



LINN

Linn Akurate CD - RS232 ASCII Interface Specification and Commands

Revision 1.00

Revision History

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Introduction

This document describes how to control the Akurate CD and peripherals through an RS232 interface.

There are three main sections to this document:

1: Message Protocol

- This section describes how commands are constructed and how they may be used.

2: System Commands

- This section lists the commands, which allow the Akurate CD to be used as part of a system driven through an RS232 interface.

3: Akurate CD Commands

- This section defines a list of commands for controlling Akurate CD. This section is further subdivided into the subsets of the Akurate CD commands.
- These are :-
 - Disc Commands
 - Audio Commands
 - Setup Commands
 - Option Commands

1: Message Protocol

1.1: Overview

The RS232 interface on the Akurate CD allows it to be controlled by a touch screen, PC or any computer with an RS232 port. The Akurate CD obeys the commands received through the RS232 interface and replies to confirm successful or unsuccessful operation.

The RS232 interface uses an initial response then final response method to acknowledge receiving the command and then completing the task. The interface also supports device and group identifiers to allow a number of units to be connected together. The controlling device can also supply a source identification, which the Akurate CD will echo as the destination for the replies.

Previous products were termed as slave devices, in regards that nothing was transmitted until something was received, e.g. a task or status command. The Akurate CD however, will transmit unsolicited messages when something within the product changes, e.g. the disc stops playing.

1.2: Message Syntax

The general syntax is as follows: **(Source_ID) (Group_ID) (Destination_ID) Command NL**

Where:

Source_ID Syntax: **#Source_ID#**

is a unique identifier, used to denote the source of the message. Enclosed by the ‘#’ delimiter, the maximum identifier size is 20 ASCII alphanumeric characters (excluding spaces).

Destination_ID Syntax: **@Destination_ID@**

is a unique identifier, used to denote the destination of the message. Enclosed by the ‘@’ delimiter, the maximum identifier size is 20 ASCII alphanumeric characters (excluding spaces).

Group_ID Syntax: **&Group_ID&**

is a unique identifier, used to denote a specific group of products. Enclosed by the ‘&’ delimiter, the maximum identifier size is 20 ASCII alphanumeric characters (excluding spaces).

Command Syntax: **\$Command\$**

is the command from the host for the product. Enclosed by the ‘\$’ delimiter.

NL Syntax: 13dec and 10dec (0Dhex and 0Ahex)

are the line termination characters, carriage return and line feed.

Note:

Nesting of fields is not permissible, nor is the use of the special delimiter characters as part of the field strings themselves, unless they are expressed as an escape sequence (see Appendice B : Escape Sequences).

Spaces are permissible before and after an identifier, but are not allowed within the actual identifier, unless they are expressed as an escape sequence (see Appendice B : Escape Sequences).

For example, # recorddeck # is valid whereas # record deck # is invalid.

By using an escape sequence, the second example becomes valid, i.e. # record\0x20deck #

1.3: Identifier Considerations

The full transmission format uses four fields as shown.

```
#Source_ID# &Group_ID& @Destination_ID@ $Message$
```

Where fields are omitted the results are defined in the following notes.

- \$Message\$ *refer to note 1*
- @Destination_ID@ \$Message\$ *refer to note 2*
- &Group_ID& \$Message\$ *refer to note 3*
- &Group_ID& @Destination_ID@ \$Message\$ *refer to note 4*
- #Source_ID# \$Message\$ *refer to note 5*
- #Source_ID# @Destination_ID@ \$Message\$ *refer to note 6*
- #Source_ID# &Group_ID& \$Message\$ *refer to note 7*
- #Source_ID# &Group_ID& @Destination_ID@ \$Message\$ *refer to note 8*

Note Details

- 1 - A product recognising the command will issue an initial response and try to perform the task.
 - A successful or unsuccessful final response will be issued subsequently.
 - Products not recognising the command will remain silent.
 - If no product recognises the command then there will be no reply.
 - If more than one product recognises the command then there may be a comms clash on the replies.
- 2 - The destination product is responsible for all replies.
 - Invalid commands will generate an error response.
 - The replying product will transfer the destination to the source field on a reply.
 - All products not matching the destination must remain silent and not attempt to handle the command.
 - If two products have the same id, then a comms clash may occur.
- 3 - All products within the group should attempt the task.
 - Products out with the group should ignore the task.
 - There are no replies from any boxes.
- 4 - All products within the group should attempt the task.
 - Products out with the group should ignore the task.
 - Only the product, which matches the destination identity, should reply.
 - Invalid commands will generate an error response.
 - If there are more than two products in the group with the same destination identity then a comms clash may occur.
 - The destination identity becomes the source identity in any reply traffic.
- 5 - As for note 1, with the source identity becoming the destination identity in any replies.
- 6 - As for note 2, with the source identity becoming the destination identity in any replies.
- 7 - As for note 3. There are no replies.
- 8 - As for note 4, with the source identity becoming the destination identity in any replies.

1.4: Syntax of Commands and Responses

1.4.1: Command Syntax

The command message has two variations:

1.4.1.1: Command Help

This allows the host to find out what type of parameters the command requires.

Syntax: **\$? Command\$NL**

Where:

\$	is the command start delimiter
?	is a request for help
Command	is the command help request is for
\$	is the command end delimiter
NL	are the line termination characters - carriage return, line feed.

Additionally, if '**Command**' is a '?' then the command set of the product will be provided, with an initial response followed by a final response for each command supported by the product.

This is a change to the previous method, where the command set of the product was output as a single response, with each command being separated from the next by a space and no help text was included.

Note:

Command help is product dependent and is not implemented on the Akurate CD.

1.4.1.2: Command

This is the method by which the host controls the product

Syntax: **\$Command (Param (Param))\$NL**

Where:

\$	is the command start delimiter
Command	is the command string
Param	is the parameter string (0 or more)
\$	is the command end delimiter
NL	are the line termination characters - carriage return, line feed.

Note:

Parameters required are command dependent

1.4.2: Solicited Response Overview

When replies are made an initial response and final response are issued. It is unwise for the host to issue further commands until the final response has been received. Section 1.3: Identifier Considerations, describes the action of identifiers on these replies and specifies rules which may also suppress the replies.

1.4.2.1: Initial Response

This will be given on receipt of a valid command and for a positive acknowledge will be of the form:

```
(Source_ID) (Group_ID) (Destination_ID) !
```

In this way, the host quickly knows that the destination has received and understood the command.

1.4.2.1.1: Initial Response Failure

This will be given on receipt of an invalid command and will be of the form:

```
(Source_ID) (Group_ID) (Destination_ID) !$FAIL sc fn$
```

Where 'sc' is a status code (see section 2.4.1.1: Status Codes) specifying why the task could not be completed, and 'fn' specifies which field was responsible.

Note: There is no final response.

1.4.2.2: Final Response

This will be given on completion of the task and will be of the form:

```
(Source_ID) (Group_ID) (Destination_ID) !$Status_String$
```

The status string will be a unique response to the originating command.

1.4.2.2.1: Final Response Failure

This will be given where a task could not be completed and will be of the form:

```
(Source_ID) (Group_ID) (Destination_ID) !$FAIL sc fn$
```

Where 'sc' is a status code (see section 2.4.1.1: Status Codes) specifying why the task could not be completed, and 'fn' specifies which field was responsible.

Note:

¹ In all cases, identifiers will only be returned as part of the response if supplied as part of the command (refer to section 1.3: Identifier Considerations for further details).

² Fields are numbered from left to right, starting at 1.

1.4.3: Unsolicited Response Overview

Unsolicited responses are an addition to the RS232 protocol, and are generated automatically by the product to inform the host of a change to the products status.

1.4.3.1: Unsolicited Response

This will be given at any time during the operation of the product and will be of the form:

(Source_ID) \$Status_String\$

The major differences between solicited and unsolicited responses are as follows:

1. Unsolicited messages can occur at any time (if activated).
2. Source identifier, if present within product settings, will always form part of the message.
3. No exclamation mark is included before the command delimiter.

Note:

*Please refer to user options with regards to unsolicited responses (see **Error! Reference source not found.** and 3.3.4.1.7: **Error! Reference source not found.**).*




2: System Commands




The following commands allow the Akurate CD to be part of a system driven through an RS232 interface.




2.1: Identity Commands

2.1.1: ID

Configure the product on a one to one basis




 <code>\$ID identifier\$</code>
 <code>\$ID identifier\$</code>
 <i>Write product identifier</i>




 <code>\$ID ~identifier\$</code>
 <code>\$ID\$</code>
 <i>Remove product identifier</i>

 <code>\$ID ?\$</code>
 <code>\$ID identifier\$</code>
 <i>Return product identifier</i>

2.1.2: GID

Configures a product as part of a group so that it can be accessed a number of ways

 <code>\$GID identifier\$</code>
 <code>\$GID identifier\$</code>
 <i>Write group identifier (product now becomes part of a group of products)</i>

 <code>\$GID ~identifier\$</code>
 <code>\$GID identifier [identifier [...]]\$</code>
 <i>Remove a product from a particular group</i>

 <code>\$GID ?\$</code>
 <code>\$GID identifier [identifier [...]]\$</code>
 <i>Return list of currently defined group identifiers from product</i>

Notes on Groups:

A product can be a member of at most 5 groups to allow it to be addressed in a variety of ways.




While in 'group' mode, products with the same group ID will react in the same way to product specific commands sent to them using the Group_ID syntax (&group_id&).




In addition, products in Group Mode will not acknowledge receipt of commands from the host. This is to avoid all products in the group potentially responding at the same time.

Each product can be polled individually at the end of a group mode command to check they have all been updated correctly.

2.2: Communication Commands

2.2.1: BAUD

 \$BAUD baudrate\$
 !\$BAUD baudrate\$
 <i>Select new baud rate from the following: 4800, 9600, 14400³, 19200, 28800³, 38400, 57600³, 115200³, 230400³</i>

 \$BAUD ?\$
 !\$BAUD baudrate\$
 <i>Returns current baud rate (see above)</i>

Note:




¹ Initial and final responses will be at the current baud rate, before the new baud rate is implemented.

² Baud rate defaults to 9600 when the product is initialised.




³ New baud rates supported by this product.

⁴ 2400 baud rate not supported by this product.

2.2.2: RESET

 \$RESET\$
 !\$RESET\$
 <i>Clear communications buffer on product</i>

2.2.3: ECHO

 \$ECHO text\$
 !\$ECHO <text>\$
 <i>Echo's the text back enclosed in < and ></i>

This command is used ease the burden of initial set-up of host-product communications, the product will echo the parameter provided back to the host.

Note:

If no identifiers are supplied with this command, then all devices connected to a system will respond, which may result in a comms clash.

2.2.3.1: Power_Up Message

A power up message is provided which is transmitted to the host in order to verify that the host / product link is working.

The power up message on the Akurate CD is as follows: **!\$AKURATE_CD\$**




Note:

*Please refer to user options with regards to power up message (see **Error! Reference source not found. Error! Reference source not found.** and 3.3.4.1.8: RS232_STARTUP_MESSAGE).*




2.3: Polling Command




2.3.1: POLL

Polling is used to extract details of all products connected to the host

 \$POLL START\$
 !\$POLL START\$
 <i>Marks the start of polling</i>

 \$POLL ID\$
 !\$POLL ID product identifier\$
 <i>Returns product identifier</i>

 \$POLL SLEEP\$
 !\$POLL SLEEP\$
 <i>Product responding to this will ignore all further commands until 'POLL DONE' is received</i>

 \$POLL DONE\$
 No response to this command
 <i>All products will now return to active operation</i>

Important:

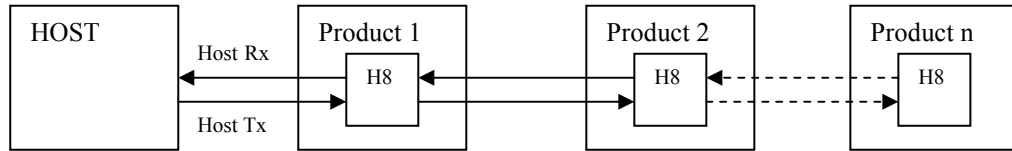
The '**POLL SLEEP**' command should be used with the product identifier returned by '**POLL ID**'.

If this is not done then all the products will stop responding and the polling sequence will fail.

2.3.2: Polling Explained

The RS232 interface hardware, via the **POLL** command, allows communication to daisy-chained RS232 controlled devices. The devices must be capable of buffering data for transmission as required.

Using this feature allows the host to 'auto-detect' the slave products on the RS232 link.



By taking advantage of this, it is possible to identify what is on the link using the following type of algorithm:

\$POLL START\$

- opens return-path switches in all devices, so only first device in chain can respond

\$POLL ID\$

- all devices respond but only response from first device reaches host

@dest_1_id@\$POLL SLEEP\$

- where 'dest_1_id' is the result of the previous 'POLL ID'
- matching product closes its switch
- product will not respond to any command now until 'POLL DONE' command received.

\$POLL ID\$

- second device can now respond with it's ID

@dest_2_id@\$POLL SLEEP\$

- where 'dest_2_id' is the result of the previous 'POLL ID'
- matching product closes its switch
- product will not respond to any command now until 'POLL DONE' command received.

The 'POLL ID' and 'POLL SLEEP' commands are issued repeatedly until all products have been queried and there is no response from the last 'POLL ID' command.

\$POLL ID\$

- no response since all product id's read, so time-out



\$POLL DONE\$

- resync all products on link again

2.4: Status Command

The status command has been provided as a debugging aid, i.e. the host can find out why a command was not processed.

2.4.1: STATUS

 \$STATUS\$
 !\$STATUS sc (sv)\$
 <i>Return the status of the last command</i>





Where 'sc' is the returned status code and 'sv' is the status value (only used with code 25 for now). Codes are allocated on a block basis for each product with the first 48 codes reserved for general use.


2.4.1.1: Status Codes




The following table lists the General Status Codes which all products support.

Code	Description
00 (0x00)	- No error
01 (0x01)	- Unexpected termination of command line
02 (0x02)	- Unrecognised or misplaced character in command line
03 (0x03)	- Corrupted command message (within \$...\$)
04 (0x04)	- Start of another source identifier, identifier has already been supplied
05 (0x05)	- Start of another group identifier, identifier has already been supplied
06 (0x06)	- Start of another destination identifier, identifier has already been supplied
07 (0x07)	- Source identifier is too large, maximum of 20 characters
08 (0x08)	- Group identifier is too large, maximum of 20 characters
09 (0x09)	- Destination identifier is too large, maximum of 20 characters
10 (0x0A)	- Source identifier corrupted
11 (0x0B)	- Group identifier corrupted
12 (0x0C)	- Destination identifier corrupted
13 (0x0D)	- Unknown group identity
14 (0x0E)	- Unknown destination identity
15 (0x0F)	- Unknown command
16 (0x10)	- Unknown command parameter
17 (0x11)	- Parameter missing from ID command
18 (0x12)	- Unknown product identifier, cannot delete
19 (0x13)	- Parameter missing from GID command
20 (0x14)	- Cannot delete group identifier, unknown
21 (0x15)	- Cannot add new group identifier, already exists
22 (0x16)	- Cannot add new group identifier, list full
23 (0x17)	- Polling must be activated by the POLL START command
24 (0x18)	- Only POLL ID , SLEEP or DONE commands accepted during polling
25 (0x19)	- Message exceeded maximum allowable length - 'sv' defines maximum length (upto and including CR, and excluding LF)
26 (0x1A)	- Reserved
up to	
47 (0x3F)	




2.5: IR

 \$IR ?\$
 !\$IR ON\$
 !\$IR OFF\$
 <i>Return current IR control status</i>





 \$IR [Y ON]\$
 !\$IR ON\$
 <i>Enable IR control of product</i>

 \$IR [N OFF]\$
 !\$IR OFF\$
 <i>Disable IR control of product</i>



2.6: INIT

 \$INIT\$
 !\$INIT\$
 <i>Resets product back to factory defaults</i>

2.7: CHECKSUM

 \$CHECKSUM ?\$
 !\$CHECKSUM hhhh\$
 <i>Return current software checksum</i>
 <i>Where: 'hhh' is a four digit hexadecimal value</i>

2.8: COUNTER

 \$COUNTER POWER ?\$
 !\$COUNTER POWER days:hours:minutes:seconds\$
 Returns total powered up (operational) time.

 \$COUNTER MAINS ?\$
 !\$COUNTER MAINS days:hours:minutes:seconds\$
 Returns total mains connected time

2.9: VERSION

 \$VERSION SOFTWARE ?\$
 !\$VERSION SOFTWARE H8 s version ESS s version MECH m version\$
 Return current versions of system software.

Notes:

The format of 's_version' is 'tpppvvvv'

where:






't'	is the software release type ('P' = prototype and 'S' = release)
'ppp'	is the software identifier (3 digits)
'vvvv'	is the software version (4 digits)

The format of 'm_version' is 'dd.dd.dd.dd'

where:

'dd'	is a 2 digit field (four fields in total)
------	---

VERSION continued ...





 \$VERSION HARDWARE ?\$
 !\$VERSION HARDWARE b_version serial\$
 !\$VERSION HARDWARE UNKNOWN\$
 Return current hardware board version(s).
 Multiple responses may be received if more than one board is present.

Notes:

The format of 'b_version' is 'PCASb_tm_{Rn}'

where	'PCAS'	is the version header
	'b'	is the board identifier (1-16383)
	't'	is the major board release type ('P' = prototype and 'L' = release)
	'm'	is the major board revision number (1-255)
	'R'	is the minor board release type (always 'R')
	'n'	is the minor board revision number (1-255)

and 'serial' is a 16 digit hex value.

 \$VERSION HARDWARE PCAS (b (t (m (Rn (serial))))))\$
 !\$VERSION HARDWARE b_version\$
 !\$VERSION HARDWARE UNKNOWN\$
 Return current hardware board version(s), which match search criteria.

Notes:

This version of the command allows for the interrogation of the hardware, using increasingly specific search criteria, in order to return only the most relevant information.

The search criteria is one of the following (see above for details of format) ...

'PCAS'
'PCASb'
'PCASbt'
'PCASb_tm'
'PCASb_tm_{Rn}'
'PCASb_tm_{Rn} serial'

The 'b', 'm' and 'n' fields can be specified as '0', which acts as a wildcard character matching any value.

The 't' field can be specified as '?', which acts as a wildcard character matching any value.

Example 1: \$VERSION HARDWARE PCAS270?\$

Will return all boards, which are PCAS270's regardless of whether they are prototype or release versions.

Example 2: \$VERSION HARDWARE PCAS0L1R0\$

Will return all boards, which are release versions but regardless of board type etc.

3: Akurate CD Commands

The following pages contain the command set for the Akurate CD player.

Important:

¹ Parameters must be separated from commands and each other by at least one space character

² Where a command can be enabled or disabled then

Y or **ON** will enable (turn on) the setting and **N** or **OFF** will disable (turn off) the setting

3.1: Command Help

Command help is not currently implemented by the Akurate CD.

3.2: System Commands






The system commands supported by the Akurate CD are **ID**, **GID**, **BAUD**, **RESET**, **ECHO**, **POLL**, **STATUS**, **IR**, **CHECKSUM**, **VERSION**, **COUNTER** and Power_Up Message. These are all explained in section 2: System Commands of this document.

3.3: Other Commands






Where **!\$IGNORED command reason\$** is shown in the command response, please refer to 'IGNORED Disc Commands' for further information.

3.3.1: DISC COMMANDS





3.3.1.1: OPEN

 \$OPEN\$
 !\$OPEN OPENING\$
 !\$OPEN OPENED\$
 !\$IGNORED OPEN reason\$
 <i>Open the drawer</i>





3.3.1.2: CLOSE

 \$CLOSE\$
 !\$CLOSE CLOSING\$
 !\$CLOSE CLOSED\$
 !\$IGNORED CLOSE reason\$
 <i>Close the drawer</i>







3.3.1.3: PLAY

 \$PLAY\$
 !\$PLAY PLAYING\$
 !\$IGNORED PLAY reason\$
 <i>Start playing disc or continue from current position if paused</i>






























3.3.1.4: PAUSE

 \$PAUSE\$
 !\$PAUSE PAUSED\$
 !\$IGNORED PAUSE reason\$
 <i>Pause playing at current position</i>

3.3.1.5: STOP

 \$STOP\$
 !\$STOP STOPPED\$
 !\$STOP PRESTOP\$
 !\$IGNORED STOP reason\$
 <i>Stop playing the disc.</i>
 <i>PRESTOP only applies to DVD and DVD-A discs.</i>

3.3.1.6: MODE





 \$MODE\$
 !\$MODE INSTANDBY\$
 !\$MODE POWEREDUP\$
 !\$MODE SETUPMENU\$
 !\$MODE TRAY_UNDEFINED\$
 !\$MODE OPENING\$
 !\$MODE OPENED\$
 !\$MODE CLOSING\$
 !\$MODE CLOSED\$
 !\$MODE DISC_UNDEFINED\$
 !\$MODE LOADING\$
 !\$MODE NODISC\$
 !\$MODE UNKNOWN\$
 !\$MODE CDDA\$
 !\$MODE SACD\$
 !\$MODE VCD\$
 !\$MODE SVCD\$
 !\$MODE DVD\$
 !\$MODE DVDA\$
 !\$MODE DATA\$
 !\$MODE PLAY_UNDEFINED\$
 !\$MODE PLAYING\$
 !\$MODE PAUSED\$
 !\$MODE PRESTOP\$
 !\$MODE STOPPED\$
 !\$MODE SEARCHING\$
 !\$MODE SCANNING\$
 !\$MODE DVDMENU\$
 <i>Return current operational status</i>





Note:






The status list above is essentially a copy of the 'IGNORED Disc Commands' reason list, with the 'UNIT_', 'TRAY_', 'DISC_' and 'TRAY_' removed (in most cases).





Please refer to 'IGNORED Disc Commands' for further details.





3.3.1.7: TRACK

 \$TRACK +\$
 !\$TRACK number\$
 !\$IGNORED TRACK reason\$
 <i>Select next (available) track.</i>

 \$TRACK -\$
 !\$TRACK number\$
 !\$IGNORED TRACK reason\$
 <i>Select previous (available) track.</i>

 \$TRACK number\$
 !\$TRACK number\$
 !\$TRACK BADTRACK\$
 !\$IGNORED TRACK reason\$
 <i>Select track number</i>





 \$TRACK ?\$
 !\$TRACK number\$
 !\$IGNORED TRACK reason\$
 <i>Return current track number</i>





 \$TRACK TOT\$
 !\$TRACK TOT number\$
 !\$IGNORED TRACK reason\$
 <i>Return total number of tracks.</i>






Note:





TRACK and CHAPTER commands perform the same operations and can be used for both CD and DVD disc types.





3.3.1.8: CHAPTER

 \$CHAPTER +\$
 !\$CHAPTER number\$
 !\$IGNORED CHAPTER reason\$
 <i>Select next (available) chapter.</i>

 \$CHAPTER -\$
 !\$CHAPTER number\$
 !\$IGNORED CHAPTER reason\$
 <i>Select previous (available) chapter.</i>

 \$CHAPTER number\$
 !\$CHAPTER number\$
 !\$CHAPTER BADCHAPTER\$
 !\$IGNORED CHAPTER reason\$
 <i>Select chapter number</i>

 \$CHAPTER ?\$
 !\$CHAPTER number\$
 !\$IGNORED CHAPTER reason\$
 <i>Return current chapter number</i>

 \$CHAPTER TOT\$
 !\$CHAPTER TOT number\$
 !\$IGNORED CHAPTER reason\$
 <i>Return total number of chapters.</i>

Note:

TRACK and CHAPTER commands perform the same operations and can be used for both CD and DVD-A disc types.

3.3.1.9: DISCINFO




 \$DISCINFO ?\$
 !\$DISCINFO disc type stream type
 <i>Return disc type and stream type.</i>




Note:




Where disc type is: *DISC_*
followed by: *CDDA, SACD, VCD, SVCD, DVD, DVDA, DATA, UNKNOWN, LOADING, NODISC*
or *UNDEFINED*.




And stream type is: *STREAM_*
followed by: *CDDA, DTS, LPCM, DSD_STEREO, DSD_MULTI, DSD_STEREO_DOWNMIX,*
PCM, MLP or *UNKNOWN*.

3.3.1.10: NAMEINFO

 \$NAMEINFO ?\$
 !\$NAMEINFO TRACK [UNKNOWN name] ARTIST [UNKNOWN name] ALBUM [UNKNOWN name]\$
 <i>Return track ,artist and album name information for current track.</i>

 \$NAMEINFO TRACK ?\$
 !\$NAMEINFO TRACK [UNKNOWN name]\$
 <i>Return track name information for current track.</i>






 \$NAMEINFO ARTIST ?\$
 !\$NAMEINFO ARTIST [UNKNOWN name]\$
 <i>Return artist name information for current track.</i>






 \$NAMEINFO ALBUM ?\$
 !\$NAMEINFO ALBUM [UNKNOWN name]\$
 <i>Return album name information for current track.</i>





Note:







This command is specifically for SACDs, therefore names will always be returned as *UNKNOWN* if disc type is not *SACD*.

3.3.1.11: SEARCH





 \$SEARCH < speed\$
 !\$SEARCH < speed\$
 !\$IGNORED SEARCH reason\$
 Search backwards through disc until STOP command is received.
 Where speed is 2X, 4X, 6X or 8X





 \$SEARCH > speed\$
 !\$SEARCH > speed\$
 !\$IGNORED SEARCH reason\$
 Search forwards through disc until STOP command is received.
 Where speed is 2X, 4X, 6X or 8X





 \$SEARCH STOP\$
 !\$SEARCH STOP\$
 !\$IGNORED SEARCH reason\$
 Stop searching disc





 \$SEARCH ?\$	Not Implemented
 !\$SEARCH STOP\$	
 !\$SEARCH <\$	
 !\$SEARCH >\$	
 !\$IGNORED SEARCH reason\$	
 Return current search status	





3.3.1.12: TIME

 \$TIME DISC BEG\$
 !\$TIME DISC BEG minutes seconds\$
 !\$IGNORED TIME reason\$
 <i>Set the time mode to return the elapsed time of the disc</i>





 \$TIME DISC END\$
 !\$TIME DISC END minutes seconds\$
 !\$IGNORED TIME reason\$
 <i>Set the time mode to return the remaining time of the disc</i>







 \$TIME DISC TOT\$
 !\$TIME DISC TOT minutes seconds\$
 !\$IGNORED TIME reason\$
 <i>Return the total time of the disc</i>

 \$TIME TRACK BEG\$
 !\$TIME TRACK BEG minutes seconds\$
 !\$IGNORED TIME reason\$
 <i>Set the time mode to return the elapsed time of the track</i>









 \$TIME TRACK END\$
 !\$TIME TRACK END minutes seconds\$
 !\$IGNORED TIME reason\$
 <i>Set the time mode to return the remaining time of the track</i>






 \$TIME TRACK TOT\$
 !\$TIME TRACK TOT minutes seconds\$
 !\$IGNORED TIME reason\$
 <i>Return the total time of the track</i>





 \$TIME OFF\$
 !\$TIME OFF\$
 !\$IGNORED TIME reason\$
 <i>Set the time mode to off.</i>





 \$TIME ?\$
 !\$TIME [DISC TRACK] BEG minutes seconds\$
 !\$TIME [DISC TRACK] END minutes seconds\$
 !\$TIME [DISC TRACK] TOT minutes seconds\$
 !\$IGNORED TIME reason\$
 <i>Return the time elapsed/remaining/total as set by commands above or by the handset</i>

3.3.1.13: PROGRAM

 \$PROGRAM [INCLUDE EXCLUDE] track [track [...]]\$
 !\$PROGRAM [INCLUDE EXCLUDE] track [track [...]]\$
 !\$PROGRAM [INCLUDE EXCLUDE] ACTIVEPROGRAM\$
 !\$PROGRAM [INCLUDE EXCLUDE] BADPROGRAM\$
 !\$IGNORED PROGRAM reason\$
 <i>Create new program list including or excluding tracks listed</i>
 <i>ACTIVEPROGRAM response given where an inclusive or exclusive program is currently active.</i>
 <i>BADPROGRAM response given when no valid tracks</i>

 \$PROGRAM RANDOM\$
 !\$PROGRAM RANDOM\$
 !\$IGNORED PROGRAM reason\$
 <i>Generates a random play list of tracks and repeats it continuously</i>
 <i>Tracks are re-randomised on each repeat</i>

 \$PROGRAM SHUFFLE\$
 !\$PROGRAM SHUFFLE\$
 !\$IGNORED PROGRAM reason\$
 <i>Generates a random play list of tracks and repeats it once</i>

 \$PROGRAM [N OFF]\$
 !\$PROGRAM OFF\$
 !\$IGNORED PROGRAM reason\$
 <i>Turn program off (only allowed when disc is stopped)</i>

 \$PROGRAM ?\$
 !\$PROGRAM OFF NONE\$
 !\$PROGRAM ON INCLUDE\$
 !\$PROGRAM ON EXCLUDE\$
 !\$PROGRAM ON RANDOM\$
 !\$PROGRAM ON SHUFFLE\$
 !\$IGNORED PROGRAM reason\$
 <i>Return current program status</i>






Notes:





¹ The program command is specifically for CD and SACD discs.






² The number of tracks is limited to 15 for the INCLUDE/EXCLUDE program commands.







³ The 'PROGRAM ?' command does not currently return a list of tracks, for the INCLUDE, EXCLUDE, RANDOM and SHUFFLE responses.






3.3.1.14: REPEAT









 \$REPEAT [Y ON] \$
 !\$REPEAT ON\$
 !\$IGNORED REPEAT reason\$
 Turn repeat on
 If a program is currently active then the program will be repeated, otherwise the entire disc will be repeated

 \$REPEAT [N OFF] \$
 !\$REPEAT OFF\$
 !\$IGNORED REPEAT reason\$
 Turn repeat off





 \$REPEAT BEG\$
 !\$REPEAT BEG\$
 !\$IGNORED REPEAT reason\$
 Mark start of repeat section






 \$REPEAT END\$
 !\$REPEAT END\$
 !\$REPEAT BADREPEAT\$
 !\$IGNORED REPEAT reason\$
 Mark end of repeat section and start to repeat
 This command must be preceded at some point by a \$REPEAT BEG\$ command

 \$REPEAT TRACK\$
 !\$REPEAT TRACK\$
 !\$IGNORED REPEAT reason\$
 Repeat current track








 \$REPEAT ?\$
 !\$REPEAT ON\$
 !\$REPEAT OFF\$
 !\$REPEAT TRACK\$
 !\$REPEAT A\$
 !\$REPEAT A-B\$
 !\$IGNORED REPEAT reason\$
 Return current repeat status







3.3.1.15: SKIP







 \$SKIP +\$
 !\$SKIP +\$
 !\$IGNORED SKIP reason\$
 <i>Select next track or chapter.</i>

 \$SKIP -\$
 !\$SKIP -\$
 !\$IGNORED SKIP reason\$
 <i>Select previous track or chapter.</i>





3.3.1.16: LAYER

 \$LAYER ?\$
 !\$LAYER CDDA\$
 !\$LAYER DSD_STEREO\$
 !\$LAYER DSD_MULTI\$
 !\$IGNORED LAYER reason\$
 <i>Return the current SACD Layer setting</i>








 \$LAYER [CDDA DSD_STEREO DSD_MULTI]\$
 !\$LAYER CDDA\$
 !\$LAYER DSD_STEREO\$
 !\$LAYER DSD_MULTI\$
 !\$IGNORED LAYER reason\$
 <i>Changes the current SACD Layer</i>

 \$LAYER +\$
 !\$LAYER CDDA\$
 !\$LAYER DSD_STEREO\$
 !\$LAYER DSD_MULTI\$
 !\$IGNORED LAYER reason\$
 <i>Moves on to the next (available) SACD Layer</i>

3.3.1.17: DISCID

 \$DISCID\$
 !\$DISCID identifier\$
 !\$IGNORED DISCID reason\$
 <i>Return disc identifier (CD only), where identifier is an eight digit hexadecimal value.</i>




3.3.1.18: DISCTOC




 \$DISCTOC\$
 !\$DISCTOC TOTAL tracks\$
 !\$DISCTOC ENTRIES time [...time]\$
 !\$IGNORED DISCTOC reason\$
 <i>Return disc table of contents (CD and SACD only).</i>
 <i>The TOTAL reply states the number of tracks of the CD/SACD.</i>
 <i>The ENTRIES reply (one or more) will return the time for each track in seconds (maximum of ten track times per reply). Track times will be returned in track order.</i>




3.3.2: AUDIO COMMANDS

3.3.2.1: STANDBY

 \$STANDBY ?\$
 !\$STANDBY [ON OFF]\$
 <i>Return current standby status.</i>

 \$STANDBY [Y ON]\$
 !\$STANDBY [ON OFF]\$
 <i>Enter standby.</i>

 \$STANDBY [N OFF]\$
 !\$STANDBY [ON OFF]\$
 <i>Exit standby.</i>

 \$STANDBY TOGGLE\$
 !\$STANDBY [ON OFF]\$
 <i>Toggle standby.</i>




3.3.3: SETUP COMMANDS




3.3.3.1: CHANNELSETUP

 \$CHANNELSETUP ?\$
 !\$CHANNELSETUP [2CHANNEL 5.1CHANNEL]\$
 <i>Return current channel setup setting.</i>




 \$CHANNELSETUP [2CHANNEL 5.1CHANNEL]\$
 !\$CHANNELSETUP [2CHANNEL 5.1CHANNEL]\$
 <i>Set channel setup to supplied value.</i>




3.3.3.2: SPDIFOUTPUT

 \$SPDIFOUTPUT ?\$
 !\$SPDIFOUTPUT [OFF RAW LTRTPCM]\$
 <i>Return current SPDIF output setting.</i>




 \$SPDIFOUTPUT [OFF RAW LTRTPCM]\$
 !\$SPDIFOUTPUT [OFF RAW LTRTPCM]\$
 <i>Set SPDIF output to supplied value.</i>




3.3.3.3: DOWNMIX

 \$DOWNMIX ?\$
 !\$DOWNMIX [PURESTEREO LTRT]\$
 <i>Return current downmix setting.</i>

 \$DOWNMIX [PURESTEREO LTRT]\$
 !\$DOWNMIX [PURESTEREO LTRT]\$
 <i>Set downmix to supplied value.</i>

3.3.3.4: LPCMOUTPUT

 \$LPCMOUTPUT ?\$
 !\$LPCMOUTPUT [48K 96K]\$
 <i>Return current LPCM output setting.</i>




 \$LPCMOUTPUT [PURESTEREO LTRT]\$
 !\$LPCMOUTPUT [48K 96K]\$
 <i>Set LPCM output to supplied value.</i>

3.3.4: OPTION COMMANDS FOR AKURATE CD





This section details the option commands available for the Akurate CD product.

3.3.4.1: OPTION




3.3.4.1.1: DISPLAY_BRIGHTNESS





 \$OPTION DISPLAY BRIGHTNESS value\$
 !\$OPTION DISPLAY BRIGHTNESS value\$
 <i>Set display brightness to value supplied.</i>

 \$OPTION DISPLAY BRIGHTNESS AUTO\$
 !\$OPTION DISPLAY BRIGHTNESS AUTO\$
 <i>Set display brightness to auto (automatically adjusts according to ambient light level)</i>

 \$OPTION DISPLAY BRIGHTNESS ?\$
 !\$OPTION DISPLAY BRIGHTNESS [value AUTO]\$
 <i>Return current brightness status (1-100% inclusive or AUTO)</i>
 <i>Default setting [AUTO].</i>

3.3.4.1.2: SLEEP_DISPLAY_DELAY

 \$OPTION SLEEP DISPLAY DELAY [seconds OFF]\$
 !\$OPTION SLEEP DISPLAY DELAY [seconds OFF]\$
 <i>Set time delay before sleep display is shown.</i>

 \$OPTION SLEEP DISPLAY DELAY ?\$
 !\$OPTION SLEEP DISPLAY DELAY [seconds OFF]\$
 <i>Return time delay before sleep display is shown.</i>
 <i>Default setting [OFF].</i>

Note:





¹ A delay of 0 seconds will disable the sleep display.

² The time delay is specified in seconds, with a range of 0 to 300 seconds (5 minutes) in 10 second steps.

³ The time delay is relative to last user operation via either the handset or front panel.




3.3.4.1.3: FRONT_PANEL_IR_COMMANDS





 \$OPTION FRONT PANEL IR COMMANDS [ACCEPTED IGNORED]\$
 !\$OPTION FRONT PANEL IR COMMANDS [ACCEPTED IGNORED]\$
 <i>Accept or ignore IR commands received via the front panel.</i>

 \$OPTION FRONT PANEL IR COMMANDS ?\$
 !\$OPTION FRONT PANEL IR COMMANDS [ACCEPTED IGNORED]\$
 <i>Return current status of IR command processing received via front panel.</i>
 <i>Default setting [ACCEPTED].</i>




Note: This command provides the same functionality as the IR command.





3.3.4.1.4: PASS_IR_TO_REMOTE_OUT

 \$OPTION PASS IR TO REMOTE OUT [ENABLED DISABLED]\$
 !\$OPTION PASS IR TO REMOTE OUT [ENABLED DISABLED]\$
 <i>Enable or disabled passing of front panel IR commands to Remote Out</i>




 \$OPTION PASS IR TO REMOTE OUT ?\$
 !\$OPTION PASS IR TO REMOTE OUT [ENABLED DISABLED]\$
 <i>Return current status of passing front panel IR commands to Remote Out.</i>
 <i>Default setting [ENABLED].</i>



3.3.4.1.5: PASS_REMOTE_IN_TO_OUT

 \$OPTION PASS REMOTE IN TO OUT [ENABLED DISABLED]\$
 !\$OPTION PASS REMOTE IN TO OUT [ENABLED DISABLED]\$
 <i>Enable or disable passing of commands from Remote In to Remote Out.</i>

 \$OPTION PASS REMOTE IN TO OUT ?\$
 !\$OPTION PASS REMOTE IN TO OUT [ENABLED DISABLED]\$
 <i>Return current status of passing commands from Remote In to Remote Out.</i>
 <i>Default setting [ENABLED].</i>

3.3.4.1.6: RS232_BAUDRATE





 \$OPTION RS232 BAUDRATE baudrate\$
 !\$OPTION RS232 BAUDRATE baudrate\$
 <i>Set baud rate to one of the following: 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200, 230400</i>

 \$OPTION RS232 BAUDRATE ?\$
 !\$OPTION RS232 BAUDRATE baudrate\$
 <i>Return current RS232 baudrate setting</i>
 <i>Default setting [9600].</i>




Note: This command provides the same functionality as the BAUD command.





3.3.4.1.7: RS232_EVENTS

 \$OPTION RS232 EVENTS [ENABLED DISABLED]\$
 !\$OPTION RS232 EVENTS [ENABLED DISABLED]\$
 <i>Enable or disable unsolicited RS232 events</i>

 \$OPTION RS232 EVENTS ?\$
 !\$OPTION RS232 EVENTS [ENABLED DISABLED]\$
 <i>Return current unsolicited RS232 events status</i>
 <i>Default setting [DISABLED].</i>

3.3.4.1.8: RS232_STARTUP_MESSAGE

 \$OPTION RS232 STARTUP MESSAGE [ENABLED DISABLED]\$
 !\$OPTION RS232 STARTUP MESSAGE [ENABLED DISABLED]\$
 <i>Enable or disable RS232 startup message</i>

 \$OPTION RS232 STARTUP MESSAGE ?\$
 !\$OPTION RS232 STARTUP MESSAGE [ENABLED DISABLED]\$
 <i>Return current RS232 startup message status</i>
 <i>Default setting [ENABLED].</i>






3.3.4.1.9: *SCROLL_SACD_TEXT*

 \$OPTION SCROLL SACD TEXT [OFF ON LOOP]\$
 !\$OPTION SCROLL SACD TEXT [OFF ON LOOP]\$
 <i>Enable or disable scrolling of SACD track, artist and album names (LOOP means continuous scrolling).</i>

 \$OPTION SCROLL SACD TEXT ?\$
 !\$OPTION SCROLL SACD TEXT [OFF ON LOOP]\$
 <i>Return current SACD text scrolling status.</i>
 <i>Default setting [ON].</i>

Appendice A : Format Of Command Table

Commands are described using the following format:

 \$COMMAND parameters\$	-	actual command
 !\$COMMAND response 1\$	-	list of possible responses
		
 !\$COMMAND response n\$		
 <i>Description</i>	-	brief description of command

Each table describes one variation of the command, therefore, for a command with five variations there will be five tables. In cases of a command where there may be more than one form of response, all forms of the response will be listed.

The following conventions apply:

\$COMMAND parameters\$	-	is the command variation
!\$COMMAND response\$	-	is the response to a command
!\$FAIL sc fn\$	-	is the response to a failed command
All uppercase words are keywords	-	all commands and system parameters must be supplied in uppercase
All lowercase words represent a parameter	-	ie. number means supply a numeric value
Parameter's shown as, '(p1)'	-	means the value is optional
Parameter's shown as, '[p1 p2 p3]'	-	means use one of these values
Parameter's shown as, 'p1 [p2 [...]]'	-	means supply one or more values

Appendice B : Escape Sequences

Previous implementations of the RS232 protocol, excluded the use of specific characters within identifiers (#, \$, &, @ and spaces) and the command itself. These characters may now be included by using the escape sequence `\xHH`, where `HH` is a two digit hexadecimal code representing the actual ASCII code of the character.

This, for example, allows identifiers and command field data to contain spaces, which would otherwise be treated as field separators.

For example,	<code>#Record Deck#</code>
now becomes	<code>#Record\x20Deck#</code>
and	<code>!\$ARTIST name of artist\$</code>
becomes	<code>!\$ARTIST name\x20of\x20artist\$</code>

The following (ASCII) characters must be encoded, if they are to be included as part of an identifier or as part of a command.

- | | | |
|-------------|-------|------------------------------------|
| - 32 (0x20) | space | - field separator |
| - 35 (0x23) | # | - source identifier delimiter |
| - 36 (0x24) | \$ | - command delimiter |
| - 38 (0x36) | & | - group identifier delimiter |
| - 64 (0x40) | @ | - destination identifier delimiter |
| - 92 (0x5C) | \ | - escape sequence |
- Additionally, top-bit set (ASCII codes 128-255) characters can now also be included, using the same method.

Note:

¹ The Akurate CD supports the ISO 8859-1 character set (with some exceptions, see ²).

² Characters within the ranges 0 to 31, and 128 to 159 should not be used.

³ Character 127 (DELETE) will delete the last character received from the RS232 buffer.

⁴ The main use of escape sequences will be to output Album, Artist and Track names. It is therefore **highly recommended that hosts do not use escape sequences unless absolutely necessary, thereby limiting any possible problems when this product is connected to a daisy chain of products which includes previous incarnations of Linn equipment (software in these products will simply treat them as raw ASCII data).**

Appendice C : Communications Settings

The Akurate CD uses the following communications settings:

- 7 bits data
- 1 stop bit
- even parity
- baud rate specified by host (initially 9600)

Relationship Between Disc Commands And Product State

The following table details the outcome of a command in relation to the current state of the product.

For example:

Command: **\$PLAY\$** when current state is *DISC_NODISC*

Response: **\$IGNORED PLAY DISC_NODISC\$**

✓ denotes command will be ignored (digit denotes that certain variants of command are allowed)

	OPEN	CLOSE	PLAY	PAUSE	STOP	MODE	TRACK	CHAPTER	DISCINFO	NAMEINFO	SEARCH	TIME	PROGRAM	REPEAT	SKIP	ZOOM	KEY	ANGLE	MENU	LAYER
UNIT_INSTANDBY	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UNIT_POWEREDUP	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
UNIT_SETUPMENU	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
TRAY_UNDEFINED			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
TRAY_OPENING			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
TRAY_OPENED				✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
TRAY_CLOSING			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
TRAY_CLOSED			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_UNDEFINED			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_LOADING			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_NODISC			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_UNKNOWN			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_CDDA			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_SACD			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_VCD			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_SVCD			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_DVD			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_DVDA			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
DISC_DATA			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
PLAY_UNDEFINED			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
PLAY_PLAYING													2							4
PLAY_PAUSED												1	2					✓		4
PLAY_PRESTOP				✓			✓	✓		✓	✓	1	2	3	✓	✓		✓		4
PLAY_STOPPED				✓			✓	✓			✓	1		3	✓	✓		✓		
PLAY_SEARCHING													2							4
PLAY_SCANNING													2							4
PLAY_DVDMENU			✓	✓			✓	✓		✓	✓	✓	✓	✓	✓	✓		✓		4

Note:

¹ All TIME commands apart from ?, DISC TOT and TRACK TOT commands will be ignored.

² Program RANDOM, SHUFFLE, INCLUDE and EXCLUDE commands will be ignored.

³ Repeat BEG and END commands will be ignored.

⁴ All LAYER commands apart from ? will be ignored.