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Title:

RC8000/IDA801 Disc Process.
Reference Manual.

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Abstract:

Reference Manual for the RC8000/IDA801 Disc Process.

This manual describes the user interface and the associated functions.

It covers the specific aspects of using the RC8000/IDA801 Disc Process, and is meant to be used by RC8000 users.

(40 printed pages)

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1. INTRODUCTION.

This manual is only valid for disc storage modules connected to the RC8000 through an Intelligent Device Adapter (IDA801 - RC834x storage modules).

1.1. Changes.

The following has been changed compared to disc storage modules RC82xx (see ref. 1).

- The monitor kind of an RC834x disc process has been changed.
- The CLEAN TRACK and INITIALIZE operations have been cancelled.
- The SENSE and EXTRACT STATISTICS operations have been changed.
- Six new operations have been added:
FORMAT KIT, POWER UP SPINDEL, POWER DOWN SPINDEL, READ SYSTEM FW, WRITE SYSTEM FW and SECURITY ERASE.
- The MODE specification of the operations has been changed:
It is no longer possible to operate on the address part of a sector.
It is no longer possible to specify limited error-recovery.
Specification of READ AFTER WRITE is now possible.
- The format of the answer has been changed.
- The disc now contains a description of the logical format of the kit i.e. a description of the autoloader part and a description of each logical disc on the kit.

- It is now possible to create and remove physical and logical disc processes at run time. When a logical disc has been created on a (physical) disc, it is no longer possible to communicate with the physical disc process.

1.2. Glossary of Terms.

ISI:	Intelligent Standard Interface. Interface of the disc units to the RC8000 Intelligent Device Adapter (IDA).
CM:	Control Module. A control module supporting the ISI standard operations.
IDA:	Intelligent Device Adapter. An 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 halfwords (768 8 bits bytes). One RC8000 segment is composed of three physical disc sectors .
Sector:	Physical data block on the disc, 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 RC8000 segment).
Slave Device:	A physical disc connected to an ISI interface.
FSD:	Fixed Storage Drive.
RSD:	Removable Storage Drive.

2. DISC MEDIA DESCRIPTION.

The RC834x disc units are connected to RC8000 through an Intelligent Device Adapter (IDA801), to which the physical disc units are connected through an Intelligent Standard Interface (ISI).

The following general description applies to all RC834x disc units unless explicitly stated.

2.1. The Data Medium.

The disc packs used on the disc storage modules consist of a number of coax-like discs rotating together.

Data is stored in **tracks** that are concentric circles on the disc **surface**. A **read/write head** is allocated to each surface on the disc pack; these read/write heads are movable in radial direction by means of a common head activator. Hence the radial position of the heads defines a track on all surfaces, these tracks are in common called a **cylinder**. To select a certain track it is necessary to select a read/write head corresponding to a certain disc surface.

Each track is further divided into a number of pie-shaped sections which are called **sectors**. A sector is the smallest addressable unit on the disc pack.

Each sector is (logically) composed of two parts: A **header part** and a **data part**.

The header contains address, error and Error Correction Code (ECC) information. The error information is used to skip a group of 24 bits containing a permanent error of at most 8 bits in the data part of the sector. The ECC information is only used for error detection in the header although the control module has the ability to correct the header; but this is not done due to the impact that a mis-correction would have on the RC8000 file.

The **data part** of the sector contains 256 8 bits bytes and an ECC of 8 bytes. The ECC can be used to correct a single burst error of 25 bits or less.

2.2. RC8000 Disc Administration.

The smallest addressable unit of data from RC8000 is called a **segment**. A segment is a data block of 768 8 bits bytes (three physical sectors).

Disc operations are initiated by sending messages to the RC8000 external process representing the disc.

To each disc storage module corresponds one external process (representing the physical disc) which controls the entire disc module. To each physical disc may exist none, one or more so-called **logical discs** which is an external process describing a part of the disc storage module. From the view of an internal process, each physical or logical disc represents an independent device identified by a unique device number.

Segment numbers supplied in messages sent to a physical disc driver specify segments relative to the first segment on the disc storage module, whereas segment numbers supplied in messages sent to a logical disc specify segments relative to the start of the logical disc.

A logical disc may be accessed via messages sent to the external process representing the logical disc or if the process represents a logical backing storage it may be accessed through **area** processes. An area process is a process representing a file on the logical disc. To maintain the logical backing storage system each logical disc has a **catalog** and a **chaintable** stored on the logical disc.

The catalog contains information of the files stored on the logical disc whereas the chaintable contains information of which segments (**slices**) a given file occupies. Segments on the logical disc is allocated in groups (called slices) to an area (file).

The number of segments in a slice is defined for each logical disc.

Segment numbers supplied to an area process is relative to the start of the area. Although the segments of an area is allocated sequentially from the internal process' point of view, it may be allocated in a non-consecutively way on the logical disc, where the chaintable gives the sequentially connection between the segments (slices). For physical and logical discs the segments are allocated sequentially in both a physical and logical sense.

Disc processes (physical and logical) are created at runtime. When a physical disc process has been created, it can be divided into a number of logical discs each represented by a logical disc process.

Creation and removal of disc-processes are carried out by sending messages to the IDA-main process supervising the IDA-controller on which the disc-units are connected (see ref. (3)).

It should be noted that it is impossible to communicate with a physical disc when the first logical disc process has been created. The disc may then only be accessed through logical discs or areas.

All physical discs which are divided into logical discs will contain a logical disc (an autoloader disc) which describes the first part of the disc. This autoloader part of the disc contains:

- a description-part and
- a system software part.

The description part contains information about the system-software location and a description of all logical discs on the disc-kit. The logical discs are described by their location, size and type. The type specifies whether the logical disc contains a catalog or not. The description of the logical disc may also contain an RC8000 device number which specifies the external process that should be used when the logical disc is created (linked) (see ref. 3).

The system software part is used when the disc is used as an autoloader disc. It contains:

- disc-space for RC8000 coredump,
- IDA801 firmware,
- RC8000 bootloader,
- RC8000 monitor and
- software for device-controllers.

This disc-description and the possibility of creation and removal of (physical and logical) disc processes at runtime implies that a diskit now is independent of a pre-defined monitor (see ref. (3)).

2.3. Error Recovery.

The Intelligent Standard Interface supports different kinds of error recovery including Error Correction Codes (ECC), repeated reading with early and late strobe and variable offset.

In the following a description of the different errors and error corrections are noted.

Seek Error:

This error indicates that it is impossible to verify a certain track. When this occurs the disc will always move to track zero and repeat the seek operation once more. If the recovery failed the operation is terminated and a seek error status is set.

Header (address information block) Error:

If the address information part of a sector contains an error (which may be detected through an ECC mismatch) no ECC error correction is applied, but a re-reading of the header will be performed once. If this re-reading 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 the specified track is performed to ensure that the correct cylinder is selected, before an error status is delivered.

Data Error:

If an error is detected during a reading of the datapart 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 employed in the final attempt.

Intervention:

This indicates that manual intervention has occurred on a slave device. If it concerns a removable storage device, the disc pack may have been changed.

3. GENERAL COMMUNICATION RULES.

The monitor kind of a (physical and logical) IDA disc is 6.

A logical disc cannot be reserved if the corresponding physical disc is reserved by another internal process, and a physical disc cannot be reserved if any of the logical discs situated on the physical disc are reserved by another internal process.

Remember that it is impossible to communicate with a physical disc if any logical disc processes have been created for that physical disc.

To use a logical disc, the corresponding physical disc need not have a name.

A disc process representing a logical backing store is, during normal use, reserved by the anonymous process executing process functions.

3.1. Message Format.

The format of a message to a disc process depends on the operation. I/O messages may serve as an example:

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

3.1.1. Mode.

The mode specifies a modification of the operation. The only allowed mode is:

mode: read after write<0

read after write: Only output operations. After the specified block has been written or the specified sectors have been erased, it is read to check that it contains no uncorrectable errors.

3.1.2. First and Last Storage Address.

If first or last storage addresses are odd they are 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.

3.1.3. Segment Number.

This is the address (number) of the (first) RC8000 segment which the operation concerns (relative to the beginning of the physical or logical disc; first segment has number zero).

3.2. Answer Format.

When communicating with a (physical or logical) disc process, the following results are possible from the "wait answer" system call:

- Result 1: Message accepted, answer contains further status information.
- Result 2: Message rejected because of 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 disc process does not exist.

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

If result 1 is returned the answer contains logical RC8000 status, RC8000/IDA communication status, control module (ISI) status and the status of the slave device (in case of a logical disc it concerns the physical disc on which the logical disc is situated).

The answers have 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 word:

The status word is bit encoded:

bit 0: intervention

1: parity error or hard error

2: position error

5: end medium

11: disc error (always set when any errors).

All bits zero: operation completed.

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 has 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 of the answer is normally only of interest to test programs. For a detailed description see appendix B. This part of the answer is in the rest of this manual called Detailed Status.

4. OPERATIONS.

The disc process (physical and logical) accepts the following messages:

SENSE, INPUT, OUTPUT, FORMAT KIT, POSITION, EXTRACT STATISTICS, POWER UP SPINDEL, READ SYSTEM FIRMWARE, POWER DOWN SPINDEL, WRITE SYSTEM FIRMWARE and SECURITY ERASE.

SENSE, FORMAT KIT, POSITION, POWER UP SPINDEL, POWER DOWN SPINDEL and SECURITY ERASE does not involve any data-transfer to or from RC8000.

FORMAT KIT, READ SYSTEM FIRMWARE and WRITE SYSTEM FIRMWARE are operations which concern the initialization of a disc kit. These operations and POWER UP and POWER DOWN SPINDEL will only be accepted by a physical disc driver (and only when there are no logical disc processes for that disc).

4.1. SENSE.

Function:

The slave device is sensed. No input/output operation is initiated but a seek operation is performed to the first track of the disc (track zero in case of a physical disc or the first track of the logical disc) to get a correct slave device status, i.e. SENSE acts like a POSITION to the first segment of the disc.

The sending process must be user of the disc process.

Message:

+ 0: 0<12 + 0

Answer:

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

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

Disc process is reserved by another process.

Result 3: Message sent to a physical disc on which a logical disc is linked.

4.2. INPUT.

Function:

A number of consecutive segments of 256 words each are input to a storage area within the sending process. The first segment number wanted is given in the message.

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

$$\begin{aligned} \text{number of segments} = \\ (\text{last storage address} + 2 - \text{first storage address}) // 512 \end{aligned}$$

If the input block thus specified exceeds the upper limit of the (physical or logical) disc, input is performed only of that part of the block that is within the disc. In any case the actual number of halfwords and characters transferred are given in the answer.

The number of halfwords transferred is a multiple of 512. The number of characters is defined as three times the number of words transferred.

If the first segment is outside the limits of the (physical or logical) disc, input is not initiated, but the answer contains a status bit, end medium, and number of halfwords and characters transferred are zero.

The sending process must be user of the disc 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.

Errors: Result 2: Sending process is not user of disc process.
 Disc process is reserved by another process.
 Result 3: Message sent to a physical disc on which a
 logical disc is linked.

4.3. OUTPUT.

Function:

The output operation is equivalent to the input operation except that the specified core area is output to the disc, starting from the segment number given (the segment specified must be relative to the beginning of the (physical or logical) disc.

If the specified core area will exceed the upper limit of the (physical or logical) disc, the operation is initiated for that part of the core area which is within the disc.

As for input only blocks of a multiple of 512 halfwords will be transferred.

The sending process must be reserver of the disc process.

Message:

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

mode: See section 3.1.1.

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 disc process.

Result 3: Illegal mode specification. Message sent to a physical disc on which a logical disc is linked.

4.4 **FORMAT KIT.**

Function:

The entire disc pack is formatted and certified.

Note that this operation requires approximately 8 hours for a RC8346 disc pack and 4 hours for a RC8345 disc pack.

The answer will be returned when the operation is finished.

This operation will only be accepted by a physical disc (and no logical discs must be linked on it).

The sending process must be reserver of the disc process.

Message:

+ 0: 6<12 + 0

Answer:

+ 0: status

+ 2: 0

+ 4: 0

+ 6: i/o result

+ 8-+14: detailed status

Errors: Result 2: Sending process is not reserver of (physical) disc.

Result 3: Disc in not a physical disc.

Logical disc linked to physical disc.

4.5. POSITION.

Function:

The read/write heads on the slave device are moved to the cylinder on which the segment specified in the message is located (if the disc is a logical disc, the specified segment must be relative to the beginning of the logical disc).

If the segment is outside the limit of the disc, no operation is initiated, but the answer contains the END OF MEDIUM status bit.

The sending process must be user of the disc process.

Message:

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

Answer:

- + 0: status word
- + 2: 0
- + 4: 0
- + 6: i/o result
- + 80+14: detailed status

Errors: Result 2: Sending process is not user of disc process.
 Disc process is reserved by another process.
 Result 3: Message sent to a physical disc on which a
 logical disc is linked.

4.6. EXTRACT STATISTICS.

Function:

On each physical disc a table of statistical information reflecting the use and condition of the slave device is maintained. If the operation is sent to a logical disc driver, the information concern the physical disc on which the logical disc is situated.

The information may be transferred to a core area within an internal process by sending this message.

If the storage area is too small, only the amount of data which there is room for, is transferred.

Number of characters in the answer, specifies the amount of valid statistical information.

The supplied information contains permanent statistics as the table is kept on the disc. The table on the disc is updated when the disc receives a 'POWER DOWN SPINDEL' operation.

If the disc is physical disc unit number zero, the supplied disc information is appended with information about the control module on which the disc unit is connected.

The sending process must be user of the disc process.

Appendix C contains a detailed description of the supplied statistical information.

Message:

- + 0: 9<12 + mode
- + 2: first storage address
- + 4: last storage address

Mode: clear statistics <0

if one the table of statistics is cleared when
the information has been transferred to RC8000.

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 user of disc process.

Disc process is reserved by another process.

Result 3: Illegal mode specification.

Message sent to a physical disc on which a
logical disc is linked.

4.7. POWER UP SPINDEL.

Function:

The IDA801 controller will power up the spindle on the slave device.

The slave device will be ready within approximately 30 seconds for an FSD and within approximately 70 seconds for an RSD slave device. The answer will be returned when the operation is finished.

This operation will only be accepted by a physical disc (and no logical discs must be linked on it).

The sending process must be reserver of the disc process.

Message:

+ 0: 10<12 + 0

Answer:

+ 0: status

+ 2: 0

+ 4: 0

+ 6: i/o result

+ 8-+14: detailed status

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

Result 3: Message sent to a logical disc or sent to a physical disc on which logical discs are linked.

4.8 READ SYSTEM FIRMWARE.

Function:

The firmware (the COS-program) or the test-program (the level II diagnostic test program) for the control module on which the disc is connected is transferred to the specified core area.

This operation will only be accepted by a physical disc (and no logical discs must be linked on it).

The sending process must be reserver of the disc process.

Message:

- + 0: 11<12 + mode
- + 2: first storage address
- + 4: last storage address

mode: firmware <0 :
 firmware = 0: COS program.
 firmware = 1: level II diagnostic.

Answer:

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

Errors: Result 2: Calling process is not reserver of disc process.

Result 3: Message sent to a logical disc or logical discs linked to physical disc.

4.9. POWER DOWN SPINDEL.

Function:

This command causes IDA801 to power down the spindle on the slave device. This command completes within approximately 20 seconds for FSD and approximately 40 seconds for RSD. The answer will be returned when the operation has been completed.

This operation will only be accepted by a physical disc (and no logical discs must be linked on it).

The sending process must be reserver of the disc.

Message:

+ 0: 12<12 + 0

Answer:

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

The slave device status and the current seek address part of the detailed status is not valid.

Errors: Result 2: Calling process is not reserver of disc process.

Result 3: Message sent to a logical disc or logical discs linked to physical disc.

4.10 WRITE SYSTEM FIRMWARE.

Function:

The specified core area, containing either the firmware (the COS-program) or the test-program (the level II diagnostic test program), is written on the system-cylinder of the disc.

This operation will only be accepted by a physical disc (and no logical discs must be linked on it).

The sending process must be reserver of the disc process.

Message:

- + 0: 13<12 + mode
- + 2: first storage address
- + 4: last storage address.

mode: firmware <0:
 firmware =0: COS-program
 firmware =1: level II diagnostic.

Answer:

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

Errors: Result 2: Calling process is not reserver of disc process.

Result 3: Message sent to a logical disc or logical discs linked to physical disc.

4.11 SECURITY ERASE.

Function:

The specified segments on the disc are erased.
A random bit-pattern are written on the segments.

The sending process must be reserver of the disc.

Message:

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

Answer:

- + 0: status
- + 2: (number of 'halfwords' erased)
- + 4: number of characters erased
- + 6: i/o-result
- + 8-+14: detailed status.

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

Result 3: Message sent to a physical disc on which
logical discs are linked.

APPENDIX.A. REFERENCES.

- (1) RC8000 Disc Process, RCSL No 31-D528.
- (2) RC8000/IDA801 Backing Storage Area Process, Reference Manual.
RCSL No 991 09780.
- (3) RC8000/IDA801 Main Process, Reference Manual.
RCSL No 991 09773.
- (4) Intelligent Standard Interface (ISI) Specification.
Spec.: 77653440.
- (5) 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. 4 and 5 for a more detailed description.

B.1. 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 + flaw Address, byte 3<0
- +14: Flaw Address, byte 2<16 + flaw Address, byte 1<8 + flaw 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 status fields).

2-4: Execution status: 100B ISI i/o parity error or
internal controller error.
110B Disc pack change (RSD). This
will also be signaled in the
status word (answer word +0)
bit 0.

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 Code.

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 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 code will indicate SEEK RETRY APPLIED.

If the second seek failed, the status word indicates POSITION ERROR, Control Module status indicates CHECK END and delay code indicates SEEK RETRY APPLIED.

Read header troubles:

No ECC correction is applied if an address information block (header) contains errors.

Read data troubles:

See section 2.3: Data error.

B.2.3. Manual Intervention Code.

00 (00H): No manual intervention status.
Other values: Indicates an error which normally is correctable only through manual intervention (for further information see ref. 5).

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 (21H-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. Current Seek 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, output with read after write).

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. FORMAT OF STATISTICS INFORMATION.

The statistics information supplied from a disc process does not contain information concerning the communication between RC8000 and the IDA801 controller.

The statistics information for the Control Module will only be delivered when reading statistics for the disc unit which has physical device address zero on the Control Module.

The detailed statistics are given as 16 bits count values unless others noted in the description. The statistics are input to RC8000 in a packed format. Along with the description the RC8000 layout is sketched. Some of the fields are separated in two parts which are stored in two consecutively placed RC8000 words. In the description these parts are denoted Most/Least Significant Byte (MSB/LSB). In the sketch of the layout a "," denotes a byte (8 bits) and a "!" denotes a byte and a field limit.

The 16 bits count values must be interpreted as a countvalue concatenated of 2 8 bits counters, where the 8 leftmost bits are the least significant and the 8 rightmost bits are the most significant byte.

Counters with more than 16 bits must be interpreted as a concatenation of a number of 16 bits counters (interpreted as described) where the 16 leftmost bits are the most significant and the 16 rightmost bits are the least significant bits.

Slave Device Detailed Statistics:

Bit no:
0 8 16

+ 0: !...,...,..., No of seeks (48 bits count)
+ 2: ,...,...,...!
+ 4: !...,...!..., Seek error. Unable to read header LSB.
+ 6: ,...!...,...! Unable to read header MSB. Unable to read data.
+ 8: !...,...!..., Write protected media violation. No device
response LSB.
+10: ,...!...,...! No device response MSB. Data correction applied.
+12: !...,...!..., Seek retry applied. Data retry applied LSB.
+14: ,...!...,...! Data retry applied MSB. Unused.
+16: !...,...!..., Unused. No head select fault LSB.
+18: ,...!...,...! No head select fault MSB. Write fault.
+20: !...,...!..., (R+W) x Off cylinder fault. (RxW) fault LSB.
+22: ,...!...,...! (RxW) fault MSB. Voltage fault.
+24: !...,...!..., Head select fault. Unused.
+26: ,...!...,...! Unused. Software write protect fault.
+28: !...,...!..., Unused.
+30: !...,...!..., Unused.

The following sector addresses are absolute
sector addresses (32 bits):

+32: !...,...,..., 1. defective sector address, byte 2,3,0.
+34: ,...!...,..., 1. defective sector address, byte 1. 2. defective
sector address, byte 2,3.
+36: ,...,...!..., 2. defective sector address, byte 0,1. 3.
defective sector address, byte 2.
+38: ,...,...,...! 3. defective sector address, byte 3,0,1.
+40: !...,...,..., 4. defective sector address, byte 2,3,0.
+42: ,...! 4. defective sector address, byte 1.

Control Module Detailed Statistics:

+42: !...,...! Command block overwrite.
+44: !...,...!..., Illegal command byte. Illegal secondary seek
address LSB.
+46: ,...!...,...! Illegal secondary seek address MSB. Illegal
primary seek address.
+48: !...,...!..., Illegal command parameter. I/o illegal write
error LSB.
+50: ,...!...,...! I/o illegal write error MSB. I/o illegal
disconnect.
+52: !...,...,...! Unused.
+54: !...!...,...! Unused. I/o parity error.
+56: !...,...!..., R/w scheduler parity error. Buffer parity error
LSB.
+58: ,...!...,...! Buffer parity error MSB. ECC hardware fault.
+60: !...,...!..., Illegal device no/control field. Diagnostic fault
detected LSB.
+62: ,...!...,...! Diagnostic fault detected MSB. Unused.

D. MESSAGE/ANSWER FORMAT SURVEY.

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

Format kit	6<12 + 0	status
		0
		0
		i/o result
		detailed status
		- " -
		- " -
		- " -
Position	8<12 + 0	status
	irrelevant	0
	irrelevant	0
	segment	i/o result
		detailed status
		- " -
		- " -
		- " -
Extract Statistics	9<12 + mode	status
	first storage address	number of halfwords
	last storage address	number of characters
		i/o result
		detailed status
		- " -
		- " -
		- " -
Power Up Spindel	10<12 + 0	status
		0
		0
		i/o result
		detailed status
		- " -
		- " -
		- " -

Read System FW	11<12 + mode	status
	first storage address	number of halfwords
	last storage address	number of characters
		i/o result
		detailed status
		- " -
		- " -
		- " -

Power Down Spindel	12<12 + 0	status
		0
		0
		i/o result
		detailed status
		- " -
		undefined
		undefined

Write System FW	13<12 + mode	status
	first storage address	number of halfwords
	last storage address	number of characters
		i/o result
		detailed status
		- " -
		- " -
		- " -

Security Erase	18<12 + 0	status
	0	(number of halfwords)
	0	number of bytes
	first segment	i/o result
	no of segments	detailed status
		- " -
		- " -
		- " -

RETURN LETTER

Title: RC8000/IDA801 Disc Process
Reference Manual

RCSL No.: 991 09775

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