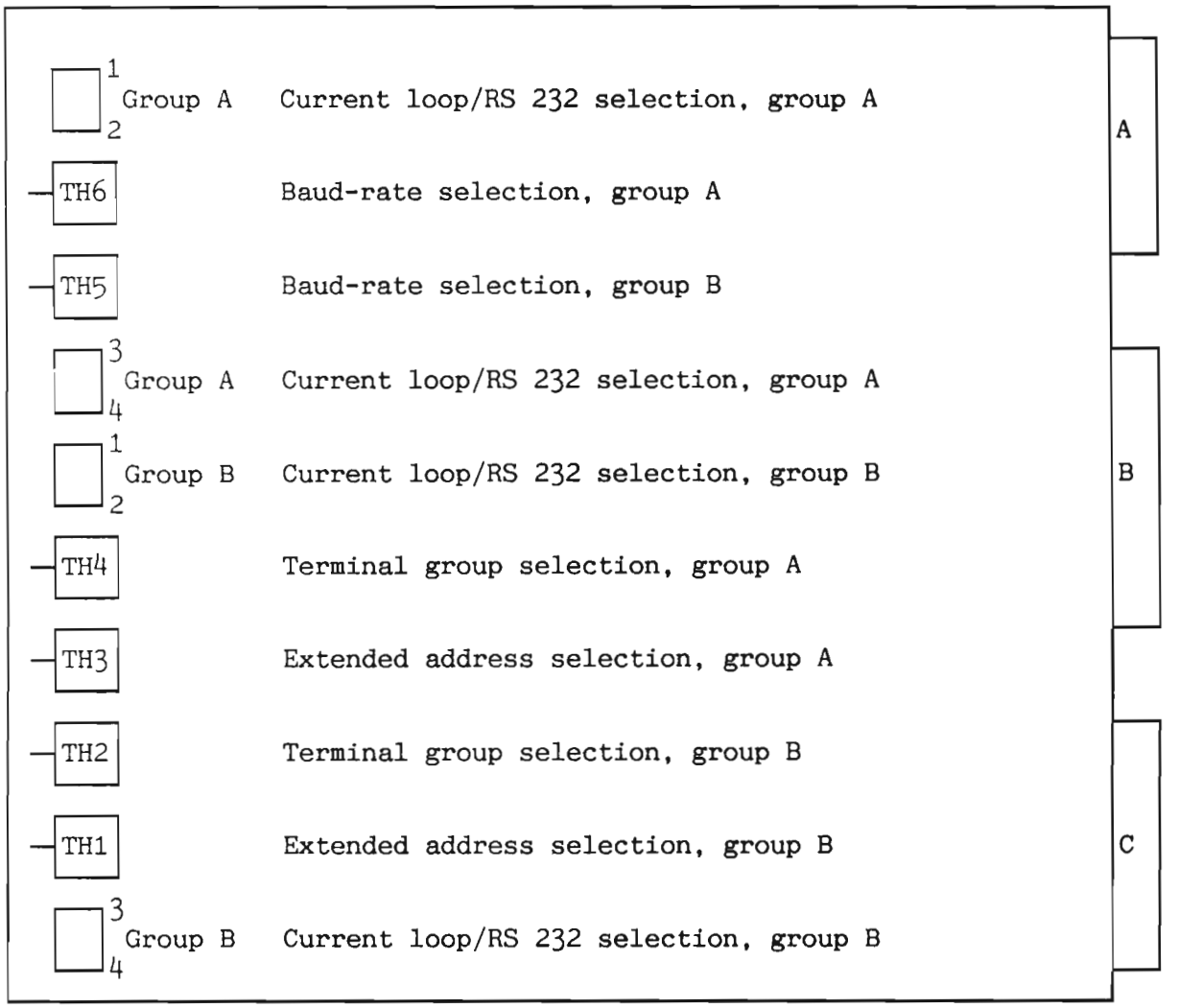


Figure 79. 8-Terminal Interface with Buffer (3111)

EXTENDED ADDRESS SELECTION: These thumbwheels (TH1 and TH3) have only two valid positions:

0 - normal address range

1 - extended address range

Extended address means terminals 65 to 128. These terminals are reached only by using the ND-100 instruction, IOXT.

TERMINAL GROUP SELECTION (TH2,TH4):

Normal address range selected, TH1 and TH3 is set to 0 (terminals 1-64).

TH1/TH3 setting:	TH2/TH4 setting:	Terminals:	Dev. no.:	Group:
0	0	1- 4	300- 337	0
0	1	5- 8	340- 377	1
0	2	9-12	1300-1337	2
0	3	13-16	1340-1377	3
0	4	33-36	640- 677	4
0	5	37-40	1100-1137	5
0	6	41-44	1140-1177	6
0	7	45-48	1400-1437	7
0	8	49-52	1500-1537	8
0	9	53-56	1640-1677	9
0	10	57-60	1700-1737	10
0	11	61-64	1740-1777	11
0	12	17-20	200- 237	12
0	13	21-24	240- 277	13
0	14	25-28	1200-1237	14
0	15	29-32	1240-1277	15

Table 51. Normal Address Range on the 8-terminal Interface with buffer (3111)

Extended address range selected, TH1 and TH3 is set to 1 (terminals 65-128).

TH1/TH3 setting:	TH2/TH4 setting:	Terminals:	Dev. no.:	Group
1	0	65- 68	140400 - 140437	0
1	1	69- 72	140440 - 140477	1
1	2	73- 76	140500 - 140537	2
1	3	77- 80	140540 - 140577	3
1	4	81- 84	140600 - 140637	4
1	5	85- 88	140640 - 140677	5
1	6	89- 92	140700 - 140737	6
1	7	93- 96	140740 - 140777	7
1	8	97-100	141000 - 141037	8
1	9	101-104	141040 - 141077	9
1	10	105-108	141100 - 141137	10
1	11	109-112	141140 - 141177	11
1	12	113-116	141200 - 141237	12
1	13	117-120	141240 - 141277	13
1	14	121-124	141300 - 141337	14
1	15	125-128	141340 - 141377	15

Table 52. Extended Address Range on the 8-terminal Interface with buffer (3111)

BAUD-RATE SELECTION (TH5, TH6):

Switch-setting:	Baud rate:
0	110
1	150
2	300
3	2400
4	1200
5	1800
6	4800
7	9600
8	2400
9	600
10	200
11	134.5
12	75
13	50
14	100
15	19200

Table 53. Baud Rate on the 8-Terminal Interface with Buffer (3111)

CURRENT LOOP/RS232 SELECTION:

There are eight switches for the selection of current loop or RS232, one for each terminal. Each terminal has two positions:

0 - current loop

1 - RS232-C

8.39 Plotter - printer DMA interface (3114)

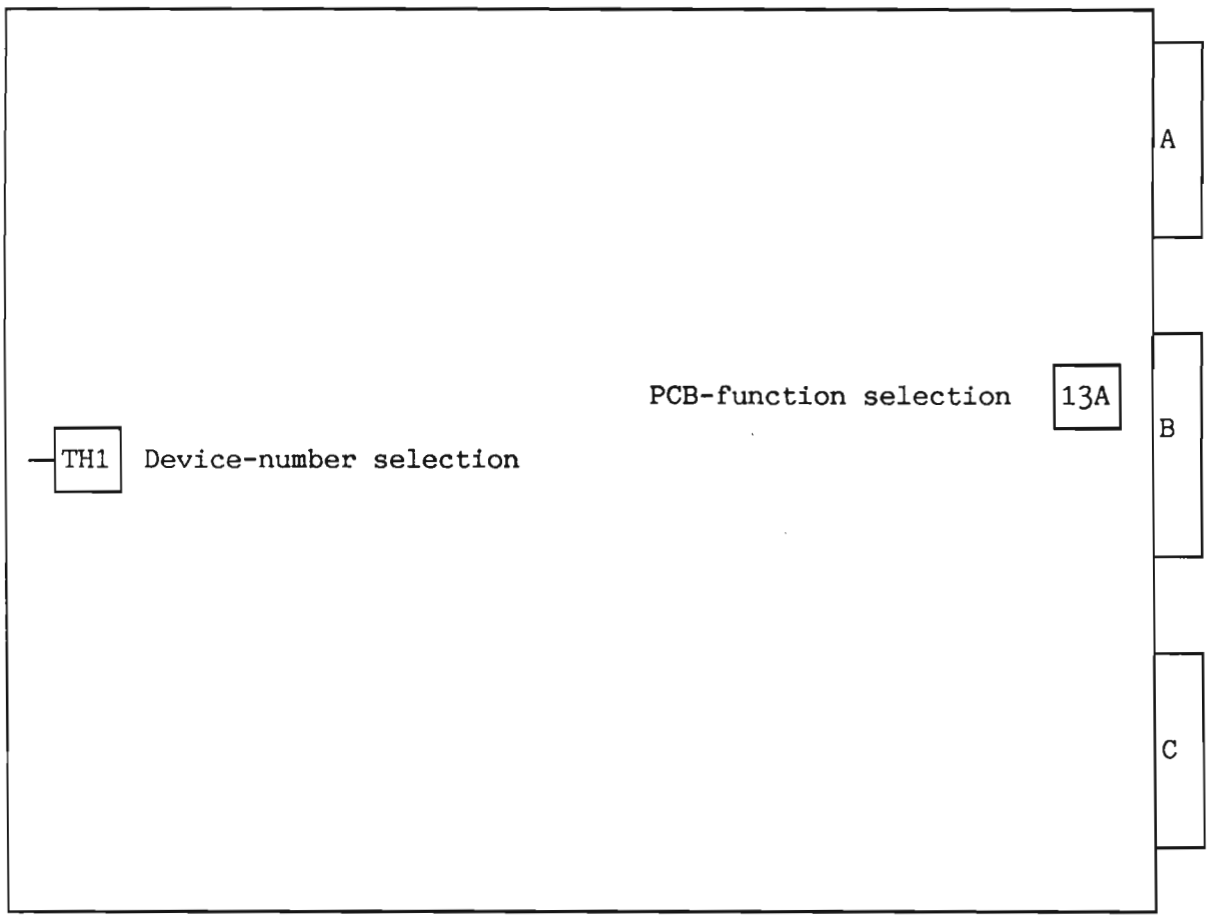


Figure 80. Plotter – Printer DMA Interface (3114)

PCB-FUNCTION SELECTION (13A):

Switch: 4	3	2	1	Function:
On	X	X	On	Versatec, A-connector, TTL
On	X	X	Off	Printer, A-connector, TTL
Off	X	X	On	Versatec, B-connector, V80

Table 54. PCB–Function Selector on the Printer/Plotter Interface (3114)

DEVICE-NUMBER SELECTION:

Thumbwheel setting	Device-reg. addr. range (octal)	Ident code (octal)	Device name
0	142170-142177	140230	Printer/plotter no.1
1	142200-142207	140231	Printer/plotter no.2
2	142210-142217	140232	Printer/plotter no.3
3	142220-142227	140233	Printer/plotter no.4
4	600-607	4	Printer/plotter no.1 (old)
5	1600-1607	14	Printer/plotter no.2 (old)
6-15	Not used		

Table 55. Device Number Selection on the 3114 Card

8.40 ND-120/CX CPU board

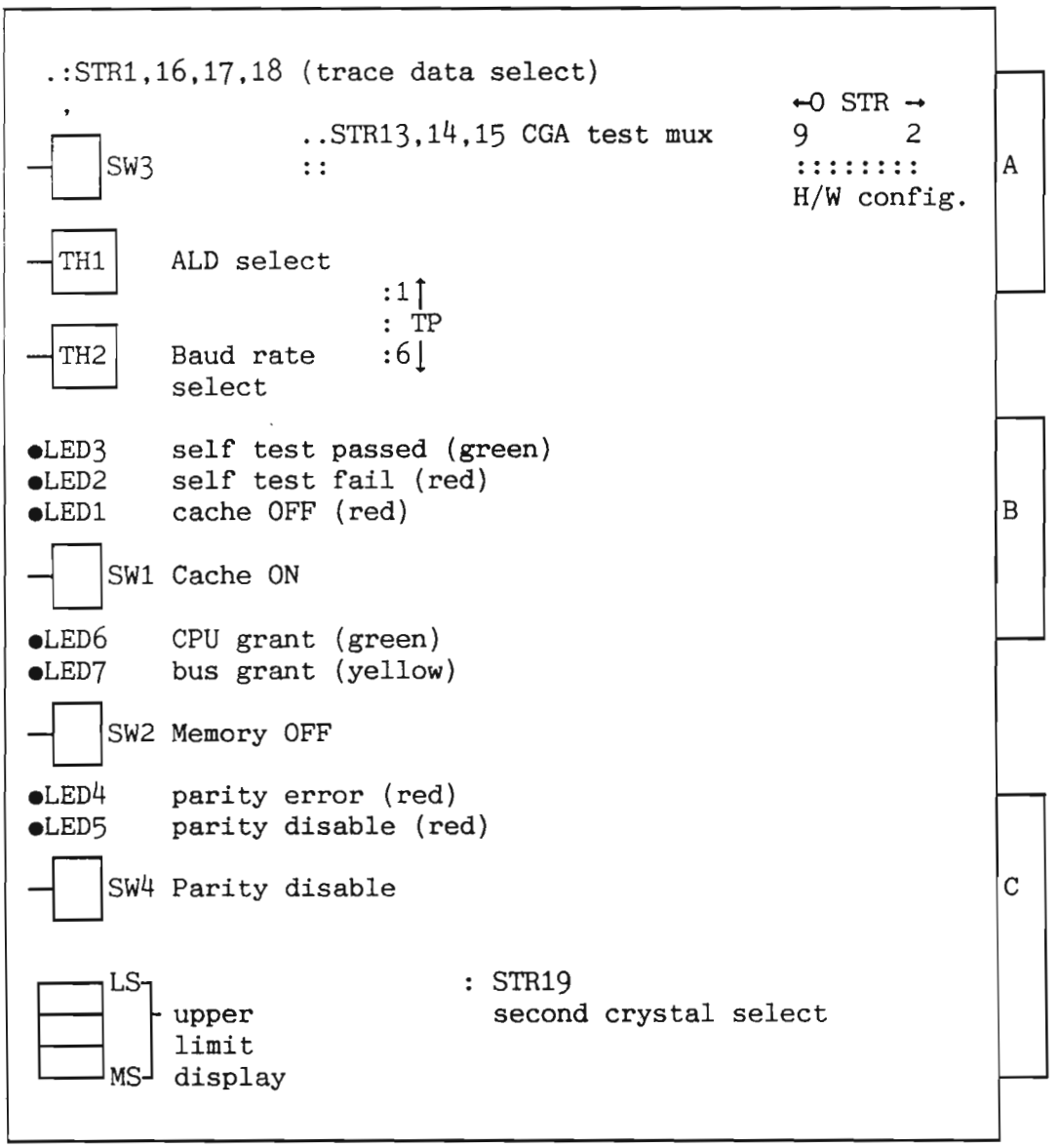


Figure 81. ND-120/CX CPU

Switches

SW1

CACHE ON: Normal position= down.

With this switch in its normal position (down), cache memory is enabled. Moving it up will illuminate LED1 and disable the cache.

SW2

MEMORY OFF: Normal position= down.

With this switch in the down position, the on-board memory is enabled and starts from address 0.

Should this switch be moved upwards, any on-board memory will be turned off. In this case, all system memory must be on the ND-100 Bus and the 3-digit memory size indicator (see below) will read "000".

SW3

MASTER CLEAR: Normal position= central.

This switch may be depressed to give a hardware master clear to the CPU

SW4

PARITY DISABLE: Normal position= down.;

This switch allows parity checking of on-board memory to be disabled. In the down position, parity checking is enabled; in the up position, parity checking is disabled, indicated by LED5 being illuminated.

SW4 may also be used to clear a latched parity error indication on LED4, by toggling it from down to up and back to down again.

TH1 ALD select

ALD	I 12	LOCK and Standby Power OK	LOCK and Standby Power not OK	Unlock and Load
15	0	Start in address 20	Stop	Nothing
14	1560	Start in address 20	Binary load from 1560	Binary load from 1560
13	20500	Start in address 20	Mass load from 500	Mass load from 500
12	21540	Start in address 20	Mass load from 1540	Mass load from 1540
11	400	Start in address 20	Binary load from 400	Binary load from 400
10	1600	Start in address 20	Binary load from 1600	Binary load from 1600
9		Start in address 20		
8		Start in address 20		
7	100000	Stop	Stop	Nothing
6	101560	Binary load from 1560	Binary load from 1560	Binary load from 1560
5	120500	Mass load from 500	Mass load from 500	Mass load from 500
4	121540	Mass load from 1540	Mass load from 1540	Mass load from 1540
3	100400	Binary load from 400	Binary load from 400	Binary load from 400
2	101600	Binary load from 1600	Binary load from 1600	Binary load from 1600

Table 56. ALD Switch Settings on ND-120/CX

TH2 Baud Rate select

Switch position	Baud rate	Switch position	Baud rate
0	110	8	2400
1	150	9	600
2	300	10	200
3	2400	11	134.5
4	1200	12	75
5	1800	13	50
6	4800	14	extern
7	9600	15	extern

Table 57. Baud Rate Switch Settings

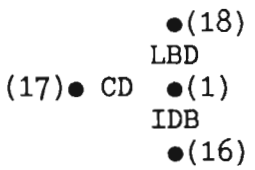
STRAP FIELDS

STR1,STR16,STR17,STR18

TRACE DATA SELECT: Normal= No link.

This is a three-way strap which selects any one of three sources for the data bus gated on to the B connector (for the tracer).

The straps posts are arranged as shown below:



Using a standard 0.1" jumper, one of these straps can be connected to give the required option:

Link	Enabled to B Connector data bus
IDB	Internal Data Bus
CD	Cache Data Bus
LBD	Local Bus Data for multiplexed address/data to ND-100 bus and local memory

STR2-STR9

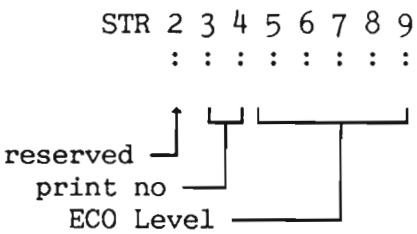


Figure 82. Hardware Configuration (ND-120/CX)

In the following tables,

● = STRAP 0 = NO STRAP

PRINT NO: STR 3 4:

3	4	
●	0	= 3202 (ND-120)

Other combinations of straps 3 & 4 are reserved.

ECO LEVEL:

STR 5	6	7	8	9		
●	●	●	●	0	=	A
●	●	●	●	●	=	B
0	0	0	0	0	=	C
0	0	0	0	●	=	D
0	0	0	●	0	=	E
0	0	0	●	●	=	F
0	0	●	0	0	=	G
0	0	●	0	●	=	H
0	0	●	●	0	=	J
0	0	●	●	●	=	K
0	●	0	0	0	=	L
0	●	0	0	●	=	M
0	●	0	●	0	=	N
0	●	0	●	●	=	P
0	●	●	0	0	=	Q
0	●	●	0	●	=	R
0	●	●	●	0	=	S
0	●	●	●	●	=	T
●	0	0	0	0	=	U
●	0	0	0	●	=	V
●	0	0	●	0	=	W
●	0	0	●	●	=	X
●	0	●	0	0	=	Y
●	0	●	0	●	=	Z
●	0	●	●	0	=	BA
●	0	●	●	●	=	BB
●	●	0	0	0	=	BC
●	●	0	0	●	=	BD
●	●	0	●	0	=	BE
●	●	0	●	●	=	BF
●	●	●	0	0	=	BG
●	●	●	0	●	=	BH

Table 58. ECO Level Strap Field

The Print No. and ECO Level can be read into the A register by the VERSN instruction:

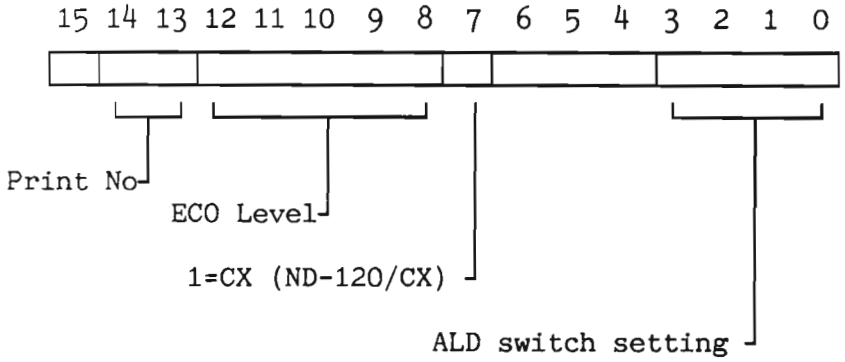


Figure 83. Format of the A-Register after a VERSN Instruction

STR13, STR14, STR15

CGA Test Mux: Normal= No straps

..13 9
..14 4 STR
..15 3

There are a number of nodes within the CGA gate array which are brought out to test points on the PCB, to allow monitoring of events internal to the gate array. Three jumpers, STR13, STR14 and STR15 determine the signals which will appear on test points TP2 - TP6 according to the following table (● = link IN, blank = no link):

STR					TP		
15	14	13	2	3	4	5	6
			0	TVEC3	TVEC2	TVEC1	TVEC0
		●	DEEP	SC6	SC5	SC4	SC3
	●		RESTR	CFETCH	OOD	DZD	LCZ-
	●	●	1	T-	P-	COND	UP-
●			CRY	SGR	F15	ZF	OVF
●		●	1	XFETCH-	WP-	PTM	MI
●	●		DSTOP-	WRITE-	CBRK-	IND-	VACC-
●	●	●	1	VEX	LDIRV	CSMREQ	1

Note: Signals suffixed with a "-" are active low, following the convention used on ND-120 logic diagrams

Table 59. Jumper Settings for Internal Test Points

STR19 Second Crystal Select: Normal = No strap

Insertion of a link in this field causes the main CPU clock frequency to be based on the crystal oscillator inserted in PCB position X1, rather than the normal X4. Console baud rates are not affected by this strap as they are determined by the crystal oscillator at X4 which must always be 39.3216MHz

On-Board Indicators

LED1 — Cache Off indicator (Red)

Used in conjunction with SW1. When lit, this indicates that cache is switched off.

LED2 — Self-Test Fail indicator (Red)

If this indicator remains on after a master clear or power up, it shows that self-test has failed and that the CPU board is in need of attention.

LED3 — Self-Test passed indicator (Green)

This indicator should illuminate on completion of the self-test following a master clear or power-up. If not, the CPU board is in need of attention.

LED4 — Parity Error (Red)

As on a normal ND-100 memory card, this LED will illuminate whenever a parity error is flagged by, in this case, the on-board memory. Once lit, the LED will remain lit until extinguished under software control or by toggling the parity disable switch SW4.

LED5 — Parity Disable (Red)

This LED has a similar function to that on a normal ND-100 memory card in that it shows whether or not on-board parity checking is enabled. When lit, it indicates that on-board parity checking is disabled. Operation is controlled via SW4 or by software.

LED6 — CPU Grant Indicator (Green)

This LED flashes whenever the CPU gains access to the on-board memory.

LED7 — BUS Grant Indicator (Yellow)

This LED flashes whenever a device on the ND100 Bus gains access to the on-board memory.

Memory Size Indicator

This is a bank of three 7-segment LED displays.

Its 3-digit indicator shows the thumbwheel setting that should be used on the next memory card on the ND-100 Bus, according to the following table:

Amount of on-board memory	Indicator reading
memory off (SW2)	000
2M Bytes	100
4M Bytes	200
6M Bytes	300

Table 60. Memory Size Indicator

Test points

TP1

INTRQ from the CGA gate array.

TP2 - TP6

The signals present on these test points vary according to the settings on STR13, STR14 and STR15. See the description on page 261.

Appendix A HARDWARE STATUS FOR VARIOUS DEVICES

This is the status word returned by @DEVICE-FUNCTION <peripheral file name> FUNCTIONS: READ-STATUS FUNCTIONS: READ-LAST-STATUS and by MAGTP (MON 144) function codes 20 and 24. The specified condition is true if the bit is set in the status word.

CONTENTS:

Status word for Tandberg, Pertec and STC magnetic tape units

bit 0: tape on line
1: write enable ring present
2: tape standing on load point

3: CRC error/fatal error
4: set if any of bits 5, 6, 7, 8, 9, 11 or 12 are set
5: control or modus word error; trying to write on protected tape, trying to reverse tape at load point, tape unit not on-line etc.; action is inhibited

6: bad data block; an error is detected
7: end of file is detected
8: the search character is detected

9: end of tape is detected; resetting this bit depends on the model. Tandberg, STC: the bit remains set if carrying out a function after EOT Pertec: the bit is cleared if carrying out a function after EOT
10: word counter is not zero
11: DMA error

12: overflow (in read)
13: tape busy or formatter busy
14: LRC error/software error

15: interrupt when formatter is ready

Status word for Hewlett-Packard magnetic tape units

bit 0: ready interrupt enabled (cleared by the interrupt)
1: error interrupt enabled (cleared by the interrupt)
2: device active

3: device ready for transfer
4: set if any of bits 6, 9, 10, 11 or 12 are set or if a reverse command is given with tape at load point
5: write enable ring present

6: LRC error
7: EOF detected
8: load point (the unit remains in this state also after the first forward command after load point is detected)

9: EOT detected
10: parity error
11: DMA error

12: overflow in read
13: density select: 1 = 800 BPI
14: magnetic tape unit ready (selected, online and not rewinding)

15: bit 15 is loaded by the previous control word.

Status word for Versatec line printer/plotter

bit 0: ready for transfer, interrupt enabled
1: error interrupt enabled
2: device active

3: device ready for transfer
4: set if bit 6 or 7 is set
5: not used

6: no paper
7: plotter not on-line
8: not used

9: not used
10: not used
11: not used

12: not used
13: plotter ready
14: not used

15: not used

Status word for old (PIO) floppy disk

bit 0: interrupt enabled
1: not used
2: device busy

3: device ready for transfer
4: set if any of bits 5, 8, 11, 12 or 14 are set
5: deleted record detected

6: read/write completed
7: seek completed
8: drive not ready

9: write protected
10: not used
11: address mismatch

12: CRC error
13: not used
14: data overrun

15: must be 0 for this type of floppy disk

Status word for new (DMA) floppy disk

```
bit  0:  RFT-interrupt enabled
     1:  not used
     2:  device active
     3:  device ready for transfer
     4:  or of errors
     5:  deleted record
     6:  retry on controller
     7:
     8:  not used
  9-14:  error code from controller (see below)
    15:  should be 1 for this type of floppy disk
```

Status word 1, bit 9-14 (error codes):

oct. no.	description
00	ok
05	CRC-error
06	sector not found
07	track not found
10	format not found
11	diskette defect (impossible to format)
12	format mismatch
13	illegal format
14	single-sided diskette inserted
15	double-sided diskette inserted
16	write-protected diskette
17	deleted record
20	drive not ready
21	controller busy on start
22	lost data (over- or underrun)
23	track zero not detected
24	VCO-frequence out of range
25	microprogram out of range
26	timeout
27	undefined error
30	track out of range
31	RAM error
32	compare error
33	internal DMA-error
40	ND-100 bus error during command fetch
41	ND-100 bus error during status transfer
42	ND-100 bus error during data transfer
43	illegal command
44	wordcount not zero
50	no bootstrap found on diskette
51	wrong bootstrap (too old version of floppy-monitor)
70	prom checksum error (selftest error)
71	RAM error (selftest error)
72	CTC error (selftest error)
73	DMActrl error (selftest error)
74	VCO error (selftest error)
75	floppy control error (selftest error)

Status word for ECC disk controllers

bit 0: controller not active, interrupt enabled
1: error interrupt enabled
2: controller active

3: controller finished with a device operation
4: inclusive or of errors (Bit 5 - 13)
5: illegal load, that is, load while status bit 2 is true, or load of block address while the unit is not on cylinder

6: time out
7: hardware error (disk fault + missing read clocks + missing servo clocks)
8: address mismatch

9: parity error
10: compare error
11: DMA channel error

12: abnormal completion
13: disk unit not ready
14: on cylinder

15: extended cylinder address

Status word for big disks 33/66 MB

bit 0: controller not active
1: error interrupt enabled
2: controller active

3: finished with device operation
4: inclusive OR of errors (5-13)
5: write protect violation

6: time out
7: hardware error
8: address mismatch

9: parity error
10: compare error
11: DMA channel error

12: abnormal completion
13: disk unit not ready
14: on cylinder

15: extended cylinder-address

Status word for small disk 10 MB

bit 0: ready for transfer, interrupt enabled
1: error interrupt enabled
2: device active

3: device ready for transfer
4: inclusive OR of errors (bit 5-11)
5: write protect violation

6: time out
7: hardware error
8: address mismatch

9: parity error
10: compare error
11: DMA channel error

12: transfer complete
13: transfer on
14: on cylinder

15: loaded by previous control-word

Status word for 45 MB Micropolis and 21 MB Finch disks

bit 0: controller not active interrupt enabled
1: error interrupt enabled
2: controller active

3: controller finished with a device operation
4: inclusive or of errors (bits 5-11)
5: Finch: 0 (not used),
micropolis: trying to read or write while performing rtz.

6: timeout
7: disk fault or missing clocks
8: address mismatch

9: CRC error
10: compare error
11: FIFO over/under-run or DMA channel error

12: Finch: Serious error (or of status bits 6, 7 and 8).
Micropolis: Track 0.
13: Finch: Read or write gate active. Micropolis: Always 1.
14: on cylinder

15: 0, used to distinguish from 10 Mb controller