
RCSL No: 991 09780

Edition: August 1984

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Title:

RC8000/IDA801 Backing Storage Area Process
Reference Manual.

Keywords:

RC8000, Backing Storage Area, IDA801, External Process.

Abstract:

Reference Manual for the RC8000/IDA801 Backing Storage Area Process.
This manual describes the user interface and the associated functions.
It covers the specific aspects of using the RC8000/IDA801 Backing
Storage Area Process, and is meant to be used by RC8000 users.

(26 printed pages)

TABLE OF CONTENTS**PAGE**

1. INTRODUCTION	1
1.1 Changes	1
1.2 Glossary of Terms	2
2. GENERAL COMMUNICATION RULES	3
2.1 Message Format	3
2.1.1 Mode	3
2.1.2 First and Last Storage Address	3
2.1.3 First Segment	4
2.2 Answer Format	4
3. OPERATIONS	7
3.1 SENSE	7
3.2 INPUT	8
3.3 OUTPUT	10
3.4 POSITION	11
3.5 SECURITY ERASE	12

APPENDIX

A. REFERENCES	13
B. DETAILED STATUS FORMAT	14
B.1 Answer Format	14
B.2 Status Description	14
B.2.1 Control Module Status	15
B.2.2 System Intervention Status	15
B.2.3 Manual Intervention Status	17
B.2.4 Delay Code	17
B.2.5 Slave Device Status	18
B.2.6 Flaw Address (byte 3-0)	18
C. MESSAGE/ANSWER FORMAT SUMMARY	19

1. INTRODUCTION.

This manual is only valid for areas on RC834x discs connected through an IDA801 adapter.

The error recovery procedure has been changed compared to the one used in connection with areas located on RC82xx discs. The error recovery procedure is similar to the one used when accessing the disc directly (see ref. 2).

1.1 Changes.

The following has been changed compared to areas stored on RC82xx disc (see ref. 1):

- A new operation SECURITY ERASE has been added.
- The SENSE operation has been changed.
- The MODE specification in the operations has been changed. It is no longer possible to specify limited or no error recovery.
Specification of READ AFTER WRITE is now possible.
- The format of the answer has been changed. The four first words in the answer resembles the old format but the contents of the last four words has been changed.

1.2. Glossary of Terms.

- ISI: Intelligent Standard Interface. Interface of the disc units to the RC8000 Intelligent Device Adapter (IDA).
- IDA: Intelligent Device Adapter. Adapter which interfaces one or more ISI disc interfaces (and Pertec interfaces for magnetic tape stations) to RC8000.
- Segment: Logical data block containing 512 RC8000 half-words (768 8 bits bytes). One RC8000 segment is composed of three physical disc **sectors**.
- Sector: Physical data block on the discs, containing 256 8 bits bytes. It is not possible to address and transfer one single sector to or from RC8000, but only in groups of three sectors (one segment).
- Slave device: A physical disc connected to an ISI interface.

2. GENERAL COMMUNICATION RULES.

The kind of a backing store area process is 4.

2.1. Message Format.

The format of a message to an area depends on the operation. An i/o message may serve as an example.

- + 0: operation< 12 + mode
- + 2: first RC8000 storage address
- + 4: last RC8000 storage address
- + 6: first segment

2.1.1. Mode.

The mode specification in the operations has the following field:

mode: read after write<0

read after write: only in output operation.

If one, the specified block is read to check that it contains no uncorrectable errors.

2.1.2. First and Last Storage Address.

If first or last address is odd, they will be decreased by one. First and last storage address must point to a storage area within the sending process.

If not the specified storage area is a multiple of the segment size (512 RC8000 halfwords) the last storage address will be adjusted (decreased) to fit a multiple of the segment size.

2.1.3. First Segment.

This is the address (segment number) of the first segment which the operation concerns. The segment number is given relative to the beginning of the area (first segment of the area has number zero).

2.2. Answer Format.

When communicating with an area process the following results are possible from the "wait answer" system call:

- Result 1: Message accepted, answer contains further status information.
- Result 2: Violation of user/reserver requirement.
- Result 3: Unintelligible message; illegal operation or mode.
- Result 4: Malfunction, IDA controller troubles.
- Result 5: Receiver unknown, the specified area process does not exist.

For every operation the meaning of result 2 and 3 will be specified.

The answers contains logical RC8000 status, RC8000/IDA communication status, control module (ISI) status and the status of the slave device on which the area is located.

The answers has the following common format:

- + 0: status word
- + 2: number of halfwords transferred
- + 4: number of characters transferred
- + 6: i/o result
- + 8: reserved<8 + control module status<0
- +10: system intervention code<16 + manual intervention
code<8 + delay code<0
- +12: reserved<16 + slave device status<8 + flaw address,
byte 3<0
- +14: flaw address, byte 2<16 + flaw address, byte 1<8
+ flaw address, byte 0<0

Status: This status word is bit encoded:

- bit 0: intervention
 - 1: parity error or hard error
 - 2: position error
 - 5: end of area
 - 11: disc error after error recovery (always set of any
error).

Number of Halfwords and Number of Characters Transferred:

Specifies the exact number of characters which have been transferred without errors. Number of halfwords specifies number of halfwords which have been modified (always a multiple of 2).

i/o result:

- 0: normal termination
- 1: RC8000 system bus reject.
- 2: RC8000 system bus timeout.
- 3: software timeout.
- 6: power restart.
- 7: RC8000 system bus data reject
- 8: RC8000 system bus data timeout
- 9: RC8000 system bus parity error
- 10: controller bus reject
- 11: controller bus timeout
- 12: controller bus parity error

The information supplied in halfwords +8 to +14 is normally only of interest to test programs. In the rest of this manual it is called Detailed Status. For a detailed description see appendix B.

3. OPERATIONS.

The area process accepts the following messages:

SENSE, INPUT, OUTPUT, POSITION and SECURITY ERASE.

SENSE and POSITION are control operations which concern the disc on which the area is located.

INPUT, OUTPUT and SECURITY ERASE concern transport of data from or to the area. SECURITY ERASE does not involve data transport from RC8000.

3.1. SENSE

Function:

The device, on which the area is stored, is sensed.

No input/output operation is initiated on the disc but a seek operation is performed to the track on which the first segment of the area is stored, to get a correct slave device status; i.e. SENSE acts like a POSITION operation to segment zero of the area, but if the size of the area is zero (no segment allocated) no END OF AREA status is given and the slave device status will not be valid.

The sending process must be user of the area process.

Message:

+ 0: 0<12 + 0

Answer:

+ 0: status
 + 2: 0
 + 4: 0
 + 6: i/o result
 + 8 - + 14: detailed status

Errors: Result 2: Calling process is not user of area process.

Area process reserved by another process.

Result 3: Not possible.

3.2. INPUT.

Function:

A number of consecutive segments of 256 RC8000 words each are input to a storage area within the sending process. The first segment number relative to the beginning of the area on the backing store must be given in the message.

The segments need only be consecutive in a logical sense, thus securing that the user does not have to be aware of the position of the segments of an area.

The operation transfers the maximum number of segments for which there is room within the storage area, i.e.

number of segments=
 (last storage address+2 - first storage address)//512

If the input block thus specified exceeds the upper limit of the area on the backing store, input is performed only for that part of the block which is within the area. In any case the actual number of halfwords transferred is given in the answer.

If the first segment is outside the limits of the area, input is not initiated, but the answer contains the END OF AREA bit in the status word, number of halfwords/characters will be zero and the detailed status will be undefined.

The sending process must be user of the area process.

Message:

- + 0: 3<12 + 0
- + 2: first storage address.
- + 4: last storage address.
- + 6: first segment number.

First and last storage address must point to a core area within the sending process.

Answer:

- + 0: status
- + 2: number of halfwords transferred
- + 4: number of characters transferred
- + 6: i/o result
- + 8- +14: detailed status

Number of characters defines the actual number of characters which has been transferred without errors. Number of halfwords defines the number of halfwords (in multiple of 2) which has been modified (c.f. section 2.2.).

Errors: Result 2: Sending process is not user of area process.

Area reserved by another process

Result 3: Specified core area outside sending process.

3.3. OUTPUT.

Function:

The output operation is equivalent to the input operation except that the specified core area is output to the area starting from the segment number given (the segment specified must be relative to the beginning of the area). Only blocks of a multiple of 512 halfwords will be transferred.

The sending process must be reserver of the area process.

Message:

- + 0: 5<12 + mode
- + 2: first storage address
- + 4: last storage address
- + 6: first segment number

Mode: See section 2.1.1.

First and last storage address must point to a core area within the sending process.

Answer:

- + 0: status
- + 2: number of halfwords transferred
- + 4: number of characters transferred
- + 6: i/o result
- + 8-14: detailed status

Errors: Result 2: Sending process is not reserver of area process.

Result 3: Illegal mode specification.

Specified core area outside sending process.

3.4. POSITION.

Function:

The read/write heads on the device on which the area is stored are moved to the cylinder on which the segment specified in the message (specified relative to the beginning of the area) is located.

If the segment is outside the limits of the area, no operation is initiated, but the answer contains the END OF AREA status bit. In this case the detailed status will be undefined.

The sending process must be user of the area process.

Message:

- + 0: 8<12 + 0
- + 2: irrelevant
- + 4: irrelevant
- + 6: segment

Answer:

- + 0: status word
- + 2: 0
- + 4: 0
- + 6: i/o result
- + 8-14: detailed status

Errors: Result 2: Sending process is not user of area process.

Area reserved by another process.

Result 3: Not possible.

3.5. SECURITY ERASE.

Function:

The specified segment(s) in the area are erased. A random bit pattern is written on the segments.

The sending process must be reserver of the area process.

Message:

- + 0: 18<12 + 0
- + 2: 0
- + 4: 0
- + 6: first segment
- + 8: no of segments

Answer:

- + 0: status
- + 2: (no of halfwords erased)
- + 4: no of characters erased
- + 6: i/o result
- + 8- +14: detailed status

Errors: Result 2: Sending process is not reserver of area process.

Result 3: Not possible.

APPENDIX.**A. REFERENCES.**

- (1) RC8000 Backing store area process.
RCSL no 31-D539.
- (2) RC8000/IDA801 Disc Process, Reference Manual.
RCSL no 991 09775.
- (3) Intelligent Standard Interface (ISI) Specification.
Spec.: 77653440.
- (4) Product Specification for 9056 Control Module.
Spec.: 64400100.

B. DETAILED STATUS FORMAT.

In this section a description of the status delivered in word +8 - +14 of the answer is given.

It is recommended to consult ref. 3 and 4 for a more detailed description.

B.1. Answer Format.

Summary of the answer format:

- + 0: -
- + 2: -
- + 4: -
- + 6: -
- + 8: reserved<8 + Control Module status<0
- +10: System intervention code<16 + Manual intervention code<8 + Delay code<0
- +12: reserved<16 + slave device status<8 + flow address, byte 3<0
- +14: Flow address, byte 2<16 + flow address, byte 1<8 + flow address, byte 0<0

B.2. Status Description.

In the following description the bit number is given relative to the specified field, where bit 0 is the most significant bit.

B.2.1. Control Module Status.

This is bit encoded:

- Bit 0: Normal end (no further information in system/manual intervention status fields but delay code may contain valid information).
- 1: Check end (further information in system/manual intervention or delay status fields).
- 2-4: Execution status: 100B ISI i/o parity error or internal controller error.
110B Disc pack change (RC8345).
- 5: System intervention status valid.
- 6: Manual intervention status valid.
- 7: Delay status valid.

Bit 5-7 indicates whether or not further information can be found in the corresponding fields of the answer.

B.2.2. System Intervention Status.

- 00 (00H): No system intervention status
- 33 (21H): Seek error
- 65 (41H): Unable to read header (read operation)
- 67 (43H): Unable to read data
- 97 (61H): Unable to read header (write operation)

Seek error:

A seek error may be detected in all of the operations. If it is detected the following is automatically done:

The heads are moved to track zero and the seek is repeated once. If this second seek succeeded the status word will indicate operation completed, the control module status will indicate NORMAL END but the delay status will indicate SEEK RETRY APPLIED.

If the second seek failed, the status word indicates POSITION ERROR, control module status indicates CHECK END, system intervention status indicates SEEK ERROR and delay status indicates SEEK RETRY APPLIED.

Read header trouble:

If the address information (header) part of a sector contains an error (which may be detected through an ECC mismatch) no ECC error correction is applied, but a rereading of the header will be performed once. If this rereading of the header is unsuccessful and it is impossible to verify that the slave device is on the proper cylinder, a return to track zero and a seek to specified track is performed to ensure that the correct cylinder is selected, before an error status is delivered (system intervention status will indicate UNABLE TO READ HEADER).

If the rereading of the header was successful the control module status will indicate NORMAL END, but the delay code will indicate HEADER RETRY APPLIED.

Read data trouble:

If an error is detected during a reading of the data part of a sector the following is done:

Two attempts to read the data are made with carriage and data offset at nominal, and single burst (of at most 25 bits) ECC employed. Then three attempts are made at each of the strobe offsets (early and late) while holding the carriage offset at nominal.

Also three attempts are made at each of the carriage offsets (plus and minus) while holding the strobe offset at nominal. Finally, one more attempt is made with the offsets in their nominal conditions. A single burst ECC procedure is applied in the final attempt.

If the error recovery is unsuccessful the control module will indicate CHECK END, system intervention status will indicate UNABLE TO READ DATA and the delay code will indicate DATA CORRECTION APPLIED and DATA RETRY APPLIED.

If the error recovery was successful the control module will indicate NORMAL END but the delay code will indicate DATA CORRECTION APPLIED and/or DATA RETRY APPLIED depending on when the error recovery succeeded.

B.2.3. Manual Intervention Status

00 (00H): No manual intervention status.

Other values: Indicates an error which normally is correctable only through manual intervention. For further information see ref. 3 and 4.

B.2.4. Delay Code

The delay code specifies whether or not an error recovery action has been performed. The delay code does not necessarily indicate an error as the data correction may have been successful.

00 (00H): No delay status

33-39 (21-27H): Bit encoded delay status:

0010.0xx1 Data correction applied

0010.0x1x Seek retry applied

0010.01xx Data retry applied

66 (42H): Header retry applied.

B.2.5. Slave Device Status.

The slave device status is bit-encoded:

- bit 0: No head select
- 1: Write fault
- 2: read/write off cylinder
- 3: read/write fault
- 4: voltage fault
- 5: head select fault
- 6: seek error
- 7: write protect

B.2.6. Flaw Address (byte 3 - 0)

The flaw address is given as an absolute sector address on the physical disc.

If the operation succeeded but the delay status indicates 'data correction applied' or 'data retry applied', it contains the sector address of the sector which needed data correction to be applied (only possible for input and output with read after write specified).

If the operation failed because of an unrecoverable error, it contains the sector-address of the erroneous sector.

If the operation succeeded it is undefined.

C. MESSAGE/ANSWER FORMAT SUMMARY.

<u>Operation</u>	<u>Message</u>	<u>Answer</u>
sense	0<12 + 0	status word 0 0 i/o result detailed status - " - - " - - " -
input	3<12 + 0 first storage address last storage address first segment number	status word number of halfwords number of characters i/o result detailed status - " - - " - - " -
output	5<12 + mode first storage address last storage address first segment number	status word number of halfwords number of characters i/o result detailed status - " - - " - - " -

position	8<12 + 0	status word
	irrelevant	0
	irrelevant	0 -
	segment	i/o result
		detailed status
		- " -
		- " -
		- " -

security erase	18<12 + 0	status word
	0	number of halfwords
	0	number of characters
	first segment	i/o result
	number of segments	detailed status
		- " -
		- " -
		- " -

RETURN LETTER

Title: RC8000/IDA801 Backing Storage Area
Process. Reference Manual

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