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Title:

RC3502 SAI Testprogram Package
User's Guide

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Keywords:

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Abstract:

This manual describes a reliability test of SAI201 and Winchester Drive Controller.

(20 printed pages).

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TABLE OF CONTENTS PAGE

APPENDICES:

1. INTRODUCTION 1.

This manual describes the reliability testprogram for the RC3502 SAI201 and winchester disk controller.

The testprogram consists of 5 different subtests:

a: SAI test
b: Disk reliability test
c: Disk format test
d: Disk diagnostic test, move head test
e: Disk bad block test

The SAITEST is a testprogram in the RC3502 Test System, TOP35, and must have this as a parent process, see ref. 2.

The program is written in RC3502 Real-Time Pascal.

1.1 Configuration Requirements 1.1

The configuration needed is an RC3502 with:

a) TOP35 system in TES202 and memory for buffers

or

b) a load device (FPA100 and RC8000) and memory for program and buffers

\+ one SAI201

\+ one disk controller (NEC D5104)

1.2 Parameter Values for SAI Test, Test a 1.2

Param. No.	Text	Default	Min.	Max.
01	no of runs	20		32767
02	level no	87	8	122
03	SCSI unit + drive	0	0	255
49	max.error messages	10	0	32767

P02 is interrupt level no.

P03 is drive address computed as:

+ SCSI unit no * 64
+ station no. on the SCSI bus * 8
+ disk drive no. on the controller

1.3 Parameter Values for Reliability, Test b 1.3

Param. No.	Text	Default	Min.	Max.
01	no of runs	20	1	32767
02	level no	87	8	122
03	SCSI unit + drive	0	0	255
04	RC35no, no =	64	00	99
05	write ?	no	no	yes
06	read ?	yes	no	yes
07	retry on ?	yes	no	yes
08	status check	yes	no	yes
09	data check	yes	no	yes
10	first cylinder	299	0	max.
11	first head	0	0	max.
12	first sector	0	0	max.
18	no of tracks	-1	-1	max.
19	no of sectors	0	0	max.
20	bufferlength	1	1	255
21	datakind	4	0	4
22	address mode	1	1	3
27	max.mess per block	2	0	32767
49	max.error messages	10	0	32767

P05, if YES then writing on the disk is performed.

P06, if YES then reading from the disk is performed.

P07, if YES then the automatic retry is performed if error.

P08, if YES then error messages are written if the driver reports an error.

P09, if YES then the contents of the blocks are checked.

P10, P11, and P12 give the starting address.

P18 gives number of tracks to be tested.
-1 means as many as possible.

P19 no of sectors added to P18 to give total test area on the disk.

P20 number of sectors per transfer.

P21 datakind 0-4, see 2.2.

P22 addressing mode, see 2.2.

1.4 Parameter Values for Format Test, Test c 1.4

Param No.	Text	Default	Min.	Max.
01	no of runs	20	1	32767
02	level no	87	8	122
03	SCSI unit + drive	0	0	255
04	RC35no, no =	64	00	99
07	retry on ?	yes	no	yes
08	status check	yes	no	yes
10	first cylinder	299	0	max.
11	first head	0	0	max.
13	format drive?	no	no	yes
14	format tracks?	no	no	yes
17	check format?	yes	no	yes
18	no of tracks	-1	-1	max.
23	interleave factor	1	0	max.
49	max.error messages	10	0	32767

P13, if YES then the whole disk is formatted.
!all data destroyed!

P14, if YES then the selected tracks are formatted.

P23, interleave factor, taken from the disk controllers manual. Used to control the sector sequence on the track.

1.5 Parameter Values for Diagnostic, Test d

Param. No.	Text	Default	Min.	Max.
01	no of runs	20	1	32767
02	level no	87	8	122
03	SCSI unit + drive	0	0	255
04	RCno, no =	64	00	99
06	read?	yes	no	yes
07	retry on ?	yes	no	yes
08	status check?	yes	no	yes
10	first head	0	0	max.
12	first sector	0	0	max.
15	drive diagnostic?	yes	no	yes
16	seek test?	no	no	yes
17	check format?	yes	no	yes
18	no of tracks	-1	-1	max.
19	no of sectors	0	0	max.
23	interleave factor	1	0	max.
24	seek length	100	1	max.
27	max.mess per block	2	0	32767
49	max.error messages	10	0	32767

P15, if YES the built-in drive diagnostic test and read errorlog are performed.

P16, if YES then seek is tested.

P17, if YES then "check track format" is performed.

P24 gives the seek distance. 1st seek is for cylinder P10, 2nd seek is for cylinder P10 + P24. NB: P24 might be negative.

1.6 Parameter Values for Bad-track Test, Test e 1.6

Param. No.	Text	Default	Min.	Max.
01	no of runs	20	1	32767
02	level no	87	8	122
03	SCSI unit + drive	0	0	255
04	RC35no, no =	64	00	99
07	retry on ?	yes	no	yes
08	status check?	yes	no	yes
09	data check?	yes	no	yes
10	first cylinder	299	0	max.
11	first head	0	0	max.
25	second cylinder	308	0	max.
26	second head	0	0	max.
27	max.mess per block	2	0	32767
49	max.error messages	10	0	32767

F10 specifies a track used as alternative track.

P25 specifies a track which will be considered bad.

Data on both tracks are destroyed.

1.7 Start of the Test 1.7

To start the test, type "NEW:SAI" when TOP is waiting for input. This causes the test to start and wait for selection of subtest. When the subtest is selected, the test is ready to have its parameters changed and to be started.

2. TEST DESCRIPTION 2.

2.1 SAI Diagnostic Test, Test a 2.1

This test is used to test that the adaptor can interrupt RC3502. In each run 2000 diagnostic tests are performed. No channel program is executed.

2.2 Write and Read Test, Test b 2.2

This test is used for long-term testing of the disk. It executes data transport in double buffered mode, various addressing, datamodes, and checking may be selected.

In every run the test writes the number of blocks specified. When all segments wanted have been written, they will be read back.

Errors and status errors may be output during run. When the test terminates it will check the error log.

Before writing on the disk you are given a chance to regret. The program writes "you are going to write on x tracks" "Please confirm?". If you answer YES, then the test proceeds.

Testdata

The data contents are selected by the parameter "datakind".

Five different types of data may be selected:

```
0   all zeroes:   0000 ---- 00
1   all ones:     1111 ---- 11
2   alternating zeroes/ones: 0101 ---- 01
3   0000101011110101
4   wordnumber
```

Type 0-3 fill all words with identical information. Datakind 0 and 1 (constant string of zeroes or ones) will result in the highest bit frequency in the read-write channel. Datakind 2 (alternating ones and zeroes) will give the lowest possible bit frequency. Datakind 3, shifting between max. and min. frequency will form a worst-case test with respect to magnetic

distortion (bit shift) and the compensation circuits in the readdetector.

Datakind 4 is the wordnumber written in the word, starting with 0 on first segment/first cylinder. This means that practically no words will be equal, making this test good for checking sequencing or addressing errors. Alsw wrong screwing of address marks is detected.

The error messages are relatively easily interpreted, as the contents appear counting. Segment starts will always contain a number, which is an integer multiple of 256, and consecutive segments can be recognized by the contents, increasing 256 from segment to segment. Also, the absolute segmentno may easily be calculated from the contents.

Addressing Modes

Three modes may be selected:

1 continuous
2 alternating
3 random

In continuous mode the write and read operations are carried out block for block, starting at the beginning of the area specified by the "first segment param". The last block transferred may be cut in size to match the areabound.

In alternating mode the blocks are transferred from/to the beginning of the area and the end of the area alternatingly. If the area consists of n blocks, the sequence is: block 1, n, 2, n-1, 3, n-2 etc. This may be visualized so:

```
transfer no                          area

      I----,----,----,----,----,----,----,----,----,----,----,--I
  1    ----
  2                                                          --I
  3         ----
  4                                                       ----
  5              ----
  6                                                 ----
  7                   ----
  8                                           ----
  9                        ----
 10                                     ----
 11                             ----
 12                                  ----
```

Fig. 1. Alternating addressing mode

Notice that if the blocksize does not match the areasize, always the highest block will be cut.

In random mode the blocks are selected by means of a random number generator. This means that during the first run not all segments in the testarea will be written; this will give errorindications during the read operations. To prevent this, the area must have been initialized in continuous or alternating mode.

The random generator generates pseudo random numbers, so in two consecutive runs different segments will be affected.

The alternating and random modes perform a hard test of the head-positioning mechanism of the drive, but the run time is much longer than in continuous mode.

2.3 Format Test, Test c

2.3

This test is used for disk systems, where hardware failure causes malfunction of the built-in address mark mechanisms.

It is also used for formatting and testing of virgin disks before put into operation.

Seven disk commands are used:

1. Test drive ready
2. Recalibrate, used in the beginning of each run and after seek error
3. Seek is always used before a read or write
4. Format drive
5. Check track format
6. Format track
7. Request sense, used when test terminates

During run, errormessages may be output.

2.4 Disk Diagnostic Test, Test d 2.4

This test is used to run the built-in diagnostic test or check track format or read some tracks or more head test.

This test will not destroy any data on the disk.

2.5 Bad Track Test, Test e 2.5

This test is used to test the bad track and alternate track facilities in the disk controller. Param 10 and param 25 specifies two tracks to be written on.

3. ERRORTEXTS 3.

If an error is detected during operation, an associated errortext is written on the output media as follows:

```
<errortext>
module no: <lun no * 8 + ai no>
cylinder = <xxx>    head = <x>    sector = <xx>
expected : <xxxx>
received : <xxxx>
```

The errortexts may be:
(Most texts are taken from the DTC 510B manual).

"SCSI bus parity error"
"no index signal"
"no seek complete"
"write fault"
"drive not ready"
"drive not selected"
"no track 00"
"multiple drives selected"
"invalid command from host"
"illegal disk addr"
"illegal function"
"volume overflow"
"SCSI bus timeout"
"seek in progress"
"RAM error"
"SAI error, aux reg and intr reg:"
(expected value is aux register
received value is interrupt register)

"ID read error"
"uncorrectable data error"
"ID adr mark not found"
"data adr mark not found"
"record not found"
"seek error"
"SAI diagnostic error"
"write protected"
"correctable data error"
"bad block found"
"format error"
"illegal driver function"
error in test program
"unable to read alternate track addr"
"data error"
"direct access to alternate track"

"timeout during bus transfer"

These texts also give the meaning of the 32 statistical counters.

A. REFERENCES

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RC3502, TOP35, Test Operating System,
User´s Guide

2. RCSL No.: 99 0 00792
SAI201 Technical Manual

3. RCSL No.: 99 0 00793
WDD201, WDD202 Technical Manual

4. RCSL No.: 99 0 00794
DTC 510B Technical Manual,
Programmer´s Reference

5. RCSL No.: 99 0 00795
NEC D5104 Series Magnetic Disk Drive,
Product Description

6. NCR
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Data Sheet

7. RCSL No.: 99 0 00761
RC-FS Programmer´s Reference Manual

B. INDICES B.

B.1 Survey of Figures B.1

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