DVD 2

Diagnostic Software
User Manual

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TABLE OF CONTENTS

1 INTRODUCTION

1.2 GLOSSARY

AC3   : Audio Compression format 3
ACK   : Acknowledge
ADC   : Analogue to Digital Conversion
AMIX   : Audio Matrix (Audio switching)
ANAB   : Analogue Board
AROM   : Analogue Board EEPROM
ASP   : Analogue Slave Processor
ATA   : AT Attachment
ATAPI   : AT Attachment Packet Interface
BE   : Basic Engine
BROM   : BOOT EEPROM
CHR   : Codec Host Repository
CRC   : Cyclic Redundancy Check
DAC   : Digital to Analogue Conversion
DB   : Digital Board
DCB   : Display and Control Board
DENC   : Digital (video) ENCoder
DMA   : Direct Memory Access
DS   : Diagnostic and Service Software
DSP   : Digital Signal Processor
DTTM   : Digital Terrestrial Tuner Module
DV   : Digital Video
DVIO   : Digital Video Input Output
EPGB   : Electronic Program Guide Board
FRE   : Front End (Tuner)
HDD   : Hard Disk Drive
HDMI   : High Definition Multimedia Interface
IC   : Integrated Circuit
IDE   : Integrated Drive Electronics
IH   : Interface Handler
IIC   : Inter IC Communication
INT   : Interrupt
LED   : Light Emitting Diode
NVRAM : Non Volatile Random Access Memory
OPC   : Optimal Power Control
PIO   : Peripheral IO pin
PSCAN   : Progressive Scan
RC   : Remote Control
S2B   : Serial to Basic Engine
SYS   : System
TOC   : Table Of Contents
UART   : Universal Asynchronous Receiver Transmitter
UDF   : Universal Disc Format
VIP   : Video Input Processor
VMIX   : Video Matrix (Video switching)

1.3   PURPOSE, SCOPE AND SHORT DESCRIPTION

This document is the user manual for the Diagnostic Software (DS).
Its goal is to facilitate the usage of the DS software.

The users of this document are typically the factory and service teams.

The Diagnostic Software consists of independent 'atomic' tests, called **nuclei**.
Each nucleus forms a test to indicate possible hardware failure.
Its purpose is to facilitate fault-finding in DVD+RW sets.

This document describes all tests that are currently available in the diagnostic software.

Different DVD+RW recorder sets containing different hardware become available all the time, resulting in hardware diversity covered by chapter 4 :'Digital Board Diversity'.

Apart from this there will be some different software-builds that define some hardware-specific issues at compile-time.
As a result of this there will be parts in this document that will NOT be executable on your specific DVD+RW recorder.
So if you execute a nucleus from one of these groups not currently in your software-build the command-line will e.g. look like:
DS:> 1800
DS:>

This user manual is intended for an audience that is aware of the diversity in hardware and is aware which hardware is encompassed in their DVD+RW recorder sets.

Please note that the examples given in this user manual can differ from your actual hardware.
The error codes returned by the diagnostic software will ALWAYS be as indicated in the nucleus-description. Should there be any discrepancy then please contact our team so we can correct the issue.

1.4   NOTES

The OPC change is industrial/production change because it was reported to have high OPC value (about 2 to 3%) in the production line. This change will help to improve the production fall out due to high OPC value. So the drives that have went thru the production will have good OPC value. As for the drives that are already in the market, they will not be affected. The service centre must perform the drive calibration (nucleus 931; DS_BE_AdjustLaserControl) for AV3.5 drive, which has firmware version 35 below. We do not think that the download SW needs to change anything. Please issue the drive calibration in the service nucleus (931) after the drive is upgrade with the newer firmware.

2 USER INTERFACE

The table below shows an overview of the user interfaces of the DS. The table is based on logical interface, interfaces as seen from user perspective. A logical interface can use one or more physical interface components.

The DVD Recorder has only a single RS232 port (service port) available for diagnostic or debugging purposes, implying that all interfaces using this port are mutually exclusive.

Logical Interface	Description	Physical interface components
Command line interface	Used to send commands from the Control PC or Service PC to the DVD Recorder DS.	• Control PC or service PC, running a program (e.g. Asterix, Compair, HyperTerminal), connected to service port of the DVD Recorder • Test pin
Scripts interface	Used to execute End-user/Dealer Test Script.	• Local-Keyboard • Local-Display

In the next chapters the logical user interfaces are described in more detail including the exact use of the physical interface components. To switch between interfaces, the DVD Recorder needs to be switched off and on again.

2.1 NUCLEI NUMERATION

Each nucleus has a unique number of four digits. This number is the input of the command line interface.

$$[\text{XXYY} \quad]$$

— Nucleus number
— Nucleus group number
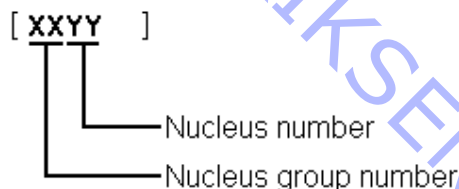
Figure 1 Unique number of a diagnostic nucleus.

The following groups are defined:

Group number	Group name
0	Scripts
1	Codec (e.g. Chrysalis, Leco)
2	Boot EEPROM
3	NVRAM
4	SDRAM
5	FLASH
6	Video Input Processor
7	DVIO
8	Progressive Scan
9	Basic Engine
10	Display and Control Board

11	Analogue Board
12	System
13	Electronic Program Guide Board
14	PCMCIA
15	HDMI
16	Analogue Slave Processor
17	Analogue Board EEPROM
18	Video Matrix
19	Audio Matrix
20	Front End
21	Hard Disk
22	Digital Terrestrial Tuner Module
23	USB

2.2 ERROR HANDLING

Results returned from a diagnostic nucleus to the control/service PC are terminated by a 'CR' character (included in the string length).

The result has the following layout
```
<number> <string> [Test OK | Error] @<CR>
```

The use of the "@" enables the *Asterix* system on the *control PC* to parse the output string of each nucleus into a database. This system is used in the factory and automates the test sequences needed to test each product using the Diagnostic and Service Software.

<number> is a 6-digit decimal number padded with leading zeros if its value is less than 6 digits. The first four digits identify the generating nucleus (group and nucleus); the latter two digits indicate the error number.
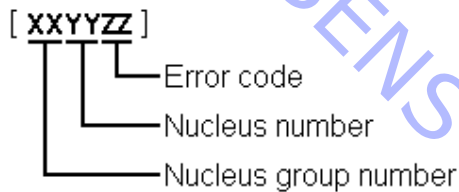

Figure 2 Error-code of a diagnostic nucleus.

2.3 COMMAND LINE INTERFACE

Via the command line interface the execution of diagnostic nuclei can be controlled.

2.3.1 Set-up of physical interface components

Hardware required:
- Control PC
- One free COM port on the Control PC
- Special cable to connect the DVD Recorder to the Control PC

The control PC must use the following port settings for the used COM port:
- **19200** bps,
- **8** data bits,
- **n**o parity,
- **1** stop bit and
- **no flow** control.

The control PC is connected with a special cable (see chapter 4A.2) to the RS232 port of the DVD Recorder. Via the same connection the 'test pin' will be connected to ground. Using this pin the software can determine whether Diagnostic mode needs to be entered.

2.3.2 Activation

After power on the next text will be sent to the control PC

```
Factory Diagnostics and Service Software
DVD Video Recorder (Dec 13 2003, 10:55:37)

Version  :258        Build     :20031213_1030
Release  :P1_7_b     Buildtype :no
Baseline :I_P1_8_63  Variant   :verum:dvdrw2_lib

DS:>
```

The first lines indicate that the DS has been activated and contains the version and build info of the DS. The next line is the command line prompt ("DS:>"). The DS is now ready to receive commands. Please note that this text will be different on your specific variant of the DVD+RW recorder product range.

2.3.3 Usage

The commands that can be given are the numbers of the nuclei. A command must be terminated with an <ENTER> character from the control PC. When typing commands, the backspace key can be used to make corrections. Apart from this one can use the Up and Down arrows to browse to previous commands.
When one enters non-supported commands, the interface returns the command line prompt.

If the command (the nucleus number) is recognised, the nucleus is executed. Result and output of an activated (and terminated) nucleus will be sent back to the control PC.

Example in case the command is correct:

```
DS:> 1200
```

```
120000: Hardware ID = 0x27
Test OK @
```

Example in case the result is an error (DVD+RW 2.1 example):

```
DS:> 1100
110002: Communication with Analogue Board fails
Error @

DS:>
```

2.3.4   Termination

To turn off the command line interface switch off the DVD Recorder.

2.4   END-USER/DEALER SCRIPT INTERFACE

This interface is used during execution of the script to display output and error messages.
The local display will be used to display the output and the error messages.

2.4.1   Set-up physical interface components

Hardware required:

• DVD Recorder

The DVD Recorder is tested stand-alone: no other equipment than the DVD Recorder is needed.

2.4.2   Activation

Pressing the **play**-key on the keyboard of the DVD Recorder during **power-on** activates the dealer script.

2.4.3   Usage

The test requires no user interaction. A number of nuclei will be run before a message is returned indicating if there is a failure in the DVD Recorder (''PASS" will be indicated when the product functions OK and "FAIL" when there has been an error during one of the tests).
During the execution of this script, a progress indicator is displayed on the display of the DVD Recorder.
Note that from the command line interface this script can be started as well, by entering '*script'*
on it.

2.4.4   Termination

To turn off the dealer test, the DVD Recorder must be powered down.

3 DETAILED DESCRIPTION OF AVAILABLE NUCLEI

3.1 CODEC HOST CONTROLLER (CHR)

Nucleus Name	**DS_CHR_DevTypeGet**	
Nucleus Number	100	
Description	Retrieves the device id, the module ids and revisions of the Codec and returns them to the stdout port.	
Technical	- Determine the codec id by means of comparing version ids of the modules. - Read the module-id register of every module and display it to the user.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	10000	Getting the information succeeded
	10001	Wrong codec id detected
Example	DS:> 100 010000: Device ID 7100 Codec ID PNX7100_C F-BCU (0x0102) 1.0 INTC (0x011d) 1.0 PCI-XIO(0x0113) 1.0 SIF (0x013b) 1.0 EJTAG (0x0104) 0.1 S-BCU (0x0102) 1.0 BOOT (0x010a) 1.0 CONFIG (0x013f) 1.1 RESET (0x0123) 1.0 DEBUG (0x0116) 0.0 UART0 (0x0107) 0.1 UART1 (0x0107) 0.1 UART2 (0x0107) 0.1 UART3 (0x0107) 0.1 I2C0 (0x0105) 0.1 I2C1 (0x0105) 0.1 GPIO (0x013c) 1.0 SYNC (0x013a) 1.0 DISP0 (0xa015) 1.12 DISP1 (0xa00f) 1.1 OSD (0x0136) 0.1 SPU (0xa00e) 0.0 MIXER (0x0137) 1.0 DENC (0x0138) 1.0 CCIR (0x0139) 1.0 VDEC (0x0133) 0.2 PARSER (0xa00d) 0.0 DV (0xa00c) 0.0 BEI (0xa00a) 0.1 IDE (0xa009) 0.1 SGDX (0xa008) 1.0 BYTE (0xa00b) 0.1 OUTPUT (0xa003) 1.0 ACOMP (0xa000) 1.0 VFE (0xa001) 0.1 VCOMP (0xa002) 1.0 SCR (0x0000) 0.0 SIFF (0xa011) 0.1 WMD (0xa010) 0.0 AUDIO0 (0xa015) 1.12 AUDIO1 (0xa00f) 1.1 PSCAN (0xa018) 0.1 Test OK @	

Nucleus Name	**DS_CHR_TestImageOn**	
Nucleus Number	101	
Description	Generates a test-image of a selected video standard on selected video output on the digital board. When no input is given, the default values will be used (see user input description below). Make sure to use the proper nuclei to route the video signal on the analogue board to get the video signal to the proper output. Note: Although a DTT has a Chrysalis C3, the codec IC may never use the YUV functionality of the internal DENC. This is specified by the hardware. The digital boards for DTT do have a YUV-matrix. The signals from this YUV-matrix are not routed to the regular video output connector but to the progressive scan output connector.	
Technical	- Validate the user input. - Initialise the SYNC module. - Initialise the DISPLAY module. - Initialise the MIXER module. - Initialise the DENC module. - Set the selected video standard. - Generate the selected test image in memory. - Start the DISPLAY module. - Start the MIXER module. - Start the DENC module according to the selected test image id.	
Execution Time	6 seconds.	
User Input	The user has to decide which test image, video standard and video output must be used: < Test image id > < Video standard > < Video output > Test image id:	

0	VERTICAL_COLOURBAR (default)	
1	HORIZONTAL_COLOURBAR	
2	WHITE	
3	YELLOW	
4	CYAN	
5	GREEN	
6	MAGENTA	
7	RED	
8	BLUE	
9	BLACK	
10	GRAY	
11	TEST_IMAGE_FOR_PROGRESSIVE_SCAN	

Video standard:

PAL	Standard PAL 50 Hz (default)
NTSC	Standard NTSC 60 Hz

Video output:

ALL	CVBS and YC and RGB DACs are enabled (default)
CVBS	CVBS DAC is enabled
YC	Y and C DAC is enabled
RGB	CVBS, R, G, and B DACs are enabled
YUV	Y, U, and V DACs are enabled
PSCAN	Progressive scan is enabled.

Error	Number	Description
	10100	Generating the test image succeeded.
	10101	Invalid input was provided.
	10102	The Codec SYNC-module cannot be initialised.
	10103	The Codec MIXER-module cannot be initialised.
	10104	The Codec VPP-module cannot be initialised.
	10105	The Codec DENC-module cannot be initialised.
	10106	The digital board hardware information is corrupt

| Example | ```
DS:> 101
010100:
Test OK @

DS:> 101 0 pal cvbs
010100:
Test OK @

DS:> 101 4 ntsc yc
010100:
Test OK @
``` |
|---|---|

Nucleus Name	**DS_CHR_TestImageOff**	
Nucleus Number	102	
Description	Switches the test-image off.	
Technical	- Stop the DENC module.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	10200	Stopping the test image generation succeeded
	10201	The Codec DENC-module failed.
| Example | ```
DS:> 102
010200:
Test OK @
``` | |

Nucleus Name	**DS_CHR_SineOn**	
Nucleus Number	103	
Description	Generate an audio sine signal on the audio output of the digital board. Note: Left channel 6kHz, right channel 12 kHz sine. Make sure to route the signal first. When 'SPDIF' is entered as a parameter, the SPDIF path will be activated correctly to contain the sine wave.	
Technical	- De-mute the analogue board - Set fifo parameters for audio - Set the volume - Set the I2S outputs and configuration paths - Set the decoder mode - Configure the audio decoder - Put the AC3 audio in the fifo - Send 'prepare' command to the audio decoder - Send 'play' command to the audio decoder	
Execution Time	Less than 1 second	
User Input	None or 'SPDIF'	
Error	Number	Description
	10300	The sine signal was successfully generated
	10301	The analogue board could not be de-muted
	10302	The audio decoder did not initialise
	10303	The dsp2 (DUET) of the audio decoder did not configure
	10304	The dsp1 (PALM) of the audio decoder did not configure
	10305	There was a delay-error before starting
	10306	Wrong input was given to the decoder function
	10307	Wrong input was given to the decoder function @@@@@
	10308	The audio decoder did not get into the 'prepared' state
| Example | ```
DS:> 103
010300:
Test OK @

DS:> 103 spdif
010300:
Test OK @
``` | |

Nucleus Name	**DS_CHR_SineOff**	
Nucleus Number	104	
Description	Stop generating the audio sine signal	
Technical	- Reset the audio block of the Codec	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	10400	Switching off the audio sine signal succeeded
	10401	Failed to reset the audio decoder

Example	`DS:> 104`
	`010400:`
	`Test OK @`	

Nucleus Name	**DS_CHR_SineBurst**	
Nucleus Number	105	
Description	Generate an audio sine signal on the audio output of the digital board for 4 seconds. Note: Left channel 6kHz, right channel 12 kHz sine with some known hick-ups	
Technical	- Call the DS_CHR_SineOn nucleus - Delay for 4 seconds - Call the DS_CHR_SineOff nucleus	
Execution Time	4 seconds	
User Input	None	
Error	Number	Description
	10500	The sine signal burst was successfully generated
	10501	The delay did not succeed during the burst
	10502	The audio sine could not be generated

Example	`DS:> 105`
	`010500:`
	`Test OK @`	

Nucleus Name	**DS_CHR_MuteOn**	
Nucleus Number	106	
Description	Mute the audio outputs of the digital board	
Technical	- Send the 'Mute' command to the audio decoder - Activate the 'audio mute' PIO pin	
Execution Time	Less than 1 second.	
User Input	"PIO" to just use the PIO pin mute. When muting using this, also de-mute using this as this works 'paired'.	
Error	Number	Description
	10600	Muting the audio succeeded
	10601	Muting the audio through the PIO-pin failed

Example	`DS:> 106`
	`010600:`
	`Test OK @`
	
	`DS:> 106 PIO`
	`010600:`
	`Test OK @`	

Nucleus Name	**DS_CHR_MuteOff**	
Nucleus Number	107	
Description	De-mute the audio outputs of the digital board	
Technical	- Send the 'DeMute' command to the audio decoder - Deactivate the 'audio mute' PIO pin	
Execution Time	"PIO" to just use the PIO pin de-mute. Only de-mute using this when you muted using the PIO parameter, as this works ''paired.	
User Input	None	
Error	Number	Description
	10700	De-muting the audio succeeded
	10701	De-muting the audio through the PIO-pin failed

Example	`DS:> 107`
	`010700:`
	`Test OK @`
	
	`DS:> 107 PIO`
	`010700:`
	`Test OK @`	

Nucleus Name	**DS_CHR_DvLedOn**	
Nucleus Number	108	
Description	Check the connection to the DV-LED on the digital board by switching it on	
Technical	- Write to the PIO pin to light the DV LED	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	10800	Switching the DV-LED on succeeded
	10801	Switching the DV-LED on failed

Example	`DS:> 108`
	`010800:`
	`Test OK @`	

Nucleus Name	**DS_CHR_DvLedOff**	
Nucleus Number	109	
Description	Switch off the DV-LED on the digital board	
Technical	- Write to the PIO pin to switch off the DV LED	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	10900	Switching the DV-LED off succeeded
	10901	Switching the DV-LED off failed

Example	`DS:> 109`
	`010900:`
	`Test OK @`	

Nucleus Name	**DS_CHR_MacroVisionOn**	
Nucleus Number	110	
Description	Turn on MacroVision.	
Technical	- Set some registers of the DENC module in the Codec.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	11000	Turning on MacroVision succeeded
	11001	Turning on MacroVision failed

Example	`DS:> 110`
	`011000:`
	`Test OK @`	

Nucleus Name	**DS_CHR_MacroVisionOff**	
Nucleus Number	111	
Description	Turn off MacroVision.	
Technical	- Set some registers of the DENC module in the Codec.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	11100	Turning off MacroVision succeeded
	11101	Turning off MacroVision failed
Example	DS:> 111 011100: Test OK @	

Nucleus Name	**DS_CHR_Peek**	
Nucleus Number	112	
Description	Peek a value on a specified address	
Technical	- Check the user input - Read out the address specified - Check whether the address to be read is aligned on 4 bytes	
Execution Time	Less than 1 second.	
User Input	The address to peek on	
Error	Number	Description
	11200	Peeking on the specified address succeeded
	11201	Peeking on the specified address failed, wrong user input
	11202	Peeking on the specified address failed due to misalignment
Example	DS:> 112 0xa0700000 011200: Value read = 0x000001BD Test OK @	

Nucleus Name	**DS_CHR_Poke**	
Nucleus Number	113	
Description	Poke a value on a specified address	
Technical	- Check the user input - Change the value on the address specified - Check whether the address to be modified is aligned on 4 bytes	
Execution Time	Less than 1 second.	
User Input	The address to poke and the value: <address><value>	
Error	Number	Description
	11300	Poking the specified address succeeded
	11301	Poking the specified address failed, wrong user input
	11302	Poking the specified address failed due to misalignment
Example	DS:> 113 0xa0700000 0xaabbccdd 011300: Test OK @	

Nucleus Name	**DS_CHR_INT_PICInterrupts**	
Nucleus Number	114	
Description	Test all interrupts of the priority interrupt controller	
Technical	- Install interrupt handlers - Generate interrupts - Test whether all interrupts were received	
Execution Time	Less than 1 second.	
User Input	-	
Error	Number	Description
	11400	Testing all the PIC interrupts succeeded
	11401	Testing all the PIC interrupts failed
Example	DS:> 114 011400: Test OK @	

Nucleus Name	**DS_CHR_DMA_TestDMA**	
Nucleus Number	115	
Description	Test the memory to memory DMA transfer	
Technical	- Create a block with known data in memory - Copy this block to the consecutive area using 3 different DMAs - Check whether all DMAs transferred the data properly	
Execution Time	Less than 2 seconds.	
User Input	-	
Error	Number	Description
	11500	The testing of the DMAs succeeded
	11501	The initialisation of the DMAs failed for one or more DMA
	11502	One or more DMAs failed the test
Example	DS:> 115 011500: Test OK @	

3.2 BOOT EEPROM (BROM)

Nucleus Name	**DS_BROM_Communication**	
Nucleus Number	200	
Description	Check the communication between the IIC controller of the Codec and the boot EEPROM	
Technical	- Initialise IIC - Read something from the EEPROM	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	20000	The data is properly read so the communication is OK
	20001	The IIC bus was not accessible
	20002	There was a timeout reading the device
	20003	The IIC acknowledge was not received
	20004	An IIC-bus error occurred
	20005	The IIC bus initialisation failed
	20006	An unexpected IIC error occurred
Example	DS:> 200 020000: Test OK @	

Nucleus Name	**DS_BROM_WriteRead**	
Nucleus Number	201	
Description	Check whether the Boot EEPROM can be written to and read from	
Technical	- Initialise IIC - Write something to the EEPROM - Read from the same location and check whether it is the same as written	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	20100	The write-read test succeeded
	20101	The write-read test failed
	20102	An IIC-bus error occurred
	20103	There was a timeout reading the device
	20104	The IIC bus was not accessible
	20105	The IIC acknowledge was not received
	20106	Got unknown IIC bus error
	20107	The IIC bus initialisation failed
Example	DS:> 201 020100: Test OK @	

3.3 NON VOLATILE RAM (NVRAM)

Nucleus Name	**DS_NVRAM_Communication**	
Nucleus Number	300	
Description	Check the communication between the IIC controller of the Codec and the NVRAM EEPROM	
Technical	- Initialise IIC - Read from a location in the NVRAM EEPROM device	
Important note:	This nucleus only checks the physical connection between the Codec and IIC EEPROM. If no EEPROM is mounted this test will fail. However other NVRAM nuclei might still work because the software will store NVM data into flash memory	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	30000	Something is properly read so the communication is OK
	30001	The IIC bus was not accessible
	30002	There was a timeout reading the device
	30003	The IIC acknowledge was not received
	30004	The communication with the device failed
	30005	The IIC bus initialisation failed
Example	DS:> 300 030000: Test OK @	

Nucleus Name	**DS_NVRAM_WriteRead**	
Nucleus Number	301	
Description	Check whether the EEPROM can be written to and read from	
Technical	- Initialise IIC - If no IIC EEPROM was found then initialise flash memory to use NVM pages - Backup data from location to modify - Write to location and read it back again - Write back the backed up data to the location to leave the NVRAM as found	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	30100	The write-read test succeeded
	30101	The IIC bus could not be initialised
	30102	There was an NVRAM IO error
	30103	The value could not be read back from the NVRAM
Example	DS:> 301 030100: Test OK @	

Nucleus Name	**DS_NVRAM_Clear**	
Nucleus Number	302	
Description	Make the EEPROM empty, containing all zeroes.	
Technical	- Initialise IIC - If no IIC EEPROM was found then initialise flash memory to use NVM pages - Read the DVID and diversity string from NVM (either EEPROM or Flash) - Create a memory block filled with zeroes - Write this block to the NVRAM (either EEPROM or Flash) - Write back the Read the DVID and diversity string to NVM (either EEPROM or Flash)	
Important note:	The Hardware Diversity Information and unique identification number (IEE1394-specific) of the **D**igital **V**ideo processing part is NOT cleared by this nucleus!	
Execution Time	16 seconds	
User Input	None	
Error	Number	Description
	30200	The clearing of the NVRAM succeeded
	30201	There was an IIC error
	30202	Clearing the NVRAM failed
Example	DS:> 302 030200: Test OK @	

Nucleus Name	**DS_NVRAM_Modify**	
Nucleus Number	303	
Description	Modifies one or more locations in NVRAM and updates the checksum of the section modified	
Technical	- Initialise IIC - If no IIC EEPROM was found then initialise flash memory to use NVM pages - Decode user input - Modify the NVRAM as indicated - Validate the NVRAM by calculating the checksum and storing it	
Execution Time	Less than 1 second	
User Input	1. The location that must be modified i.e. "ALL" "BOOT" "DIAGNOSTICS" "DOWNLOAD" "CONFIG" "RECORDER" or no string if an offset from the base address of the NVRAM is required 2. The offset and data which to put on the selected location <offset> <length> <data>	
Error	Number	Description
	30300	Modifying the NVRAM contents succeeded
	30301	Unable to initialise NVM
	30302	Modifying the NVRAM contents failed
	30303	length out of range
	30304	unable to decode length
	30305	offset out of range
	30306	unable to decode offset
	30307	unknown location specified
	30308	no location is specified
	30309	number of values incorrect
	30310	There was an IIC error
Example	DS:> 303 DIAGNOSTICS 5 1 0x5a 030300: Section is modified successfully Test OK @	

Nucleus Name	**DS_NVRAM_Read**	
Nucleus Number	304	
Description	Read out one or more locations in the NVRAM	
Technical	- Initialise IIC - If no IIC EEPROM was found then initialise flash memory to use NVM pages - Decode user input - Read from the NVRAM and return this info to the user	
Execution Time	Less than 1 second	
User Input	1. The location which must be read i.e. "ALL" "BOOT" "DIAGNOSTICS" "DOWNLOAD" "CONFIG" "RECORDER" or no string if an offset from the base address of the NVRAM is required 2. The offset and number of bytes to read <offset> <length>	
Error	Number	Description
	30400	Value read
	30401	Unable to initialise NVM
	30402	Reading the NVRAM contents failed
	30403	Length out of range
	30404	Unable to decode length
	30405	Offset out of range
	30406	Unable to decode offset
	30407	Unknown location specified
	30408	No location is specified
Example	304 DIAGNOSTICS 0 6 030400: Value read = 0x00 0x00 0x00 0x00 0x00 0x5A Test OK @	

3.4   SDRAM (SDRAM)

Nucleus Name	DS_SDRAM_WriteRead	
Nucleus Number	400	
Description	Check all data lines, address lines and memory locations of the SDRAM	
Technical	- Test the data bus - Test the address bus - Test the integrity of the device itself (memory locations)	
Execution Time	11 seconds for 32 Mb 23 seconds for 64 Mb	
User Input	None	
Error	Number	Description
	40000	The write-read test succeeded
	40001	The data bus contains an error
	40002	The address bus contains an error
	40003	The SDRAM itself contains an error

Example	`DS:> 400`
	`040000:`
	`Test OK @`	

Nucleus Name	DS_SDRAM_WriteReadFast	
Nucleus Number	401	
Description	Check all data lines and address lines of the SDRAM	
Technical	- Test the data bus - Test the address bus	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	40100	The write-read test succeeded
	40101	The data bus contains an error
	40102	The address bus contains an error

Example	`DS:> 401`
	`040100:`
	`Test OK @`	

Nucleus Name	DS_SDRAM_Write	
Nucleus Number	402	
Description	Write to a specific un-cached memory address	
Technical	- Decode the user input and check its ranges and alignment on 4 bytes - Write the data to the SDRAM	
Execution Time	Less than 1 second	
User Input	1. The location that must be modified (SDRAM starts at address 0xA0000000) 2. The value to put on the selected location	
Error	Number	Description
	40200	Writing to the SDRAM succeeded
	40201	Writing to the SDRAM failed; Wrong user input
	40202	Address is not dividable by 4

Example	`DS:> 402 0xa1000010 0xad112222`
	`040200:`
	`Test OK @`	

Nucleus Name	**DS_SDRAM_Read**	
Nucleus Number	403	
Description	Read from a specific un-cached memory address	
Technical	- Decode the user input and check the ranges - Read from the SDRAM and return this info to the user	
Execution Time	Less than 1 second	
User Input	The location from which the data must be read (SDRAM starts at address 0xA0000000)	
Error	Number	Description
	40300	Reading from the SDRAM succeeded
	40301	Reading from the SDRAM failed; Wrong user input
	40302	Address is not dividable by 4

Example	`DS:> 403 0xa1000010`
	`040300: Value read = 0xAD112222`
	`Test OK @`	

Nucleus Name	**DS_SDRAM_DmaWriteRead**	
Nucleus Number	404	
Description	Write a pattern to the entire SDRAM using DMA and check the data	
Technical	- Check if the Stack pointer is not in the write range - Clear a 64kb block and then fill it with a pattern - Initialise the DMA controller and write the data to the SDRAM - Then check if all the data was written correctly (except descriptor tables) - Repeat the process 4 times with 4 different patterns	
Execution Time	24 seconds	
User Input	None.	
Error	Number	Description
	40400	Writing to the SDRAM succeeded
	40401	Stack area definition ERROR!
	40402	DMA controller could not be initialised.
	40403	Not all data was transferred correctly

Example	`DS:> 404`
	`040400:`
	`Test OK @`	

3.5 FLASH (FLASH)

Nucleus Name	**DS_FLASH_DevTypeGet**	
Nucleus Number	500	
Description	Get the device (revision) type information of the FLASH ICs. (type, manufacturer, device ID and size)	
Technical	- Set the timing for the flash writing - Write a command sequence to determine device type information - Return the information to the user	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	50000	Getting the information from the FLASH succeeded
	50001	Getting the information from the FLASH failed
Example	DS:> 500 050000: Found FLASH memory: NOR AMD 29DL640G 8MB,NOR AMD 29DL640G 8MB Test OK @	

Nucleus Name	**DS_FLASH_WriteRead**	
Nucleus Number	501	
Description	Check whether the FLASH can be written to and read from	
Technical	- Find the test segment in flash - Read the data into SDRAM - Modify the data - Write this data from SDRAM to FLASH and verify it by reading back again	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	50100	The FLASH write-read test succeeded
	50101	The test segment could not be found
	50102	All bits in the TEST region are filled with 0 (region exhausted)
	50103	The Write Read test failed
	50104	The Write Failed
Example	DS:> 501 050100: Test OK @	

Nucleus Name	**DS_FLASH_Read**	
Nucleus Number	502	
Description	Read from a specific memory address in FLASH	
Technical	- Decode the user input and check the ranges and whether the address is aligned on 4 bytes - Read the data and return this to the user	
Execution Time	Less than 1 second.	
User Input	The location from which data must be read (FLASH starts at address 0xB8000000)	
Error	Number	Description
	50200	Reading the FLASH succeeded
	50201	Reading the FLASH failed; Wrong user input
	50202	Address is not dividable by 4
Example	DS:> 502 0xb8000000 050200: Value read = 0x3C08A000 Test OK @	

Nucleus Name	**DS_FLASH_ChecksumProgram**	
Nucleus Number	503	
Description	Check the checksum of the application partitions by recalculating and comparing partition checksums	
Technical	- Determine the number of segments - Find the application in each segment and determine its checksum - Check whether the checksums stored match the newly calculated	
Execution Time	6 seconds	
User Input	None	
Error	Number	Description
	50300	The checksum is valid, the test succeeded
	50301	The checksum is invalid

Example	```DS:> 503```
	```050300:```
	```BootCode checksum is: 0xBABE5B6F, which is correct```
	```Diagnostics checksum is: 0xBABEBAFF, which is correct```
	```Download checksum is: 0xBABEEDBF, which is correct```
	```Application checksum is: 0xBABE8EEC, which is correct```
	```Test OK @```	

Nucleus Name	**DS_FLASH_CalculateChecksum**	
Nucleus Number	504	
Description	Calculate the checksum over all memory addresses. Used to check entire FLASH contents	
Technical	- Run the checksum calculation algorithm on all flash memory addresses	
Execution Time	6 seconds	
User Input	None	
Error	Number	Description
	50400	Calculating the checksum over all addresses succeeded

Example	```DS:> 504```
	```050400: The Checksum = 0xBABE30A4```
	```Test OK @```	

Nucleus Name	**DS_FLASH_CalculateChecksumFast**	
Nucleus Number	505	
Description	Calculate a checksum over a selected number of address locations	
Technical	- Run the checksum calculation algorithm on a selected number of flash memory addresses	
Execution Time	6 seconds	
User Input	None	
Error	Number	Description
	50500	Calculating the checksum over selected addresses succeeded

Example	```DS:> 505```
	```050500: The Checksum = 0xBABEB064```
	```Test OK @```	

3.6   VIDEO INPUT PROCESSOR (VIP)

Nucleus Name	DS_VIP_DevTypeGet	
Nucleus Number	600	
Description	Get the device (revision) type information of the VIP IC	
Technical	- Initialise IIC - Read out the device (revision) type information of the VIP IC	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	60000	Getting the information from the VIP succeeded
	60001	The IIC bus initialisation failed
	60002	The was an error getting the information from the VIP
	60003	Type not according to type stored in HW diversity string

Example	`DS:> 600`
	`060000: Found SAA7118`
	`Test OK @`	

Nucleus Name	DS_VIP_Communication	
Nucleus Number	601	
Description	Check the communication between the IIC controller of the Codec and the VIP IC	
Technical	- Initialise IIC - Read data from a location in the VIP	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	60100	Communicating with the VIP succeeded
	60101	The IIC bus was not accessible
	60102	There was a timeout reading the device
	60103	The IIC acknowledge was not received
	60104	The communication with the device failed
	60105	The IIC bus initialisation failed

Example	`DS:> 601`
	`060100:`
	`Test OK @`	

Nucleus Name	DS_VIP_ClockOutputOn	
Nucleus Number	602	
Description	Switch the clock output on	
Technical	- Initialise IIC - Set the clock output through IIC	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	60200	Switching the clock output on succeeded
	60201	Switching the clock output on failed

Example	`DS:> 602`
	`060200:`
	`Test OK @`	

Nucleus Name	**DS_VIP_ClockOutputOff**	
Nucleus Number	603	
Description	Switch the clock output off	
Technical	- Initialise IIC	
	- Reset the clock output through IIC	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	60300	Switching the clock output off succeeded
	60301	Switching the clock output off failed
Example	DS:> 603 060300: Test OK @	

Nucleus Name	**DS_VIP_SelectInput**	
Nucleus Number	604	
Description	Select an input video path to be switched to the analogue output pin (AOUT) of the VIP	
Technical	- Check the user input - Initialise IIC - Read out the VIP id - Write the set of registers required for the input specified	
Execution Time	Less than 1 second	
User Input	The input to select, see table below. Available channels for input of the 7118 and their description: Available channels for input of the 7115 and their description: Available channels for input of the 7119 and their description: Available channels for input of the 7173 and their description:	
Error	Number	Description

Available channels for input of the 7118 and their description:

Channel number	Description
1	CVBS_Y_IN_A
2	CVBS_OUT_B
3	CVBS_Y_IN_B
4	CVBS_Y_IN_C
6	C_IN
8	G_IN
9	Y_IN
13	B_IN
14	U_IN
18	R_IN
19	V_IN

Available channels for input of the 7115 and their description:

Channel number	Description
1	CVBS_Y_IN_B
2	CVBS_OUT_B_VIP
4	C_IN_VIP
7	CVBS_Y_IN_B

Available channels for input of the 7119 and their description:

Channel number	Description
1	Y / CVBS
3	CVBS
4	Y3
6	C / CVBS
8	G
9	Y
12	Y2
13	B
14	U
17	C
18	R
19	V

Available channels for input of the 7173 and their description:

Channel number	Description
1	CVBS_TUNER_IN
2	CVBS_REAR_IN
3	CVBS_FRONT_IN
4	C_REAR_IN
5	Y_REAR_IN
6	Y_FRONT_IN
7	C_FRONT_IN
8	AL_REAR_IN
9	AL_FRONT_IN
10	AR_FRONT_IN
11	AR_REAR_IN
12	SIF_TUNER_IN

	60400	Selecting the input of the VIP succeeded
	60401	The user provided wrong input
	60402	The VIP was not accessible
	60403	An unsupported VIP was found

Example	`DS:> 604 1`
	`060400:`
	`Test OK @`	

3.7 DIGITAL VIDEO INPUT OUTPUT CIRCUIT (DVIO)

Nucleus Name	DS_DVIO_LinkDevTypeGet	
Nucleus Number	700	
Description	Get the device (revision) type information of the 1394 Link layer IC	
Technical	- Initialise the PIO pins on the Codec - Read out the ID register	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	70000	Getting the information from the link layer IC succeeded
	70001	Getting the information from the link layer IC failed
	70002	Type not according to type stored in HW diversity string

Example	`DS:> 700`
	`070000: Device type of the link layer IC: ffc00301`
	`Test OK @`	

Nucleus Name	DS_DVIO_PhyDevTypeGet	
Nucleus Number	701	
Description	Get the device (revision) type information of the 1394 Physical layer IC	
Technical	- Initialise the PIO pins of the Codec - Write the PHY-access register in the Link chip to indicate phy read access - Wait until the link chip has obtained the value from the phy-chip - Read this out and filter the data to be returned to the user	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	70100	Getting the information from the physical layer IC succeeded
	70101	The physical layer IC was not accessible
	70102	Getting the information from the physical layer IC failed
	70103	Type not according to type stored in HW diversity

Example	`DS:> 701`
	`070100: Physical layer IC: VendorID: 0x006037, ProductID: 0x412801`
	`Test OK @`	

Nucleus Name	DS_DVIO_LinkCommunication	
Nucleus Number	702	
Description	Check the accessibility of the 1394 Link layer IC by writing to and reading from a specific address	
Technical	- Initialise the PIO pins of the Codec - Write a pattern to the CYCTM register of the link chip - Read back and verify the pattern	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	70200	Communicating with the link layer IC succeeded
	70201	Communicating with the link layer IC failed
	70202	Result of nucleus not according to HW diversity string

Example	`DS:> 702`
	`070200:`
	`Test OK @`	

Nucleus Name	**DS_DVIO_PhyCommunication**	
Nucleus Number	703	
Description	Check the accessibility of the 1394 Physical layer IC by writing to and reading from a specific address	
Technical	- Initialise the PIO pins of the Codec - Initialise IIC - Write the data to be written to the PHY-chip to the link chip first - Wait until the link chip indicates that the data has been written to the PHY - Write the PHY-access register in the Link chip to indicate PHY read access - Wait until the link chip has obtained the value from the PHY-chip - Test whether the value read back equals the one previously written	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	70300	Communicating with the physical layer IC succeeded
	70301	The physical layer IC was not accessible
	70302	Communicating with the physical layer IC failed
	70303	Result of nucleus not according to HW diversity string
Example	DS:> 703 070300: Test OK @	

Nucleus Name	**DS_DVIO_Routing**	
Nucleus Number	704	
Description	Route a DV stream containing an audio and video signal through the physical and link layer ICs to the Codec. This test works for both NTSC and PAL.	
Technical	- Initialise the DMA to transfer 5 frames PAL/NTSC - Initialise the DV de-multiplexer - Initialise the 1394 interface and start reception of the DV stream - Check whether the stream was copied to memory properly by the byte input interface (port to memory type DMA)	
Execution Time	6-10 seconds (6 when OK, 10 when no stream or error)	
User Input	None	
Error	Number	Description
	70400	Routing the signals succeeded
	70401	The 1394 link chip could not be initialised properly
	70402	There was a syntax error in the DV stream
	70403	DMA could not copy DV stream to memory. Stream connected?
	70404	DMA not working properly
Example	DS:> 704 070400: Test OK @	

Nucleus Name	**DS_DVIO_DetectNode**	
Nucleus Number	705	
Description	Check whether a DV node can be detected by the hardware. This test works for both NTSC and PAL.	
Technical	- Initialise the 1394 interface - Detect whether a node is in range	
Execution Time	3 or 5 seconds (3 when OK, 5 when no stream or error)	
User Input	None	
Error	Number	Description
	70500	The node was detected OK
	70501	The 1394 link chip could not be initialised properly
	70502	Unable to write to 1394 PHY chip
	70503	Unable to read from 1394 PHY chip
	70504	No node was detected
Example	DS:> 705 070500: Test OK @	

Nucleus Name	**DS_DVIO_DetectStream**	
Nucleus Number	706	
Description	Check whether a DV stream can be detected by the hardware. This test works for both NTSC and PAL.	
Technical	- Initialise the 1394 interface - Start receiving the stream - Detect whether the stream is OK	
Execution Time	3 or 5 seconds (3 when OK, 5 when no stream or error)	
User Input	None	
Error	Number	Description
	70600	The stream was detected
	70601	The 1394 link chip could not be initialised properly
	70602	No stream detected
Example	DS:> 706 070600: Test OK @	

3.8 PROGRESSIVE SCAN CIRCUIT (PSCAN)

Nucleus Name	**DS_PSCAN_DevTypeGet**	
Nucleus Number	800	
Description	Get the device (revision) type information of the progressive scan ic.	
Technical	- Initialise the progressive scan ic.	
	- Try to read the version register of the progressive scan ic.	
Execution Time	1 second	
User Input	None	
Error	Number	Description
	80000	Everything went well.
	80001	The communication with the device failed
	80002	No chip was expected
| Example | ```
DS:> 800
080000:
Chip name   : 2300
Chip version : 1
Test OK @
``` | |
| | ```
DS:> 800
080000:
Chip name    : ADV7196
Test OK @
``` | |
| | ```
DS:> 800
080000:
Chip name    : ADV7302
Test OK @
``` | |

Nucleus Name	**DS_PSCAN_Communication**	
Nucleus Number	801	
Description	Check the communication between the IIC controller of the Codec and the progressive scan IC	
Technical	- Initialise IIC	
	- Write data to a register of the progressive scan ic through IIC	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	80100	Communicating with the progressive scan ic succeeded
	80101	The IIC bus was not accessible
	80102	There was a timeout reading the device
	80103	The IIC acknowledge was not received
	80104	Communicating with the progressive scan ic failed
	80105	The initialisation of the IIC bus failed
	80106	The read data is not the same as the written data
	80107	No chip was expected
| Example | ```
DS:> 801
080100:
Test OK @
``` | |

Nucleus Name	**DS_PSCAN_TestImageOn**	
Nucleus Number	802	
Description	Generate the test images that are present on the progressive scan IC.	
Technical	- Determine whether the user wanted a HATCH or a FRAME image pattern	
	- Initialise the PIO pins of the Codec	
	- Initialise IIC	
	- Reset the DENC	
	- Enable the 27Mhz clock	
	- Send all settings for the pattern to the DENC through IIC	
Execution Time	Less than 1 second	

User Input	In case of ADV7196:
	When no input is given "HATCH" is the default
	-"HATCH"
	-"FRAME"
	Remark:
	"HATCH" is a crosshatch test pattern (horizontal and vertical white lines are displayed against a black background)
	"FRAME" is a uniform coloured frame/field test pattern (default white).
	In case of FLI2300: Nothing.

Error	Number	Description
	80200	The generation of the test image succeeded
	80201	Unable to initialise PSCAN IC
	80202	Unable to reset DENC
	80203	Unable to generate image
	80204	No chip was expected

Example	`DS:> 802 HATCH`
	`080200:`
	`Test OK @`

Nucleus Name	**DS_PSCAN_TestImageOff**	
Nucleus Number	803	
Description	Switch off the generated test image	
Technical	- Initialise IIC	
	- Send the default DENC settings to the DENC through IIC	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	80300	Turning off the test image succeeded
	80301	Unable to initialise PSCAN IC
	80302	IIC Error during writing PSCAN IC
	80303	No chip was expected

Example	`DS:> 803`
	`080300:`
	`Test OK @`	

Nucleus Name	**DS_PSCAN_TestImageColourSettingsSet**	
Nucleus Number	804	
Description	Set the colour of the hatch- or the frame- field to a different value than the default white	
Technical	- Determine which colour must be set.	
	- Initialise IIC.	
	- Enable 27 MHz PSCAN Clock.	
	- Send all settings to the DENC through IIC.	
Execution Time	Less than 1 second.	
User Input	A colour string of one of the next non-case sensitive strings (WHITE, BLACK, RED, GREEN, BLUE, YELLOW, CYAN, MAGENTA) or Y Cr Cb (hexa-)decimal values.	
Error	Number	Description
	80400	Setting the new colour-settings succeeded
	80401	The user provided wrong input
	80402	Unable to initialise PSCAN IC
	80403	Unable to set colour
	80404	No chip was expected

Example	`DS:> 804 yellow`
	`080400:`
	`Test OK @`
	
	`DS:> 804 0x6a 0xde 0xca`
	`080400:`
	`Test OK @`	

Nucleus Name	DS_PSCAN_TestImageColourSettingsGet	
Nucleus Number	805	
Description	Get the colour settings of the hatch- or the frame- field.	
Technical	- Initialise IIC. - Read the colour settings from the DENC through IIC.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	80500	Getting the colour-settings succeeded
	80501	The progressive scan DENC-IC was not accessible through IIC
	80502	Unable to get colour
	80503	No chip was expected

Example	`DS:> 805`
	`080500: Colour Y Cr Cb values: 0xD2 0x92 0x10`
	`Test OK @`	

Nucleus Name	DS_PSCAN_Routing	
Nucleus Number	806	
Description	Route a video signal from the codec host processor through the progressive scan ICs to the progressive scan output of the set. **Note**: To route the progressive scan to the output of the set, first call the nucleus to do the video routing on the analogue (part of the) board.	
Technical	- Initialise the PIO pins of the codec - Initialise IIC - Reset the DENC - Enable the 27Mhz clock - Send all settings to the DENC through IIC.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	80600	Routing path is created successfully.
	80601	Unable to initialise the Codec.
	80602	Unable to access DENC
	80603	Unable to access de-interlacer.
	80604	Wrong chips were expected.

Example	`DS:> 806`
	`080600:`
	`Test OK @`	

Nucleus Name	DS_PSCAN_DevTypeGetDeinterlacer
Nucleus Number	807
Description	See nucleus 800.

Example	`DS:> 807`
	`080700:`
	`Chip name   : 2300`
	`Chip version : 1`
	`Test OK @`

Nucleus Name	DS_PSCAN_CommunicationDeinterlacer
Nucleus Number	808
Description	See nucleus 801.

Example	`DS:> 808`
	`080800:`
	`Test OK @`

3.9 BASIC ENGINE (BE)

Nucleus Name	DS_BE_CommunicationEcho	
Nucleus Number	900	
Description	Check the communication between the digital board and the basic engine by issuing an *echo* command	
Technical	- Check if an AV2 or AV3 is connected - In case of an AV2 Check the communication between the digital board and the basic engine by issuing an *echo* command over the S2B interface - Check if the BE returned the string 0x00 0xAA 0x55 - In case of an AV3 send an ATAPI TEST_UNIT_READY command	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	90000	Communicating with the BE over the S2B interface succeeded
	90001	There was a time-out while communicating
	90002	The Basic Engine returned an unexpected result
	90003	The Basic Engine returned an error code
	90004	No acknowledge received from BE
	90005	Communicating with the Basic Engine failed
	90006	Echo check failed, no echo received
	90007	Echo check failed, received wrong pattern
Example	DS:> 900 090000: Test OK @	

Nucleus Name	DS_BE_Reset	
Nucleus Number	901	
Description	Reset the basic engine	
Technical	- Check if an AV2 or AV3 is connected - In case of an AV2 Toggle the reset pin of the I2S interface - In case of an AV3 Toggle the reset pin of the IDE interface	
Execution Time	2 seconds on AV2 9 seconds on AV3 (when disc inside)	
User Input	None	
Error	Number	Description
	90100	Resetting the Basic Engine succeeded
	90101	Resetting the Basic Engine failed
Example	DS:> 901 090100: Test OK @	

Nucleus Name	**DS_BE_GetSelftestResult**	
Nucleus Number	902	
Description	Return the self-test results through the service port	
Technical	- Check if an AV2 or AV3 is connected - In case of an AV2 Send the S2B GET_SELF_TEST_RESULT command - In case of an AV3 Send the ATAPI REPORT_DRIVE_DIAGNOSTICS command - On error display the specific error codes received from the BE	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	90200	Self test succeeded, no errors
	90201	There was a time-out while communicating
	90202	The Basic Engine returned an unexpected result
	90203	The BE returned an error code
	90204	No acknowledge received from BE
	90205	Communicating with the Basic Engine failed
	90206	Basic Engine returned no info
	90207	Self test failed, errors are echoed

Example	`DS:> 902`
	`090200:`
	`Self-test result byte : 00000000`
	`Self-test result byte : 00000000`
	`Self-test result byte : 00000000`
	`Test OK @`	

Nucleus Name	**DS_BE_VersionGet**	
Nucleus Number	903	
Description	Get the version of the basic engine and that of the optical unit	
Technical	- Check if an AV2 or AV3 is connected - In case of an AV2 send the S2B GET_VERSION_NUMBER command - In case of an AV3 send the ATAPI INQUIRY command - Send the GET_OPU_VERSION command - Display the returned version information	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	90300	BE version OK
	90301	There was a time-out while communicating
	90302	The Basic Engine returned an unexpected result
	90303	The BE returned an error code
	90304	No acknowledge received from BE
	90305	Communicating with the Basic Engine failed
	90306	The BE returned no info

Example (AV2)	`DS:> 903`
	`090300: BE version = 20.09.18 Optical unit version = 3C.00.09.41.08`
	`Test OK @`	

Example (AV3)	`DS:> 903`
	`090300:`
	`BE version = 31.30.24. PHILIPS ,VAD8031`
	`,31302400,REL_8031_313024 2073,`
	`Optical unit version = 00.06.82.19.00`
	`Test OK @`	

Nucleus Name	**DS_BE_TrayOut**	
Nucleus Number	904	
Description	Open the tray of the basic engine	
Technical	- Check if an AV2 or AV3 is connected - In case of an AV2 Send the S2B TRAY_OUT command - In case of an AV3 send an ATAPI START_STOP_UNIT command	
Execution Time	Approximately 2 seconds	
User Input	None	
Error	Number	Description
	90400	The command executed successfully
	90401	There was a time-out while communicating
	90402	The Basic Engine returned an unexpected result
	90403	The BE returned an error code
	90404	No acknowledge received from BE
	90405	Unable to enter normal mode
	90406	Communicating with the Basic Engine failed

Example	`DS:> 904`
	`090400:`
	`Test OK @`	

Nucleus Name	**DS_BE_TrayIn**	
Nucleus Number	905	
Description	Close the tray of the basic engine	
Technical	- Check if an AV2 or AV3 is connected - Send the S2B TRAY_IN command - In case of an AV3 send an ATAPI START_STOP_UNIT command	
Execution Time	Approximately 1 - 2 seconds	
User Input	None	
Error	Number	Description
	90500	The command executed successfully
	90501	There was a time-out while communicating
	90502	The Basic Engine returned an unexpected result
	90503	The BE returned an error code
	90504	No acknowledge received from BE
	90505	Unable to enter normal mode
	90506	Communicating with the Basic Engine failed

Example	`DS:> 905`
	`090500:`
	`Test OK @`	

Nucleus Name	**DS_BE_WriteReadDvdRw**	
Nucleus Number	906	
Description	Write data to and read data from a DVD+RW or DVD-RW disc through the basic engine for verification of the writing	
Technical	- Check if an AV2 or AV3 is connected - Execute DS_BE_GetSelftestResults - Send the TRAY_IN command - Send the READ_TOC command - Generate a random disc location - Generate test data to write to the DVD+RW - In case of an AV2 Transfer the test data to the disc location using DMA - In case of an AV3 Transfer the test data to the disc location using PIO mode ATAPI WRITE_10 - In case of an AV2 Read back the data from disc using DMA - In case of an AV3 Transfer the test data to the disc location using PIO mode ATAPI READ_10 - Compare the two data areas and check whether the areas are equal	
Execution Time	Approximately 20 seconds	
User Input	None	
Error	Number	Description
	90600	The command executed successfully
	90601	This nucleus cannot be executed because the Self-Test failed
	90602	The BE cannot enter normal operating mode
	90603	Unable to send the tray in
	90604	Unable to read TOC from disc
	90605	Invalid disc is loaded, please insert a DVD+RW or DVD-RW disc
	90606	Writing the test pattern to DVD+RW or DVD-RW failed
	90607	Reading back the test pattern from DVD+RW of DVD-RW failed
	90608	Compare check failed
	90609	Calibrating DVD+RW or DVD-RW failed

Example	`DS:> 906`
	`090600: DVD+RW test on sector 0x5dbe0: OK`
	`Test OK @`	

	`DS:> 906`
	`090600: DVD-RW test on sector 0x304e0: OK`
	`Test OK @`	

Nucleus Name	**DS_BE_WriteReadDvdR**	
Nucleus Number	907	
Description	Write data to and read data from a DVD+R or DVD-R disc through the basic engine for verification of the writing	
Technical	- Check if an AV2 or AV3 is connected - Execute DS_BE_GetSelftestResults - Send the TRAY_IN command - Send the READ_TOC command - Use the OPC area to test if the DVD+R or DVD-R is (still) writable - Generate test data to write to the DVD+R or DVD-R - In case of an AV2 Transfer the test data to the disc location using DMA - In case of an AV3 Transfer the test data to the disc location using PIO mode ATAPI WRITE_10 - In case of an AV2 Read back the data from disc using DMA - In case of an AV3 Transfer the test data to the disc location using PIO mode ATAPI READ_10 - Compare the two data areas and check whether the areas are equal	
Execution Time	Approximately 20 seconds	
User Input	None	
Error	Number	Description
	90700	The command executed successfully
	90701	This nucleus cannot be executed because the Self-Test failed
	90702	The BE cannot enter normal operating mode
	90703	Unable to send the tray in
	90704	Unable to read TOC from disc
	90705	Invalid disc is loaded, please insert a DVD+RW disc
	90706	Unable to write, the DVD+R or DVD-R disc is full
	90707	No writable DVD+R or DVD-R sector found
	90708	Writing the test pattern to DVD failed
	90709	Reading back the test pattern from DVD failed
	90710	Compare check failed
Example	``` DS:> 907 090700: DVD+R test on sector 0x36210: OK Test OK @ ```	
	``` DS:> 907 090700: DVD-R test on sector 0x30000: OK Test OK @ ```	

Note:	Not for ATAPI based drives! Command may not work for ATAPI based drives!	
Nucleus Name	**DS_BE_StatisticalInformationGet**	
Nucleus Number	908	
Description	Retrieve the statistical information from the basic engine	
Technical	- Check if an AV2 or AV3 is connected - In case of an AV2 Send the S2B GET_STATISTICAL_INFO command - In case of an AV3 Send the transparent BIT engine GET_STATISTICAL_INFO command - Display the info returned from the BE	
Execution Time	Less than 1 second on AV2 2 seconds on AV3	
User Input	None	
Error	Number	Description
	90800	The command executed successfully
	90801	There was a time-out while communicating
	90802	The Basic Engine returned an unexpected result
	90803	The BE returned an error code
	90804	No acknowledge received from BE
	90805	Communicating with the Basic Engine failed
	90806	The BE returned no info

Example (AV2)	<pre>DS:> 908
	Number of times Tray went Open/Closed : 4
	Total minutes the CD laser was on : 0
	Total minutes the DVD laser was on : 0
	Total minutes the write laser was on : 0
	090800:
	Test OK @</pre>	

Example (AV3)	<pre>DS:> 908
	Number of times Tray went Open/Closed
	4
	Total time the power power on (HR:MIN)
	0:0h
	Total time of reading CDROM discs (HR:MIN)
	0:0h
	Total time of reading high speed CD-R discs (HR:MIN) 0:0h
	Total time of reading other CD-R discs (HR:MIN) 0:0h
	Total time of reading high speed CD-RW discs (HR:MIN) 0:0h
	Total time of reading other CD-RW discs (HR:MIN) 0:0h
	Total time of reading high speed DVD SL discs (HR:MIN) 0:0h
	Total time of reading other DVD SL discs (HR:MIN) 0:0h
	Total time of reading high speed DVD DL discs (HR:MIN) 0:0h
	Total time of reading other DVD DL discs (HR:MIN) 0:0h
	Total time of reading high speed DVD+R discs (HR:MIN) 0:0h
	Total time of reading other DVD+R discs (HR:MIN) 0:2h
	Total time of reading high speed DVD+RW discs (HR:MIN) 0:0h
	Total time of reading other DVD+RW discs (HR:MIN) 0:35h
	Total time of writing DVD+R discs at 2.4 x (HR:MIN) 0:0h
	Total time of writing DVD+R discs at 4 x (HR:MIN) 0:0h
	Total time of writing DVD+RW discs at 2.4 x (HR:MIN) 0:0h
	Total time of writing DVD+RW discs at 4 x (HR:MIN) 0:0h
	090800:
	Test OK @</pre>	

Note:	**Not for ATAPI based drives!**	
	Command may not work for ATAPI based drives!	
Nucleus Name	**DS_BE_StatisticalInformationReSet**	
Nucleus Number	909	
Description	Reset the statistical information in the basic engine	
Technical	- Check if an AV2 or AV3 is connected	
	- In case of an AV2	
	- Send the S2B RESET_STATISTICAL_INFO command	
	- Send the S2B POWER_DOWN command	
	- Toggle the reset pin of the I2S interface	
	- In case of an AV3 Send the transparent BIT engine RESET_STATISTICAL_INFO command	
Execution Time	2 seconds	
User Input	None	
Error	Number	Description
	90900	The command executed successfully
	90901	There was a time-out while communicating
	90902	The Basic Engine returned an unexpected result
	90903	The BE returned an error code
	90904	No acknowledge received from BE
	90905	Communicating with the Basic Engine failed

Example	`DS:> 909`
	`090900:`
	`Test OK @`	

Note:	**Not for ATAPI based drives!**	
	Command may not work for ATAPI based drives!	
Nucleus Name	**DS_BE_ErrorLogGet**	
Nucleus Number	910	
Description	Get the error log from the basic engine	
Technical	- Check if an AV2 or AV3 is connected	
	- In case of an AV2 Send the S2B GET_ERROR command	
	- In case of an AV3 Send the transparent BIT engine GET_ERROR and GET_FATAL commands	
	- Display the returned info	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	91000	The command executed successfully
	91001	There was a time-out while communicating
	91002	The Basic Engine returned an unexpected result
	91003	The BE returned an error code
	91004	No acknowledge received from BE
	91005	Communicating with the Basic Engine failed
	91006	The BE returned no info

Example (AV2)	`DS:> 910`
	` Momentary errors (Byte 1 - Byte 7) : 0x00 0x00 0x00 0x00 0x00 0x00 0x00`
	` Cumulative errors (Byte 1 - Byte 7) : 0x00 0x00 0x00 0x20 0x00 0x00 0x00`
	` Fatal errors (Oldest - Youngest)    : 0x00 0x00 0x00 0x00 0x00`
	`091000:`
	`Test OK @`	

Example (AV3)	`DS:> 910`
	`Momentary errors  (0-9): 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00`
	`Cumulative errors (1-9) : 0x00 0x80 0x20 0x00 0x00 0x00 0x00 0x00 0x00`
	`Software fatal assert  : 799 engineproxy.cpp`
	`091000:`
	`Test OK @`	

Note:	**Not for ATAPI based drives!** **Command may not work for ATAPI based drives!**	
Nucleus Name	**DS_BE_ErrorLogReset**	
Nucleus Number	911	
Description	Reset the error log in the basic engine	

Technical	- Check if an AV2 or AV3 is connected
	 - In case of an AV2
	  - Send theS2B RESET_STATISTICAL_INFO command
	  - Send the S2B POWER_DOWN command
	  - Toggle the reset pin of the I2S interface
	 - In case of an AV3 Send the transparent BIT engine RESET_STATISTICAL_INFO command	

Execution Time	2 seconds	
User Input	None	
Error	Number	Description
	91100	The command executed successfully
	91101	There was a time-out while communicating
	91102	The Basic Engine returned an unexpected result
	91103	The BE returned an error code
	91104	No acknowledge received from BE
	91105	Communicating with the Basic Engine failed

Example	`DS:> 911`
	 `091100:`
	 `Test OK @`	

Nucleus Name	**DS_BE_JitterOptimise**	
Nucleus Number	912	
Description	Perform jitter optimisation: A formatted DVD must be loaded into the engine before executing this nucleus	

Technical	- Check if an AV2 or AV3 is connected
	 - Send the TRAY_IN command
	 - Send the READ_TOC command
	 - In case of an AV2
	  - Send the JITTER_COMMAND command with parameter 0x00 0x00
	  - Send the JITTER_COMMAND command with parameter 0x00 0x01
	  - Send the JITTER_COMMAND command with parameter 0x00 0x02 until offset 0x80 is received
	 - In case of an AV3 Send the MEASURE_JITTER_BLER_PPN command and display the average jitter and bler values	

Execution Time	Approximately 20 seconds	
User Input	None	
Error	Number	Description
	91200	Optimising jitter succeeded
	91201	There was a time-out while communicating
	91202	The Basic Engine returned an unexpected result
	91203	The Basic Engine returned an error code
	91204	No acknowledge received from BE
	91205	Unable to send tray in
	91206	Unable to read the disc
	91207	No disc is loaded
	91208	Unknown disc is loaded
	91209	Unable to enter service mode

Example (AV2)	`DS:> 912`
	 `091200: Jitter bathtub: (-42,135)(-40,127)(-38,106)(-36,106)(-34,101)(-32,97)(-30,92)(-28,92)(-26,92)(-24,92)(-22,86)(-20,80)(-18,86)(-16,86)(-14,80)(-12,80)(-10,80)(-8,80)(-6,80)(-4,86)(-2,86)(0,86)(2,86)(4,92)(6,92)(8,101)(10,106)(12,111)(14,120)(16,123)(18,127)(20,142)`
	 `Test OK @`	

Example (AV3)	`DS:> 912`
	 `091200: Average Jitter, Bler C1, Bler C2: (92,4,254)`
	 `Test OK @`	

Note:	**Not for ATAPI based drives!**	
	Command may not work for ATAPI based drives!	
Nucleus Name	**DS_BE_FocusOn**	
Nucleus Number	913	
Description	Put the laser of the BE into focus	
Technical	- Check if an AV2 or AV3 is connected	
	- In case of an AV2 Send the FOCUS command with parameter 0x01	
	- In case of an AV3 Send the transparent BIT engine FOCUS command	
Execution Time	3 seconds	
User Input	None	
Error	Number	Description
	91300	Focus on succeeded
	91301	There was a time-out while communicating
	91302	The Basic Engine returned an unexpected result
	91303	The BE returned an error code
	91304	No acknowledge received from BE
	91305	Communicating with the Basic Engine failed
	91306	Unable to enter service mode

Example	`DS:> 913`
	`091300:`
	`Test OK @`	

Note:	**Not for ATAPI based drives!**	
	Command may not work for ATAPI based drives!	
Nucleus Name	**DS_BE_FocusOff**	
Nucleus Number	914	
Description	Turn off putting the laser of the BE into focus	
Technical	- Check if an AV2 or AV3 is connected	
	- In case of an AV2 Send the FOCUS command with parameter 0x00	
	- In case of an AV3 Send the transparent BIT engine FOCUS command	
Execution Time	Less than 1 second on AV2	
	2 seconds on AV3	
User Input	None	
Error	Number	Description
	91400	Focus off succeeded
	91401	There was a time-out while communicating
	91402	The Basic Engine returned an unexpected result
	91403	The BE returned an error code
	91404	No acknowledge received from BE
	91405	Communicating with the Basic Engine failed
	91406	Unable to enter service mode

Example	`DS:> 914`
	`091400:`
	`Test OK @`	

Nucleus Name	**DS_BE_MotorOn**	
Nucleus Number	915	
Description	Turn on the turntable motor	
Technical	- Check if an AV2 or AV3 is connected	
	- In case of an AV2 Send the TURN_TABLE_MOTOR_ON command	
	- In case of an AV3 Send the transparent BIT engine TTM command	
Execution Time	Less than 1 second on AV2	
	4 seconds on AV3	
User Input	None	
Error	Number	Description
	91500	Turn table motor is on
	91501	There was a time-out while communicating
	91502	The Basic Engine returned an unexpected result
	91503	The BE returned an error code
	91504	No acknowledge received from BE
	91505	Communicating with the Basic Engine failed
	91506	Unable to enter service mode

Example	`DS:> 915`
	`091500:`
	`Test OK @`	

Nucleus Name	**DS_BE_MotorOff**	
Nucleus Number	916	
Description	Turn off the turntable motor	
Technical	- Check if an AV2 or AV3 is connected - In case of an AV2 Send the TURN_TABLE_MOTOR_OFF command - In case of an AV3 Send the transparent BIT engine TTM command	
Execution Time	Less than 1 second on AV2 4 seconds on AV3	
User Input	None	
Error	Number	Description
	91600	Turn table motor is off
	91601	There was a time-out while communicating
	91602	The Basic Engine returned an unexpected result
	91603	The BE returned an error code
	91604	No acknowledge received from BE
	91605	Communicating with the Basic Engine failed
	91606	Unable to enter service mode
Example	DS:> 916 091600: Test OK @	

Nucleus Name	**DS_BE_Tilt**	
Nucleus Number	920	
Description	Test the tilt mechanism control loop, or allow its proper functioning to be measured. Before executing this nucleus a non-empty disc must be loaded in the recorder	

Technical	- Check if an AV2 or AV3 is connected
	- In case of an AV2
	  - Send the TRAY_IN command
	  - Send the READ_TOC command
	  - Send the TILT_COMMAND command with parameter 0x00 0x00
	  - Send the TILT_COMMAND command with parameter 0x00 0x01
	  - Send the TILT_COMMAND command with parameter 0x00 0x02
	- In case of an AV3 display a "not supported" message	

Execution Time	Approximately 15 seconds	
User Input	None	
Error	Number	Description
	92000	The command executed successfully
	92001	There was a time-out while communicating
	92002	The Basic Engine returned an unexpected result
	92003	The Basic Engine returned an error code
	92004	No acknowledge received from BE
	92005	Unable to send tray in
	92006	Unable to read the disc
	92007	No disc is loaded
	92008	Unknown disc is loaded
	92009	Unable to enter service mode
	92010	This nucleus is not supported by the engine
Example (AV2)	DS:> 920 092000: Tilt sensor bathtub: (71,-12,145)(68,-12,135)(62,-10,120)(56,-92,97)(50,-75,86)(44,-59,80)(41,-52,80)(35,-37,86)(29,-22,86)(23,-7,92)(17,8,111)(11,23,135)(8,31,138)(5,39,158) Test OK @	
Example (AV3)	DS:> 920 092010: Tilt function is not supported by the engine Error @	

Nucleus Name	**DS_BE_CheckDisc**	
Nucleus Number	921	
Description	Check whether there is a disc inside the BE	
Technical	- Send the TRAY_IN command - Send the READ_TOC command - Display the Disc type info - If Disc type is a DVD+R(W), then read ADIP info. - Display manufacturer and media type.	
Execution Time	Approximately 10 seconds	
User Input	None	
Error	Number	Description
	92100	There was a disc inside the set
	92101	Unable to load the tray
	92102	Error received from BE

Example	`DS:> 921`
	`092100:`
	`Disc type: DVD+RW disc`
	`Disc manufacturer id: PHILIPS`
	`Media type id: 010`
	`Test OK @`
	
	`DS:> 921`
	`090500:`
	`Disc type: None`
	`Test OK @`
	
	`DS:> 921`
	`092100:`
	`Disc type: DVD+R disc`
	`Disc manufacturer id: RICOHJPN`
	`Media type id: R00`
	`Test OK @`	

Nucleus Name	**DS_BE_SledgeMotor**	
Nucleus Number	922	
Description	Send the sledge to its home position, then to the middle of the disc, and then to the end.	
Technical	- Send the PCS_COMMAND command with parameter 0x03 0x00 - Send the PCS_COMMAND command with parameter 0x02 0x00 - Send the PCS_COMMAND command with parameter 0x00 0x01 - Send the PCS_JUMP_SLEGE_STEPS command for 3 times - Send the PCS_COMMAND command with parameter 0x00 0x00	
Execution Time	4 seconds on AV2 11 seconds on AV3	
User Input	None	
Error	Number	Description
	92200	The command executed successfully
	92201	There was a time-out while communicating
	92202	The Basic Engine returned an unexpected result
	92203	The BE returned an error code
	92204	No acknowledge received from BE
	92205	Communicating with the Basic Engine failed
	92206	Unable to enter service mode

Example	`DS:> 922`
	`092200:`
	`Test OK @`	

Nucleus Name	**DS_BE_ReadTocInfo**	
Nucleus Number	924	
Description	Read the TOC from the disc. This gives a good indication if the BE works properly.	
Technical	- Send the TRAY_IN command - Send the READ_TOC command - Display the TOC info.	
Execution Time	Approximately 10 seconds	
User Input	None	
Error	Number	Description
	92400	A disc is loaded, TOC info if echoed
	92401	Unable to load the tray
	92402	The BE has not returned TOC info
	92403	Error received from BE

Example	`DS:> 924`
	`092400: TOC info [hex] = 91 3A 0C`
	`Test OK @`
	
	`DS:> 924`
	`092403: The BE returned: 0x10 #{no_disc_error} No disc is detected`
	`Error @`
	
	`DS:> 924`
	`092403: The BE returned: 0x1e #{illegal_medium_error} Engine`
	`unable to handle current disc. Probably illegal medium.`
	`Error @`	

Nucleus Name	**DS_BE_DiscErase**	
Nucleus Number	925	
Description	Perform a DC-erase on a DVD+RW disc.	

Technical	- Check if an AV2 or AV3 is connected
	- In case of an AV2
	  - Execute DS_BE_GetSelftestResults
	  - Send the TRAY_IN command
	  - Send the READ_TOC command
	  - Send the SET_INPUT_TYPE command with parameter DC_ERASE
	  - Overwrite the header of the DVD+RW disc with DC erase data.
	  - Send the SET_INPUT_TYPE command with parameter NORMAL.
	- In case of an AV3 display a "not supported" message	

Execution Time	Approximately 1:15 minute	
User Input	None	
Error	Number	Description
	92500	A DVD+RW disc is erased
	92501	This nucleus cannot be executed because the Self-Test failed
	92502	The BE cannot enter normal operating mode
	92503	Unable to send the tray in
	92504	Unable to read TOC from disc
	92505	Invalid disc is loaded, please insert a DVD+RW disc
	92506	Calibrating DVD+RW failed
	92507	Set Input Type command failed
	92508	Erasing the DVD+RW disc failed
	92509	Erasing is aborted by user
	92510	This nucleus is not supported by the engine

Example (AV2)	`DS:> 925`
	`The entirely disc will be erased.`
	`Are you sure you want this?[y/n]`
	
	`092500:`
	`Test OK @`	

Example (AV3)	`092510: This nucleus is not supported by the engine` `Error @`	

Nucleus Name	**DS_BE_RegionCodeSet**	
Nucleus Number	928	
Description	Set the region code in the AV3.	
Technical	- Check if an AV2 or AV3 is connected - In case of anAV2 display a "not supported" message - In case of an AV3 send the ATAPI SEND_KEY command	
Execution Time		
User Input	Region code	
Error	Number	Description
	92800	The command executed successfully
	92801	There was a time-out while communicating
	92802	The Basic Engine returned an unexpected result
	92803	The BE returned an error code
	92804	No acknowledge received from BE
	92805	Communicating with the Basic Engine failed
	92806	No disc is present, please insert disc
	92807	Region code out of range
	92808	User input wrong
	92809	Region counter expired
	92810	This nucleus is not supported by the engine
Example (AV2)	DS:> 928 092810: This nucleus is not supported by the engine Error @	
Example (AV3)	DS:> 928 1 092800: Test OK @	

Nucleus Name	**DS_BE_RegionCodeGet**	
Nucleus Number	929	
Description	Read the region code from the AV3.	
Technical	- Check if an AV2 or AV3 is connected - In case of an AV2 display a "not supported" message - In case of an AV3 send the ATAPI REPORT_KEY command	
Execution Time		
User Input	None	
Error	Number	Description
	92900	The command executed successfully
	92901	There was a time-out while communicating
	92902	The Basic Engine returned an unexpected result
	92903	The BE returned an error code
	92904	No acknowledge received from BE
	92905	Communicating with the Basic Engine failed
	92906	This nucleus is not supported by the engine
Example (AV2)	DS:> 929 092906: This nucleus is not supported by the engine Error @	
Example (AV3)	DS:> 929 092900: DVD region 1 Test OK @	

Nucleus Name	**DS_BE_RegionCounterReset**	
Nucleus Number	930	
Description	Reset the region counter in the AV3.	
Technical	- Check if an AV2 or AV3 is connected - In case of an AV2 display a "not supported" message - In case of an AV3 send a special ATAPI RESET_REGION_COUNTER command	
Execution Time		
User Input	None	
Error	Number	Description
	93000	The command executed successfully
	93001	There was a time-out while communicating
	93002	The Basic Engine returned an unexpected result
	93003	The BE returned an error code
	93004	No acknowledge received from BE
	93005	Communicating with the Basic Engine failed
	93006	This nucleus is not supported by the engine
Example (AV2)	DS:> 930 093006: This nucleus is not supported by the engine Error @	
Example (AV3)	DS:> 930 093000: Test OK @	

Note:	**Not for ATAPI based drives!** **Command may not work for ATAPI based drives!**	
Nucleus Name	**DS_BE_AdjustLaserControl**	
Nucleus Number	931	
Description	Adjust the DVD-M (with the OPU) with PCBA. (So adjusts the two PCBS to each other)	
Technical	- Check if an AV2 or AV3 is connected - In case of an AV2 display a "not supported" message - In case of an AV3 adjust the DVD-M (with the OPU) with PCBA by sending a S2B command to align the PCBs to each other.	
Execution Time	30 seconds	
User Input	None	
Error	Number	Description
	93100	The command executed successfully
	93101	There was a time-out while communicating
	93102	The Basic Engine returned an unexpected result
	93103	The BE returned an error code
	93104	No acknowledge received from BE
	93105	Communicating with the Basic Engine failed
	93106	Unable to enter service mode
	93107	This nucleus is not supported by the engine
Example (AV2)	DS:> 931 093107: This nucleus is not supported by the engine Error @	
Example (AV3)	DS:> 931 093100: Test OK @	

Nucleus Name	**DS_BE_WriteReadDvdRDualLayer**	
Nucleus Number	932	
Description	Write data to and read data from both layers of a DVD+R DL disc through the basic engine for verification of the writing	
Technical	- Send the TRAY_IN command - Send the READ_TOC command - Use READ_TRACK_INFORMATION to determine the next free writable address on Layer 0. - In case of address 0, reserve a track of 0x1FD800 sectors for Layer 0 - Use command SEND_OPC_INFORMATION to calibrate Layer 0 - Generate test data to write to the disc - Transfer the test data to Layer 0 using PIO mode ATAPI WRITE_12 - Use READ_TRACK_INFORMATION to determine the next free writable address on Layer 1 - Use command SEND_OPC_INFORMATION to calibrate Layer 1 - Transfer the test data to Layer 1 using PIO mode ATAPI WRITE_12 - Read back the data of Layer 0 using PIO mode ATAPI READ_12 - Compare the original data with the read data and check whether the areas are equal - Read back the data of Layer 1 using PIO mode ATAPI READ_12 - Compare the original data with the read data and check whether the areas are equal	
Execution Time	Approximately 30 seconds	
User Input	None	
Error	Number	Description
	93200	The command executed successfully
	93201	This nucleus cannot be executed because the Self-Test failed
	93202	The BE cannot enter normal operating mode
	93203	Unable to send the tray in
	93204	Unable to read TOC from disc
	93205	Invalid disc is loaded, please insert a DVD+R DL disc
	93206	Unable to write, the DVD+R DL disc is full
	93207	No writable sector found
	93208	Writing the test pattern to Layer 0 failed
	93209	Writing the test pattern to Layer 1 failed
	93210	Reading back the test pattern from Layer 0 failed
	93211	Reading back the test pattern from Layer 1 failed
	93212	Compare check for Layer 0 failed
	93213	Compare check for Layer 1 failed
| Example | ```
DS:> 932
093200: Dual Layer DVD+R test on LBA 0x750 and 0x1fdf60 OK
Test OK @
``` | |

3.10 DISPLAY AND CONTROL BOARD (DCB)

Nucleus Name	**DS_DCB_CommunicationEcho**	
Nucleus Number	1000	
Description	Check the communication between the digital board and the DCB by issuing an *echo* command	
Technical	- Send an echo command to the DCB via the analogue board and wait for the result	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	100000	Communicating with the DCB succeeded
	100001	The analogue board could not access the DCB.
	100002	There was no response from the analogue board.
	100003	The returned error code from the analogue board is unknown
	100004	Unknown error code returned by the DCB.

Example	`DS:> 1000`
	`100000:`
	`Test OK @`	

Nucleus Name	**DS_DCB_VersionGet**	
Nucleus Number	1001	
Description	Get the version of the DCB	
Technical	- Issue the DCB version get command to the analogue board and wait for the result	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	100100	Retrieving the version of the DCB succeeded
	100101	The analogue board could not access the DCB.
	100102	There was no response from the analogue board.
	100103	The returned error code from the analogue board is unknown
	100104	Unknown error code returned by the DCB.

Example	`DS:> 1001`
	`100100: DCB version: 13`
	`Test OK @`	

Nucleus Name	**DS_DCB_LightDisplay**	
Nucleus Number	1002	
Description	Light the entire display of the DCB, and clear the display after confirmation. User confirmation is necessary. The REC and PLAY keys on the local keyboard are used for this confirmation. The PLAY key confirms that the test pattern is OK and the REC key indicates an error. The STOP key is used to exit this nucleus at any time. The keyboard can also be used for the same purpose. The O or o key confirms that the test pattern is OK and the N or n key indicates the user wants to go to the next test or that there is an error. The rest of the keys of the keyboard are used to exit this nucleus at any time.	
Technical	- First issue a command to clear the display and wait for the result - Then issue the command to light the entire display and wait for confirmation by the user	
Execution Time	Until user confirmation.	
User Input	None	
Error	Number	Description
	100200	Lighting the entire display succeeded
	100201	The analogue board could not access the DCB.
	100202	There was no response from the analogue board.
	100203	The returned error code from the analogue board is unknown
	100204	The analogue board could not access the DCB.
	100205	There was no response from the analogue board.
	100206	The DCB did not light all labels.
	100207	The user skipped the rest of the DCB_Light_Display test.
	100208	The user returned an unknown confirmation:
	100209	The returned error code from the analogue board is unknown
Example	DS:> 1002 100200: Test OK @	

Nucleus Name	**DS_DCB_Keyboard**	
Nucleus Number	1004	
Description	Check all keys of the keyboard by confirming the key-code displayed of each key. The PLAY key is used to confirm this nucleus. However, this key is also part of the keyboard test itself. Also the REC and STOP keys are used to exit the test. With the REC key the user signals a failure, while the STOP key signals the abortion of the test by the user. To use one of these three keys for confirmation, failure or abortion, the user needs to hold the key pressed down for more than one second.	
Technical	- Initialise the display - Display the key pressed by the user on the display - Monitor the service port for an abort and get the next key pressed - Update the display and repeat previous steps until user stops / confirms	
Execution Time	Until user confirmation.	
User Input	None	
Error	Number	Description
	100400	All the keys on the keyboard have been pressed
	100401	DCB Keyboard; test failed
	100402	DCB Keyboard; test aborted by the user
	100403	The analogue board could not access the DCB.
Example	DS:> 1004 100400: Test OK @	

Nucleus Name	**DS_DCB_RemoteControl**	
Nucleus Number	1005	
Description	Check the interface between the remote control and the DCB by checking the key-code displayed At least one key must be tested. The test can be exited by pressing the STOP-, REC-, or PLAY-key on the local keyboard. The user should press PLAY to indicate a successful test. The REC-key is pressed if the test failed, and STOP can be pressed to abort the test.	
Technical	- Initialise the display - Display the key pressed by the user on the display - Monitor the service port for an abort and get the next key pressed - Update the display and repeat previous steps until user stops / confirms	
Execution Time	Until user confirmation.	
User Input	None	
Error	Number	Description
	100500	Remote Control test succeeded
	100501	DCB Remote control; test failed
	100502	DCB Remote control; test aborted
	100503	The analogue board could not access the DCB.
	100504	DCB Remote control; no user input received
Example	DS:> 1005 100500: Test OK @	

Nucleus Name	**DS_DCB_Led**	
Nucleus Number	1006	
Description	Switch the record LED on, and after confirmation off. The user confirms by pressing the REC key, STOP key, or the PLAY key on the local keyboard. The PLAY key confirms that the LED is on and the REC key indicates an error. The STOP key signals the abortion of the test by the user. The keyboard can also be used for the same purpose. The O or o key confirms that the test pattern is OK and the N or n key indicates an error or that the user wants to go to the next test. The rest of the keys of the keyboard are used to exit this nucleus at any time. After that the nucleus switches the LED off.	
Technical	- Issue the command to light the *record* LED via the analogue board and wait for confirmation by the user	
Execution Time	Until user confirmation.	
User Input	None	
Error	Number	Description
	100600	Switching Led on succeeded
	100601	The analogue board could not access the DCB.
	100602	There was no response from the analogue board.
	100603	The DCB did not light the record LED.
	100604	The user skipped the rest of the DCB_Led test.
	100605	The user returned an unknown confirmation:
	100606	The returned error code from the analogue board is unknown
Example	DS:> 1006 100600: Test OK @	

3.11 ANALOGUE BOARD (ANAB)

Nucleus Name	DS_ANAB_CommunicationEcho	
Nucleus Number	1100	
Description	Check the communication between the digital board and the analogue board by issuing some *echo* string.	
Technical	Send command P_DS_ANACOM_ECHO with the parameter string "Hello Analogue board" to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	110000	Communicating with the analogue board succeeded
	110001	The test returned the wrong string
	110002	Communicating with the analogue board failed
	110103	The analogue board returned an unexpected result
Example	DS:> 1100 110000: Test OK @	

Nucleus Name	DS_ANAB_CommunicationlicNvram	
Nucleus Number	1101	
Description	Check the communication between the digital board and the NVRAM on the analogue board.	
Technical	Send command P_DS_ANACOM_NVRAM with no parameters to the analogue board and read back the result	
Execution Time	Less than 3 seconds	
User Input	None	
Error	Number	Description
	110100	Communicating with the NVRAM on the analogue board succeeded
	110101	The analogue board could not communicate with the NVRAM
	110102	Communicating with the analogue board failed
	110103	The analogue board returned an unexpected result
Example	DS:> 1101 110100: Test OK @	

Nucleus Name	DS_ANAB_CommunicationlicTuner	
Nucleus Number	1102	
Description	Check the communication between the digital board and the tuner on the analogue board	
Technical	Send command P_DS_ANACOM_TUNER with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	110200	Communicating with the tuner on the analogue board succeeded
	110201	The analogue board could not communicate with the tuner
	110202	There was an error communicating with the analogue board
	110203	The analogue board returned an unexpected result
Example	DS:> 1102 110200: Test OK @	

Nucleus Name	DS_ANAB_CommunicationlicDataSlicer	
Nucleus Number	1103	
Description	Check the communication between the digital board and the data slicer on the analogue board	
Technical	Send command P_DS_ANACOM_DATA_SLICER with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	110300	Communicating with the data slicer on the analogue board succeeded
	110301	The analogue board could not communicate with the data slicer
	110302	There was an error communicating with the analogue board
	110303	The analogue board returned an unexpected result
Example	DS:> 1103 110300: Test OK @	

Nucleus Name	DS_ANAB_CommunicationlicSoundProcessor	
Nucleus Number	1104	
Description	Check the communication between the digital board and the sound processor on the analogue board	
Technical	Send command P_DS_ANACOM_SOUND_PROCESSOR with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	110400	Communicating with the sound processor on the analogue board succeeded
	110401	The analogue board could not communicate with the sound processor
	110402	There was an error communicating with the analogue board
	110403	The analogue board returned an unexpected result
Example	DS:> 1104 110400: Test OK @	

Nucleus Name	DS_ANAB_CommunicationlicAVSelector	
Nucleus Number	1105	
Description	Check the communication between the digital board and the A/V-selector on the analogue board	
Technical	Send command P_DS_ANACOM_AV_SELECTOR with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	110500	Communicating with the A/V selector on the analogue board succeeded
	110501	The analogue board could not communicate with the A/V selector
	110502	There was an error communicating with the analogue board
	110503	The analogue board returned an unexpected result
Example	DS:> 1105 110500: Test OK @	

Nucleus Name	**DS_ANAB_HardwareVersionGet**	
Nucleus Number	1106	
Description	Get the hardware version of the analogue board	
Technical	Send command P_DS_ANACOM_HARDWARE_VERSION with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	110600	Reading the hardware version succeeded
	110601	The segment containing the hardware version could not be found
	110602	There was an error communicating with the analogue board
	110603	The analogue board returned an unexpected result
Example	DS:> 1106 110600: Analogue hardware version : 11 Test OK @	

Nucleus Name	**DS_ANAB_SoftwareVersionBootGet**	
Nucleus Number	1107	
Description	Get the software version of the boot software of the analogue board	
Technical	Send command P_DS_ANACOM_SOFTWARE_VERSION with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	110700	Reading the boot-software version succeeded
	110701	The segment containing the boot-software version could not be found
	110702	There was an error communicating with the analogue board
	110703	The analogue board returned an unexpected result
Example	DS:> 1107 110700: Bootcode application version : 11.00.11 Test OK @	

Nucleus Name	**DS_ANAB_SoftwareVersionDownloadGet**	
Nucleus Number	1108	
Description	Get the software version of the download software of the analogue board	
Technical	Send command P_DS_ANACOM_SW_VERSION_DOWN with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	110800	Reading the download-software version succeeded
	110801	The segment containing the download-software version could not be found
	110802	There was an error communicating with the analogue board
	110803	The analogue board returned an unexpected result
Example	DS:> 1108 110800: Download application version : 11.00.06 Test OK @	

Nucleus Name	**DS_ANAB_SoftwareVersionApplGet**	
Nucleus Number	1109	
Description	Get the software version of the application software of the analogue board	
Technical	Send command P_DS_ANACOM_SW_VERSION_APPL with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	110900	Reading the application-software version succeeded
	110901	The segment containing the application-software version could not be found
	110902	There was an error communicating with the analogue board
	110903	The analogue board returned an unexpected result
Example	DS:> 1109 110900: Recorder application version : 11.00.23 Test OK @	

Nucleus Name	**DS_ANAB_SoftwareVersionDiagnosticsGet**	
Nucleus Number	1110	
Description	Get the software version of the diagnostic software of the analogue board	
Technical	Send command P_DS_ANACOM_SW_VERSION_DIAG with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	111000	Reading the diagnostics-software version succeeded
	111001	The segment containing the diagnostics-software version could not be found
	111002	There was an error communicating with the analogue board
	111003	The analogue board returned an unexpected result
Example	DS:> 1110 111000: Diagnostics application version : 11.00.13 Test OK @	

Nucleus Name	**DS_ANAB_ChecksumProgram**	
Nucleus Number	1111	
Description	Check the checksum of the several partitions by recalculating and comparing partition checksums	
Technical	Send command P_DS_ANACOM_FLASH_CHECKSUM with no parameters to the analogue board and read back the result	
Execution Time	Less than 5 seconds	
User Input	None	
Error	Number	Description
	111100	Checksum calculation succeeded
	111101	The FLASH was not accessible
	111102	The checksum stored in FLASH is not correct
	111103	There was an error communicating with the analogue board
	111104	The analogue board returned an unexpected result
Example	DS:> 1111 111100: BootCode checksum is: 0xBABE6240, which is correct Diagnostics checksum is: 0xBABEBEAD, which is correct Download checksum is: 0xBABEA6B7, which is correct Application checksum is: 0xBABEB277, which is correct Test OK @	

Nucleus Name	**DS_ANAB_VideoRouting**	
Nucleus Number	1112	
Description	Perform the routing of the video paths on the analogue board	
Technical	Send command P_DS_ANACOM_ROUTE_VIDEO with parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	The user has to input the parameter for the routing (see Table 1 and Table 2 below)	
Error	Number	Description
	111200	Routing the video on the analogue board succeeded
	111201	Routing the video on the analogue board failed
	111202	The user provided wrong input
	111203	There was an error communicating with the analogue board
	111204	The analogue board returned an unexpected result
Example	DS:> 1112 00 111200: Test OK @	

*Table 1: The paths that are available for video routing and their description (**Europe** region)*

Path ID	Description
00	Input signal is VIDEO(CVBS) from digital board and will be re-routed back to the digital board.
01	Input signal is from FRONT VIDEO(CVBS) IN and will be routed to the digital board.
02	No routing.
03	Input signal is from FRONT S-VIDEO(Y/C) and will be routed to the digital board.
04	No routing.
05	Input signal is CVBS from SCART1 and will be routed to the digital board.
06	Input signal is CVBS from SCART2 and will be routed to the digital board.
07	Input Signal is CVBS from Digital Board and it will be routed to Scart1 and Scart2.
08	Input signal is VIDEO(CVBS) from ANTENNA IN and will be routed to SCART2.
09	Input signal is VIDEO(CVBS) from SCART1 and will be routed to SCART2.
10	Input signal is VIDEO(CVBS) from SCART2 and will be routed to SCART1.
11	Signal path is routed Fast Blank from Scart2 pin16 and will be routed Scart1 pin16
12	Input Signal is YC from Digital Board and it will be routed to Scart1.
13	No routing.
14	No routing.
15	Input Signal is CVBS from TUNER and it will be routed to Digital .
16	No routing.
17	Input Signal is routed from digital board YC to REAR S-VIDEO(YC) OUT
18	Signal path is routed from digital board RGB to RGB SCART1 and from digital board CVBS to digital board CVBS.
19	No routing.
20	Input RGB Signal is routed from Digital Board to SCART1(RGB),Input CVBS Signal from Digital Board to Digital Board and Fast Blanking Signal from Scart 2 to Scart1.
21	Input Y/C Signal from Digital Board is routed to Rear Y/C Connector and Input Y/c Signal from Front Y/C connector is routed to Digital Board.

*Table 2: The paths that are available for video routing and their description (**Nafta** region)*

Path ID	Description
00	Input signal is VIDEO(CVBS) from digital board and will be re-routed back to the digital board.A Cinch Cable needs to be connected from Rear Cinch Out to Front Cinch In for this Test.(Direct routing on analogue board from YUV In to YUV Out is not Possible)
01	Input signal is from FRONT VIDEO(CVBS) IN and will be routed to the digital board.This routing is same as the above path id.
02	Input signal is from REAR VIDEO(CVBS) IN and will be routed to the digital board.
03	Input signal is from FRONT S-VIDEO(Y/C) IN and the signal received will be routed to the digital board.
04	Input signal is from REAR S-VIDEO(Y/C) IN and will be routed to the digital board.
05	No Routing.
06	No routing.
07	No routing.
08	Input signal is VIDEO(CVBS) from TUNER and will be routed to Y Pin of Rear Y/C Connector.This will give only black/White Picture .
09	Input signal is from YUV IN and will be routed to YUV OUT.This is possible only if Digital Board routes back YUV signal received back to the Analogue board(DENC)
10	No routing.
11	No routing.
12	No Routing.
13	No Routing.
14	No Routing.
15	Input CVBS Signal from Tuner is routed to Digital Board..
16	No Routing.
17	Input RGB Signal is routed from Digital Board to RGB Rear Out and Input CVBS Signal is routed from Rear Cinch In 1 to Digital Board (This second step is for routing Input CVBS Signal from Digital Board to Digital Board again – A Cinch cable needs to be connected from Rear Cinch Out1 to Rear Cinch In 1)
18	Input Signal from CVBS Rear In is routed to Digital Board. This is the same as path id 02.
19	Input Y/C signal from Digital Board is routed to Y/C Rear Out Connector and Input signal from Y/C Front In Connector is routed to Y/C Digital Board.
20	Y/C signal from Digital Board is routed to Y/C Rear Out Connector and Input signal from Y/C Rear In Connector is routed to Y/C Digital Board.
23	The Video signal received from the Digital board will be output on Modulator channel 3.
24	The Video signal received from the Digital board will be output on Modulator channel 4.

Nucleus Name	**DS_ANAB_AudioRouting**	
Nucleus Number	1113	
Description	Perform the routing of the audio paths on the analogue board	
Technical	Send command P_DS_ANACOM_ROUTE_AUDIO with parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	The user has to input the parameter for the routing (see Table 3 and Table 4 below)	
Error	Number	Description
	111300	Routing the audio on the analogue board succeeded
	111301	Routing the audio on the analogue board failed
	111302	The user provided wrong input
	111303	There was an error communicating with the analogue board
	111304	The analogue board returned an unexpected result
Example	DS:> 1113 00 111300: Test OK @	

*Table 3: The paths that are available for audio routing and their description (**Europe** region)*

Path ID	Description
00	Input signal is from FRONT AUDIO IN and will be routed to the digital board.
01	Input signal is from FRONT AUDIO IN and will be routed to the digital board.
02	No routing.
03	Input signal is AUDIO from SCART1 and will be routed to the digital board.
04	Input signal is AUDIO from SCART2 and will be routed to the digital board.
05	No routing.
06	No routing.
07	Input Audio signal is from the digital Board and it will be routed to the Scart 1 and Scart2
08	Input AUDIO signal from TUNER and will be routed to SCART2.
09	Input signal is AUDIO from SCART1 and will be routed to SCART2.
10	Input audio signal from Scart2 is routed to Scart1.
11	Input Audio signal is routed from DVIO to Scart2.
12	No routing.
13	No routing.
14	Input is Audio Signal from DVIO and it will be routed to Digital Board.
15	Input is Audio Signal from TUNER and it will be routed to Digital Board..
16	No routing.
17	No routing.
18	Input signal is from FRONT AUDIO IN and will be routed to SCART2.
21	Input signal is from FRONT AUDIO IN and will be routed to the digital board.

*Table 4: The paths that are available for audio routing and their description (**Nafta** region)*

Path ID	Description
00	No routing.
01	Input signal is from FRONT AUDIO IN and will be routed to the digital board.
02	Input signal is from REAR AUDIO IN 2 and will be routed to the digital board.
03	Input Audio Signal is routed from FRONT Cinch In to Digital Board.(This is same as path id 01)
04	Input Signal is from Rear Cinch In1 and it will be routed to Digital Board..
05	No routing.
06	No routing.
07	No routing.
08	No routing.
09	No routing.
10	No routing.
11	No routing.
12	No routing.
13	Input Signal is from Digital Board and it will be routed to the digital board.
14	No routing.
15	Input is Audio Signal from TUNER and it will be routed to Digital Board.
16	Input signal is AUDIO from DVIO board and will be routed to Digital Board.
17	No routing.
18	No routing.
19	No routing.
20	Input signal is from REAR AUDIO IN 2 and will be routed to the digital board.
21	Input signal is from REAR AUDIO IN 1 and will be routed to the digital board.
22	Input signal is from REAR AUDIO IN 1 and will be routed to the digital board.
23	The Audio signal received from the Digital board will be output on Modulator channel 3.
24	The Audio signal received from the Digital board will be output on Modulator channel 4.

Nucleus Name	**DS_ANAB_SelectTunerChannel**	
Nucleus Number	1114	
Description	Set the tuner to receive a valid audio and video signal	
Technical	Send command P_DS_ANACOM_TUNER_FREQ_SELECT with parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	<Frequency*16> <video standard id> Tuner frequency: to tune the tuner to e.g. 216 MHz, this parameter must be 3456. (Since 216*16 = 3456. This is to avoid the decimal points to the parameter list.) Video standard id:	

Video standard id	Europe	Nafta
16	PAL_BG	NTSC
32	PAL_I	Invalid
48	PAL_DK	Invalid
64	SEC_L	Invalid
80	SEC_LS	Invalid
96	SEC_BG	Invalid
112	SEC_DK	Invalid

Error	Number	Description
	111400	Setting the tuner channel succeeded
	111401	Setting the tuner channel failed
	111402	The user provided wrong input
	111403	There was an error communicating with the analogue board
	111404	The analogue board returned an unexpected result
Example	DS:> 1114 3456 16 111400: Test OK @	

Nucleus Name	**DS_ANAB_IICWriteRead**	
Nucleus Number	1115	
Description	Perform an IIC write and read action on the analogue board	
Technical	Send command P_DS_ANACOM_I2C_WRR with parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	Writing: [<W>|<w>] [I2C address] [number of data bytes to write] with <data[0]...data[n]> Max 16 data bytes (n < 16). Reading: [<R>|<r>] [I2C address] [number of data bytes to read] Max 16 data bytes (n < 16).	
Error	Number	Description
	111500	Reading and writing IIC on the analogue board succeeded
	111501	The user provided wrong input
	111502	Reading and writing IIC on the analogue board failed
	111503	There was an error communicating with the analogue board
	111504	The analogue board returned an unexpected result
Example	DS:> 1115 w 0x94 2 0x06 0x02 111500: Test OK @	

Nucleus Name	**DS_ANAB_ClockAdjust**	
Nucleus Number	1116	
Description	Set the clock to the value passed through in the YYYY MM DD HH MM SS format	
Technical	Send command P_DS_ANACOM_CLOCK_ADJUST with parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	<YYYY> <MM> <DD> <HH> <MM> <SS>	
Error	Number	Description
	111600	Adjusting the clock succeeded
	111601	Adjusting the clock failed
	111602	The user provided wrong input
	111603	There was an error communicating with the analogue board
	111604	The analogue board returned an unexpected result
Example	DS:> 1116 2002 11 11 11 11 11 111600: Test OK @	

Nucleus Name	**DS_ANAB_ClockReference**	
Nucleus Number	1117	
Description	Generate a 1 kHz signal on pin 7 (INT) of the clock IC	
Technical	Send command P_DS_ANACOM_CLOCK_REFERENCE with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	111700	Generating the signal on the designated pin succeeded
	111701	Generating the signal on the designated pin failed
	111702	There was an error communicating with the analogue board
	111703	The analogue board returned an unexpected result
Example	DS:> 1117 111700: Test OK @	

Nucleus Name	**DS_ANAB_ClockCorrection**	
Nucleus Number	1118	
Description	Store the clock IC correction value in NVRAM	
Technical	Send command P_DS_ANACOM_CLOCK_CORRECTION with parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	The correction value for the clock	
Error	Number	Description
	111800	Storing the correction value for the clock in NVRAM succeeded
	111801	Storing the correction value for the clock in NVRAM failed
	111802	Value out of range: default value stored
	111803	The user provided wrong input
	111804	There was an error communicating with the analogue board
	111805	The analogue board returned an unexpected result
Example	DS:> 1118 1000023 111800: Test OK @	

Nucleus Name	**DS_ANAB_TunerAFCReferenceVoltage**	
Nucleus Number	1119	
Description	Store the reference voltage for the tuner in NVRAM	
Technical	Send command P_DS_ANACOM_AFC_REFERENCE_TUNER with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	The reference voltage, between 0 and 255	
Error	Number	Description
	111900	Storing the reference voltage for the tuner in NVRAM succeeded
	111901	Storing the reference voltage for the tuner in NVRAM failed
	111902	The user provided wrong input
	111903	There was an error communicating with the analogue board
	111904	The analogue board returned an unexpected result
Example	DS:> 1119 5 111900: Test OK @	

Nucleus Name	**DS_ANAB_TunerFrequencyDownload**	
Nucleus Number	1120	
Description	Store the frequency table in NVRAM. The frequency table is passed through the error-string provided to the nucleus.	
Technical	Send command P_DS_ANACOM_FREQ_DOWNLOAD with parameters to the analogue board and read back the result	
Execution Time	Less than 3 seconds	
User Input	The user input should conform to: **"X(XXX)_VVWW_ZZ_HH_IIJJKKLLMM".** Where 'X(XXX)' is a decimal value in the range of 0 to 255. V, W, Z, H, I, J, K, L, M are hex values with out the prefix '0x' (in the range 0... 9,A ... F) " _" Denotes a space character. See Table 5 below.	
Error	Number	Description
	112000	Downloading the frequency table in NVRAM succeeded
	112001	Downloading the frequency table in NVRAM failed
	112002	The user provided wrong input
	112003	There was an error communicating with the analogue board
	112004	The analogue board returned an unexpected result
Example	DS:> 1120 1 2233 00 02 4E45442031 112000: Test OK @	

Table 5: Format of user input in case of a frequency download

Format	description	remarks
X(XXX)	Preset number	
VVWW	VV: Channel number WW : Channel offset	
ZZ	Byte containing 8 bit fields for TRUE/FALSE : BIT 0: Decoder BIT 1: Modulation BIT 2 : NICAM 　　　SAP BIT 3: Satpreset BIT 4: Presetdefined 　　　Channelpreferred BIT 5: ExtPreset BIT 6: NameManuallyChanged BIT 7: ChannelPreset	Nicam/stereo bit for Europe SAP/stereo bit for Nafta Preset defined bit is only used for Europe. For Nafta, it is renamed as channelpreferred to indicate if a channel is preferred or not. TRUE if preset is defined from P50 as extern [TGA]
HH	HfSystemFineTuning	HfS: 4 bit, FT: -4,...,4
IIJJKKLLMM	Netname	Range: A,..,Z,0,..,9,_,.. Netname length exists for Europe only 'II' is the HEX-value for the first character, 'JJ' for the second, …

Remarks:
CHANNEL_SYSTEM is for Nafta
PRESET_SYSTEM is for Europe

Nucleus Name	**DS_ANAB_StoreExternalPresets**	
Nucleus Number	1121	
Description	Store the external presets in NVRAM	
Technical	Send command P_DS_ANACOM_STORE_EXT_PRESETS with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	112100	Storing the external presets in NVRAM succeeded
	112101	Storing the external presets in NVRAM failed
	112102	There was an error communicating with the analogue board
	112103	The analogue board returned an unexpected result
Example	DS:> 1121 112100: Test OK @	

Nucleus Name	**DS_ANAB_BargraphLevelAdjust**	
Nucleus Number	1122	
Description	Measure the audio signal corresponding to 0dB per channel and store it as correction value in NVRAM	
Technical	Send command P_DS_ANACOM_BARGRAPH_LEVEL_ADJUSTMENT with no parameters to the analogue board and read back the result	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	112200	Storing the bargraph adjustment values in NVRAM succeeded
	112201	Storing the bargraph adjustment values in NVRAM failed
	112202	There was an error communicating with the analogue board
	112203	The analogue board returned an unexpected result
Example	DS:> 1122 112200: Test OK @	

3.12 SYSTEM (SYS)

Nucleus Name	**DS_SYS_HardwareVersionGet**	
Nucleus Number	1200	
Description	Get the hardware version and type of the digital board	
Technical	- Initialise the PIO pins of the Codec - Read the segment header in FLASH and determine hardware version	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	120000	Getting the hardware version and type of the digital board succeeded
	120001	Getting the hardware version and type of the digital board failed
	120002	Wrong hardware version read from FLASH
Example	DS:> 1200 120000: Hardware ID = 0x29 Test OK @	

Nucleus Name	**DS_SYS_SoftwareVersionBootGet**	
Nucleus Number	1201	
Description	Get the version of the boot software on the digital board	
Technical	- Read the segment header in FLASH and determine Boot software version	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	120100	Getting the Boot software version succeeded
	120101	Getting the Boot software version failed
Example	DS:> 1201 120100: Software Boot Version = 0331 Test OK @	

Nucleus Name	**DS_SYS_SoftwareVersionDownloadGet**	
Nucleus Number	1202	
Description	Get the version of the download software on the digital board	
Technical	- Read the segment header in FLASH and determine Download software version	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	120200	Getting the Download software version succeeded
	120201	Getting the Download software version failed
Example	DS:> 1202 120200: Software Download Version = 0001 Test OK @	

Nucleus Name	**DS_SYS_SoftwareVersionApplGet**	
Nucleus Number	1203	
Description	Get the version of the application software on the digital board	
Technical	- Read the segment header in FLASH and determine Application software version	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	120300	Getting the Application software version succeeded
	120301	Getting the Application software version failed
Example	DS:> 1203 120300: Software Application Version = 0001 Test OK @	

Nucleus Name	**DS_SYS_SoftwareVersionDiagnosticsGet**	
Nucleus Number	1204	
Description	Get the version of the diagnostics software on the digital board	
Technical	- Read the segment header in FLASH and determine Diagnostics software version	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	120400	Getting the Diagnostics software version succeeded
	120401	Getting the Diagnostics software version failed
Example	DS:> 1204 120400: Software Diagnostics Version = 0001 Test OK @	

Nucleus Name	**DS_SYS_EepromUpload**	
Nucleus Number	1205	
Description	Upload the contents of the NVRAM on the analogue board or the digital board to the service PC, by using the X-modem protocol	
Technical	- Decode the user input - Determine whether to upload the analogue board or digital board NVRAM - Start uploading using the XMODEM protocol - Determine whether all was uploaded OK	
Execution Time	This depends on the chosen NVRAM and the User.	
User Input	Choose one of the following parameters for the nucleus: 1. Upload the contents of the NVRAM of the digital board 2. Upload the contents of the NVRAM of the analogue board Choose in the terminal on the control PC **-> transfer -> receive file**. Select **X-modem** protocol. Then click **receive** in the dialogue and fill in the file name in which you want to store the data. **Note**: If no analogue board NVRAM is in the product no user input is needed.	
Error	Number	Description
	120500	Download succeeded.
	120501	User input is not valid.
	120502	Something went wrong while copying the data from NVRAM to SDRAM .
	120503	Something went wrong while transferring the data.
	120504	User cancelled the upload.
Example	DS:> 1205 1 120500: Test OK @	

Nucleus Name	DS_SYS_EepromDownload	
Nucleus Number	1206	
Description	Download a file with the contents of the NVRAM for the analogue board or the digital board from the service PC to the recorder, by using the X-modem protocol	
Technical	- Decode the user input and determine what EEPROM to fill: digital / analogue - Store the downloaded (using XMODEM) bytes in SDRAM first - Then copy these contents into the EEPROM after verification	
Execution Time	This depends on the chosen NVRAM and the User.	
User Input	Choose one of the following parameters for the nucleus: 1. Download the contents of the NVRAM of the digital board 2. Download the contents of the NVRAM of the analogue board Choose in the terminal of the control **PC -> transfer -> send file**. Select **X-modem** protocol. Then choose a file with the Browse button in the dialogue and click on **send**. **Note**: If no analogue board NVRAM is in the product no user input is needed.	
Error	Number	Description
	120600	Download succeeded
	120601	The write to NVRAM failed.
	120602	Timeout. Too many retries.
	120603	A file was sent with a wrong header.
	120604	User cancelled the download.
	120605	User input is not valid.
	120606	Unknown Error
Example	DS:> 1206 1 120600: Test OK @	

Nucleus Name	DS_SYS_DvIdNumberSet	
Nucleus Number	1207	
Description	Set the IEEE 1394 unique ID	
Technical	- Decode the user input - Store the id (<b4><b3><b2><b1><b0>) into NVRAM (offset + <b4><b3><b2><b1><b0>) - Validate the segment of storage by updating the checksum	
Execution Time	Less than 1 second.	
User Input	The unique ID to be set.	
Error	Number	Description
	120700	Setting the unique DV ID succeeded
	120701	User input is not valid.
	120702	Setting the unique DV ID failed.
	120703	Write succeeded, but checksum is corrupt.
Example	DS:> 1207 1234567890 120700: Test OK @	

Nucleus Name	DS_SYS_DvIdNumberGet	
Nucleus Number	1208	
Description	Get the IEEE1394 unique ID	
Technical	- Read out the ID from the configuration segment and return this info to the user	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	120800	Getting the unique DV ID succeeded
	120801	Getting the unique DV ID failed
	120802	Reading an unexpected section version in NVRAM
Example	DS:> 1208 120800: The DvIdNumber is: 1234567890 Test OK @	

Nucleus Name	**DS_SYS_IicWrite**	
Nucleus Number	1209	
Description	Perform an IIC write action on the digital board	
Technical	- Determine bus ID, slave address, number of bytes to be written and the byte array of data from the user input - Initialise IIC - Write the data to the slave specified through IIC	
Execution Time	Less than 1 second	
User Input	The user input the number of bytes to write followed by the bytes to write: <BusID><Slave address to write to><number of bytes to write><d1><d2><..><dx> Where the bus id is either 0 (normally used) or 1	
Error	Number	Description
	120900	Writing the data over IIC succeeded
	120901	The IIC bus was not accessible
	120902	There was a timeout writing to the device
	120903	The IIC acknowledge was not received
	120904	The communication with the device failed
	120905	Got unknown IIC bus error:
	120906	Unable to initialise IIC bus
	120907	Decoding bus ID unsigned value failed
	120908	Decoding slaveAddr unsigned value failed
	120909	Decoding nrBytes unsigned value failed
	120910	Bus ID out of range
	120911	nrBytes out of range
	120912	Unable to decode parameters

Example	`DS:> 1209 0 0xa0 1 0x6`
	`120900: 1 Bytes written`
	`Test OK @`	

Nucleus Name	**DS_SYS_IicRead**	
Nucleus Number	1210	
Description	Perform an IIC read action on the digital board	
Technical	- Determine the bus ID, slave address and number of bytes to read from the user input - Initialise IIC - Read the data form the slave specified	
Execution Time	Less than 1 second	
User Input	The user inputs the bus number, the address to read them from and the number of bytes to read: <BusID><Slave address to read from><Number of bytes to read> Where the bus id is either 0 (normally used) or 1	
Error	Number	Description
	121000	Reading the data over IIC succeeded
	121001	The IIC bus was not accessible
	121002	There was a timeout writing to the device
	121003	The IIC acknowledge was not received
	121004	The communication with the device failed
	121005	There was an unknown IIC bus error
	121006	IIC bus initialisation failed
	121007	Decoding bus ID unsigned value failed
	121008	Decoding slave address unsigned value failed
	121009	Decoding number of bytes unsigned value failed
	121010	Bus ID out of range
	121011	nrBytes out of range

Example	`DS:> 1210 0 0xa0 0x20`
	`Read :`
	`0x0000:  0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00`
	`0x0008:  0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00`
	`0x0010:  0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00`
	`0x0018:  0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00`
	
	`121000:  0 0xa0 0x20`
	`Test OK @`	

Nucleus Name	**DS_SYS_UartWrite**	
Nucleus Number	1211	
Description	Perform an UART write action on the digital board on a specified UART	
Technical	- Decode the user input for the proper port to use - Write out the bytes through the indicated port	
Execution Time	Less than 1 second.	
User Input	The user inputs the UART to write to, the number of bytes and the bytes to be written to the UART. 1=UART port 1 : not used 2=UART port 2 : Bit Engine 3=UART port 3 : Analogue board <UartNr><Number of bytes to write><d1><d2><..><dx>	
Error	Number	Description
	121100	Writing the bytes to the UART succeeded
	121101	The user provided wrong input
	121102	Writing to the UART failed

Example	`DS:> 1211 2 2 0xd1 0x01`
	`121100:`
	`Test OK @`	

Nucleus Name	**DS_SYS_UartRead**	
Nucleus Number	1212	
Description	Perform an UART read action on the digital board on a specified UART	
Technical	- Decode the user input for the port to read from - Read from the port and return data read to the user	
Execution Time	Less than 1 second.	
User Input	The user inputs the UART to read from. 1=UART port 1 : not used 2=UART port 2 : Bit Engine 3=UART port 3 : Analogue board <UartNr >	
Error	Number	Description
	121200	Reading the data from the UART succeeded
	121201	The user provided wrong input
	121202	Reading the data from the UART failed

Example	`DS:> 1212 2`
	`121200: The HEX value that was read is: 0x50 0xD1 0x00`
	`Test OK @`	

Nucleus Name	**DS_SYS_VideoLoopThroughStart**
Nucleus Number	1213
Description	The video signal, which is conform the user input, is routed from the input to the output. The input is set using the proper nucleus to route the signal on the board(s). All outputs are enabled.
Technical	- Decode the videosignal: PAL / NTSC and Y/C, RGB, CVBS,YUV - Initialise the Video Input Processor and check for valid signal - Initialise the Video Front End and start capturing frames to memory - Initialise the SYNC module - Initialise the Video Post Processing and retrieve frames from memory - Initialise the mixer - Initialise the DENC module - Route the signal to all outputs
Execution Time	Less than 1 second, but stays running.
Note:	When a DTT module is in the set use **DS_DTTM_SwitchCVBSPath** as well !

User Input	<vipInput> <VideoOutput> <VideoStandard>
	1. vipInput (see table below).

GEN, OLAX, DXC, DTT specific

User input	Video input	Data path to VIP
CVBS	RGB	CVBS from analogue board
YC	YC	YC from analogue board
YUV	CVBS	YUV from analogue board
RGB	CVBS	RGB from analogue board
10	XPORT	Digital video from DTT module

OLAL22LITE specific

User input	Video input	Data path to VIP
R_CVBS	CVBS	Rear CVBS
F_CVBS	CVBS	Front CVBS
T_CVBS	CVBS	Tuner CVBS
R_YC	YC	Rear YC
F_YC	YC	Front YC

OLAL22PREMIER specific

User input	Video input	Data path to VIP
1	RGB	SCART aux RGB in
2	YC	SCART aux YC in
3	CVBS	SCART aux CVBS
4	CVBS	Tuner
5	YC	Front YC
6	CVBS	Front CVBS
7	CVBS	SCART TV CVBS
8	YC	CE mode YC in
9	CVBS	CE mode CVBS in

OLAL22MKII (mark II) specific

User input	Video input	Data path to VIP
F_CVBS	CVBS	Front CVBS
T_CVBS	CVBS	Tuner CVBS
E1_CVBS	CVBS	SCART 1 CVBS in
E2_CVBS	CVBS	SCART 2 CVBS in
F_YC	YC	Front YC

OLAL22VCRCOMBI specific:
Same as Premier, exept User input nr 4 is for tuner and VCR module

2. VideoOutput (YUV, RGB).
3. VideoStandard (PAL, NTSC).

Error	Number	Description
	121300	Video LoopthroughStart succeeded
	121301	User input is not valid.
	121302	Initialisation of the VIP failed.
	121303	Unable to stop the loop through before restarting.
	121304	Video Signal on the input is not a valid signal.
	121305	Initialisation of the VFE failed.
	121306	The digital board hardware information is corrupt
| Example | ```
DS:> 1213 CVBS RGB PAL
121300:
Test OK @
``` | |

Nucleus Name	**DS_SYS_VideoLoopThroughStop**
Nucleus Number	1214
Description	Stop routing the video input to all the outputs.

Technical	- Stop the DENC and the Video Front End	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	121400	VideoLoopthroughStop succeeded
	121401	DENC module on Codec failed.
Example	DS:> 1214 121400: Test OK @	

Nucleus Name	**DS_SYS_VideoLoop**	
Nucleus Number	1215	
Description	The Codec generates a video signal with a specific signature and sends it to the output of the digital board. The user selects which video input path must be routed on the digital board and a video standard. The Codec encodes the video signal, checks the signature, and returns a conclusion. **Note**: Before executing this nucleus the user must route the video signal on the analog board with the proper nucleus.	
Technical	- Evaluate user input. - Reset the global variables, video memory. - Fill the video memory with a vertical colourbar. - Initialise the Codec SYNC-module. - Initialise the Codec MIXER-module. - Initialise the Codec VPP-module. - Initialise the Codec DENC-module. - Display the original image. - Initialise the VIP. - Initialise the Codec VFE-module. - Try to detect a sync in the VIP input. - Catch the received image in memory. - Display the received image. - Compare the received image with original image. - Create a conclusion.	
Execution Time	3 seconds.	
NOTE!!	MORE INFO ON NEXT PAGES	

User Input	<vipinput> <video standard>
	1 Vip input of the digital board:

GEN, OLAX, DXC, DTT specific

User input	Video input	Data path to VIP
CVBS	RGB	CVBS from analogue board
YC	YC	YC from analogue board
YUV	CVBS	YUV from analogue board
RGB	CVBS	RGB from analogue board
TEST	CVBS	CVBS from host controller.
10	XPORT	Digital video from DTT module

OLAL22LITE specific

User input	Video input	Data path to VIP
R_CVBS	CVBS	Rear CVBS
F_CVBS	CVBS	Front CVBS
T_CVBS	CVBS	Tuner CVBS
R_YC	YC	Rear YC
F_YC	YC	Front YC

OLAL22PREMIER specific

User input	Video input	Data path to VIP
1	RGB	SCART aux RGB in
2	YC	SCART aux YC in
3	CVBS	SCART aux CVBS
4	CVBS	Tuner
5	YC	Front YC
6	CVBS	Front CVBS
7	CVBS	SCART TV CVBS
8	YC	CE mode YC in
9	CVBS	CE mode CVBS in

OLAL22MKII (mark II) specific

User input	Video input	Data path to VIP
F_CVBS	CVBS	Front CVBS
T_CVBS	CVBS	Tuner CVBS
E1_CVBS	CVBS	SCART 1 CVBS in
E2_CVBS	CVBS	SCART 2 CVBS in
F_YC	YC	Front YC

2 Video standard:
- PAL
- NTSC

When no input is given, the nucleus will take TEST for video input and PAL for video standard.

Error	Number	Description
	121500	Videoloop test succeeded.
	121501	Wrong user input.
	121502	The Codec SYNC-module cannot be initialised.
	121503	The Codec MIXER-module cannot be initialised.
	121504	The Codec VideoPostProcessor-module cannot be initialised.
	121505	The Codec DENC-module cannot be initialised.
	121506	The VideoInputProcessor cannot be initialised.
	121507	The VideoInputProcessor cannot detect a sync-signal.
	121508	The Codec VideoFrontEnd-module cannot be initialised.
	121509	The Codec VideoFrontEnd-module cannot capture a video field.

	121510	When selected the RGB video input: Error in colour red signal and/or Error in colour green signal and/or Error in colour blue signal. When selected one of the other video inputs: Error in luminance signal (Y) and/or Error in chrominance signal (U) and/or Error in chrominance signal (V).
	121511	The digital board hardware information is corrupt

Example	`DS:> 1215 cvbs ntsc`
		`121500:`
		`Test OK @`
		
		`DS:> 1215 cvbs pal`
		`121508: The VideoInputProcessor cannot detect a sync-signal.`
		`Error @`
		
		`DS:> 1215 yuv ntsc`
		`121511:`
		`Error in luminance signal(Y)`
		`Error in chrominance signal(U)`
		`Error in chrominance signal(V)`
		`Error @`

Nucleus Name	**DS_SYS_AudioLoop**	
Nucleus Number	1216	
Description	The user first needs to select how the audio path must be routed on the analogue board and/or digital board before calling this nucleus. The user also has to route the audio outputs back to the inputs by means of cables. In this nucleus the Codec generates an audio sine signal with a specific signature and sends it to the output of the digital board. The Codec encodes the audio signal to MPEG I layer II and after this the signature of the signal will be checked.	
Technical	- The user needs to route the signal to the audio inputs so the test can encode the audio to MPEG I layer II - An audio signal is generated, resulting in a sine of 6kHz on the left and 12kHz on the right channel. - Then the signal is decoded in memory. - When both signals are detected correctly in the MPEG, the test succeeded.	
Execution Time	Approximately 9 seconds	
User Input	InputType: - I2S (default, when no user input is given) - SPDIF: This input needs a second parameter: - OPT (optical, **default**, when no user input is given) - COAX	
Error	Number	Description
	121600	Testing the components on the audio signal path succeeded
	121601	The audio encoder did not initialise.
	121602	No audio could be generated.
	121603	The audio encoder did not encode audio.
	121604	The audio could not be decoded.
	121605	Frequency on left channel out of range.
	121606	Frequency on right channel out of range.
	121607	The frequencies on both channels are out of range.
	121608	Frequency on left channel out of range. Right channel silent.
	121609	Right channel is silent.
	121610	Frequency on right channel out of range. Left channel silent.
	121611	Left channel is silent.
	121612	Both channels are silent.

| Example | ```
DS:> 1216
121600:
Test OK @

DS:> 1216 spdif coax
121600:
Test OK @

DS:> 1216 spdif opt
121600:
Test OK @
``` |

Nucleus Name	**DS_SYS_SlashVersionSet**	
Nucleus Number	1217	
Description	Set the slash version of the system	
Technical	- Decode the user input for the slash version to set - Issue the command to set the slash version to the analogue board	
Execution Time	Less than 1 second.	
User Input	The slash version	
Error	Number	Description
	121700	Setting the slash version succeeded
	121701	Invalid slash version, no slash version is set.
	121702	Setting the slash version on the Analogue Board fails.
	121703	Invalid input.
	121704	The returned error code from the analogue board is unknown:
	121705	No DS error code known for analogue board error:
	121706	There was no response from the analogue board.
	121707	Retrieving the current version failed
	121708	Unknown recorder layout type
	121709	Validating the section where the version is stored failed
	121710	Getting the configuration section from NVRAM failed
	121711	Initialisation of IIC or reaching NVRAM failed
| Example | ```
DS:> 1217 82
121700:
Test OK @
``` | |

Nucleus Name	**DS_SYS_SlashVersionGet**	
Nucleus Number	1218	
Description	Get the slash version of the system	
Technical	- Issue the command to get the slash version to the analogue board - Return the received information to the user	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	121800	Getting the slash version succeeded
	121801	Getting the slash version failed
	121802	The IIC write failed
	121803	The IIC read failed
	121804	There was no response from the analogue board.
	121805	No DS error code known for analogue board error:
	121806	Reading the slash version failed
	121807	Initialisation of IIC or reaching NVRAM failed
	121808	Reading an unexpected section version in NVRAM
| Example | ```
DS:> 1218
121800: The slash version is: 82
Test OK @
``` | |

Nucleus Name	**DS_SYS_Virginize**
Nucleus Number	1219
Description	(Re-) Virginize the recorder. User data in the NVRAM of the analogue board is cleared
Technical	- Issue the command to return to the factory defaults to the analogue board
Execution Time	1 second.
User Input	None

Error	Number	Description
	121900	Virginization succeeded
	121901	Virginization on the Analogue Board failed.
	121902	The returned error code from the analogue board is unknown:
	121903	No DS error code known for analogue board error:
	121904	There was no response from the analogue board.
Example	DS:> 1219 121900: Test OK @	

Nucleus Name	**DS_SYS_VirginModeOn**	
Nucleus Number	1220	
Description	Turn on the virgin mode functionality (e.g. the auto channel search upon start-up)	
Technical	- Issue the command to set the bit for the virgin mode to the analogue board	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	122000	Turning on the virgin mode succeeded
	122001	Turning on VirginMode on the Analogue Board failed.
	122002	The returned error code from the analogue board is unknown:
	122003	No DS error code known for analogue board error:
	122004	There was no response from the analogue board.
	122005	Section validation or write failed in NVRAM
	122006	Reading the CONFIG section from NVRAM failed
	122007	Initialisation of IIC or reaching NVRAM failed
Example	DS:> 1220 122000: Test OK @	

Nucleus Name	**DS_SYS_VirginModeOff**	
Nucleus Number	1221	
Description	Turn off the virgin mode functionality (e.g. the auto channel search upon start-up)	
Technical	- Issue the command to reset the bit for the virgin mode to the analogue board	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	122100	Turning off the virgin mode succeeded
	122101	Turning off VirginMode on the Analogue Board failed.
	122102	The returned error code from the analogue board is unknown:
	122103	No DS error code known for analogue board error:
	122104	There was no response from the analogue board.
	122105	Section validation or write failed in NVRAM
	122106	Reading the CONFIG section from NVRAM failed
	122107	Initialisation of IIC or reaching NVRAM failed
Example	DS:> 1221 122100: Test OK @	

Nucleus Name	**DS_SYS_VirginModeGet**	
Nucleus Number	1222	
Description	Get the virgin mode functionality status (e.g. the auto channel search upon start-up)	
Technical	- Issue the command to reset the bit for the virgin mode to the analogue board	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	122200	Getting the virgin mode succeeded
	122201	Reading the Virgin Mode flag from NVRAM failed
	122202	Initialisation of IIC or reaching the NVRAM failed
	122203	Reading an unexpected version of the section in NVRAM

Example	DS:> 1222 122200: The Virgin Mode functionality is: ON Test OK @

Nucleus Name	**DS_SYS_DisplayFatalOn**	
Nucleus Number	1223	
Description	Turn on the display-fatal functionality which displays debug-information on the display when encountering a fatal error condition from which could not be recovered automatically	
Technical	- Issue the command to use the display-fatal functionality to the analogue board	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	122300	Turning on the display-fatal functionality succeeded
	122301	Turning on the display-fatal functionality failed
	122302	The returned error code from the analogue board is unknown:
	122303	No DS error code known for analogue board error:
	122304	There was no response from the analogue board.
	122305	Section validation or write failed in NVRAM
	122306	Reading the section from NVRAM failed
	122307	Initialisation of IIC or reaching NVRAM failed
Example	DS:> 1223 122300: Test OK @	

Nucleus Name	**DS_SYS_DisplayFatalOff**	
Nucleus Number	1224	
Description	Turn off the display-fatal functionality which displays debug-information on the display when encountering a fatal error condition from which could not be recovered automatically	
Technical	- Issue the command to stop using the display-fatal functionality to the analogue board	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	122400	Turning off the display-fatal functionality succeeded
	122401	Turning off the display-fatal functionality failed
	122402	The returned errorcode from the analogue board is unknown:
	122403	No DS errCode known for analogue board error:
	122404	There was no response from the analogue board.
	122405	Section validation or write failed in NVRAM
	122406	Reading the section from NVRAM failed
	122407	Initialisation of IIC or reaching NVRAM failed
Example	DS:> 1224 122400: Test OK @	

Nucleus Name	**DS_SYS_DisplayFatalGet**	
Nucleus Number	1225	
Description	Get the display-fatal flag of the recorder	
Technical	- Issue the command to get the status of the display-fatal functionality to the analogue board	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	122500	Getting the display-fatal flag succeeded
	122501	Getting the display-fatal flag failed
	122502	The returned errorcode from the analogue board is unknown:
	122503	No DS errCode known for analogue board error:
	122504	There was no response from the analogue board.
	122505	Reading the *display fatal* flag failed
	122506	Initialisation of IIC or reaching NVRAM failed
	122507	Unexpected version read from NVRAM section
	122508	Reading the fatal flag from NVRAM failed

Example	`DS:> 1225`
	`122500: The Display Fatal functionality is ON`
	`Test OK @`	

Nucleus Name	**DS_SYS_SettingsSet**	
Nucleus Number	1226	
Description	Programs the digital board settings into the boot EEPROM on the digital board.	
Technical	- Evaluate user input. - Set-up IIC-bus. - Write data to boot EEPROM. - Update checksum.	
Execution Time	1 second	
User Input	A large hexadecimal value that represents the digital board settings obtained from the **XDIVTOOL.exe** program or from a reference set.	
Error	Number	Description
	122600	The settings were successfully programmed.
	122601	User input is invalid.
	122602	IIC access failed.

Example	`DS:> 1226 646961677473746201010200010101010101000020080000`
	`122600:`
	`Test OK @`	

Nucleus Name	**DS_SYS_SettingsDisplay**	
Nucleus Number	1228	
Description	Show the settings that are programmed in the BROM on the digital board.	
Technical	- Set-up IIC-bus. - Read Digital Board Settings from boot EEPROM. - Display the settings.	
Execution Time	1 second	
User Input	None.	
Error	Number	Description
	122800	The settings were successfully displayed.
	122801	IIC access failed.
	122802	Invalid settings
Example	``` DS:> 1228 Settings ID: 444248491D9420014E46332B0000000029040303000101020001010040080800 Board name: NF3+ Hardware ID: 29 Codec IC: PNX7100_C2/C3 Video Input Processor IC: SAA7118 Progressive Scan Deinterlacer IC: S2301 Progressive Scan Denc IC: None I-Link physical layer circuit IC: PDI1394P25 I-Link link layer circuit IC: PDI1394P40 Audio clock: Clock scheme 1 Bit engine connector: not available IDE connector 1: available IDE connector 2: available PCI connector: not available RAM size 64MByte ROM size (NOR FLASH bank 1) 8MByte ROM size (NOR FLASH bank 2) 8MByte ROM size (NAND FLASH) Not available Bit Engine: AV 3.1 122800: Test OK @ ```	

Nucleus Name	**DS_SYS_SettingsGet**	
Nucleus Number	1229	
Description	Get the digital board diversity settings string that is programmed in the BROM on the digital board.	
Technical	- Set-up IIC-bus. - Read Digital Board Settings from boot EEPROM. - Read System Settings from boot EEPROM. - Display the settings.	
Execution Time	1 second	
User Input	None.	
Error	Number	Description
	122900	The settings were successfully displayed.
	122901	IIC access failed.
	122902	The settings are invalid
Example	``` DS:> 1229 122900: 6D7920626F617264000203000101010201010000020080000 Test OK @ ```	

Nucleus Name	**DS_SYS_AudioLoopThroughStart**	
Nucleus Number	1230	
Description	Description: The audio input is routed from the input to all outputs. The input is set routing the signal with the proper nucleus. All outputs are enabled.	
Technical	- Encode the audio to AC3 in memory - Decode the AC3 in memory to audio on the outputs	
Execution Time	1second buffer time and 30 seconds playing.	
User Input	**Available for all sets except for sets with a SAA7173 VIP onboard** InputType: - I2S (default) - SPDIF (Only for recorders with 5.1 input and DTT module) InputPort: (Only for recorders with 5.1 input. For DTT modules no parameter should be filled in, so default is chosen) - OPT : Optical input path is selected (default) - COAX : Coax input path is selected **Available only for sets with a SAA7173 VIP onboard** <table><tr><td>User input</td><td>Data path to VIP</td></tr><tr><td>R_A</td><td>Rear Cinch</td></tr><tr><td>F_A</td><td>Front Cinch</td></tr><tr><td>T_A</td><td>Tuner</td></tr></table>	
Error	Number	Description
	123000	AudioLoopthroughStart succeeded
	123001	Resetting the audio decoder failed
	123002	Resetting the audio encoder failed
	123003	Encoding the audio failed
	123004	Decoding the audio failed

Example	`DS:> 1230`
	`123000:`
	`Test OK @`	

Example DTT	`DS:> 1230 spdif`
	`123000:`
	`Test OK @`	

Example 5.1 input	`DS:> 1230 spdif coax`
	`123000:`
	`Test OK @`	

Example SAA7173	`DS:> 1230 T_A`
	`123000:`
	`Test OK @`	

Nucleus Name	**DS_SYS_AudioLoopThroughStop**	
Nucleus Number	1231	
Description	Stop routing the audio input to all the outputs	
Technical	- Send the 'Mute' command to the audio decoder and reset the audio decoder	
Execution Time	Less than 1 second.	
User Input	None.	
Error	Number	Description
	123100	AudioLoopthroughStop succeeded
	123101	Resetting the audio decoder failed
	123102	Resetting the audio encoder failed

Example	`DS:> 1231`
	`123100:`
	`Test OK @`	

Nucleus Name	**DS_SYS_SettingsDoubleCheck**	
Nucleus Number	1233	
Description	Double check whether stored HW-string equals actual HW as far as we can automatically detect this. An automatic and a manual mode is supported.	
Technical	- Read out the HW diversity string - Check whether these settings correspond the actual hardware - In case of modification: Write back the new HW-diversity settings.	
Execution Time	4 seconds in auto mode when everything matches	
User Input	- 'manual' or 'MANUAL' to enter manual mode - default is automatic mode where the nucleus stops upon and reports the first encountered error	
Error	Number	Description
	123300	Double checking the HW-diversity settings succeeded
	123301	Double check failed, a difference in settings was encountered
	123302	Reading the HW-diversity settings failed
	123303	Writing the modified HW-diversity settings failed
Example	DS:> 1233 123300: Test OK @ DS:> 1233 manual 123300: Test OK @ DS:> 1233 123301: Hardware ID mismatch: in HW-Diversity string:99, actual in FLASH:0 Error @ DS:> 1233 manual Hardware ID mismatch! in HW-Diversity string:99, actual in FLASH:0 Enter the correct HW ID of the digital board. > 0 The HW-diversity string has been modified by you. Settings: Board name: DIAG Hardware ID: 0 Codec IC: PNX7100_MF3 Video Input Processor IC: SAA7118 Progressive Scan Deinterlacer IC: None Progressive Scan Denc IC: ADV7196 I-Link physical layer circuit IC: PDI1394P25 I-Link link layer circuit IC: PDI1394P40 Audio clock: Clock scheme 1 Bit engine connector: available IDE connector 1: available IDE connector 2: not available PCI connector: not available RAM size 32MByte ROM size (NOR FLASH bank 1) 8MByte ROM size (NOR FLASH bank 2) Not available ROM size (NAND FLASH) Not available Is it OK to program this in the new HW-diversity string? ([y]es/[n]o):y Diversity HW-string programmed successfully. 123300: Test OK @ DS:>	

Nucleus Name	**DS_SYS_SettingsDlTableFilenameSet**	
Nucleus Number	1234	
Description	This nucleus sets the Download table filename in the HW-diversity string	
Technical	- Retrieve the new filename from the user - Ask the user whether the filename is correct before setting it - Update the diversity settings to use the newly entered filename	
Execution Time	Dependent on the user confirmation	
User Input	- The filename to be set - No input - No new filename will be set	
Error	Number	Description
	123400	Setting the new filename succeeded
	123401	Unsupported setting of the current HW-diversity settings
	123402	Setting the filename was aborted by the user.

Example	<pre>DS:> 1234
	Enter the new Download Table Filename (Currently equals
	DVDR2001.001)
	Enter a filename:
	>
	The Download Table Filename will be set to: DVDR2001.001. Is that
	correct? ([Y/N]):
	123402: Setting the filename was aborted by the user.
	Error @
	
	DS:> 1234
	Enter the new Download Table Filename (Currently equals
	DVDR2001.001)
	Enter a filename:
	>DVDR2002.001
	The Download Table Filename will be set to: DVDR2002.001. Is that
	correct? ([Y/N]):Y
	123400:
	Test OK @</pre>	

Nucleus Name	**DS_SYS_IicWriteRead**	
Nucleus Number	1235	
Description	Perform an IIC write-read action on the digital board	
Technical	- Determine bus ID, slave address, number of bytes to be written and the byte array of data from the user input - Initialise IIC - Write the data to the IIC slave - Read the data from the IIC slave	
Execution Time	Less than 1 second	
User Input	The user inputs the Bus ID, Slave Address, number of bytes to read, number of bytes to write and the bytes to be written <NucNr><BusId><SlaveAddr><ReadLen><WriteLen><WrByte0...WrByteN> Max number of bytes to write: 255 Max number of bytes to read: 255	
Error	Number	Description
	123500	Writing data to and reading data from the IIC slave succeeded
	123501	The IIC bus was not accessible
	123502	There was a bus timeout reading the device
	123503	The IIC acknowledge was not received
	123504	Unable to initialise IIC bus
	123505	The communication with the device failed
	123506	Unknown IIC bus error received
	123507	Decoding bus ID unsigned value failed
	123508	Decoding slave address unsigned value failed
	123509	Decoding number of bytes unsigned value failed
	123510	Bus ID out of range
	123511	Number of bytes out of range

Example	<pre>DS:> 1235 0 0xa0 0xf 1 0
	0x0000: 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
	0x0008: 0x00 0x00 0x00 0x00 0x00 0x00 0x00
	123500:
	Test OK @</pre>	

Nucleus Name	**DS_SYS_BuildInfoGet**	
Nucleus Number	1236	
Description	Retrieve the software build information of the Diagnostics & Service application	
Technical	- Show the information that is stored in the DVDR_BuildInfoType structure	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	123600	Retrieving build info succeeded
	123601	Retrieving build info failed
Example	```DS:> 1236```	

```
DS:> 1236
123600:
Version   :560
Build     :20040614_0510
Release   :C1
Buildtype :no
Baseline  :F_P1_9_152
Variant   :verum:dvdrw2_lib

Test OK @
```

Nucleus Name	**DS_SYS_UartSetup**	
Nucleus Number	1237	
Description	Set up a configuration for the selected UART	
Technical	- Parse user input - Use MIS_UART_Setup to setup the selected UART with the requested parameters	
Execution Time	Less than 1 second	

User Input	The user inputs 6 parameters:
	        `<UartNr><baudrate><flowcontrol><databits><parity><stopbits>`
	
	UartNr:
	      1=UART port 1 : not used (Chrysalis only)
	      2=UART port 2 : Bit Engine or DTTM (Chrysalis only)
	      3=UART port 3 : Analogue board
	baudrate:
	      115200,62500,57600,38400,19200,9600,4800,2400,1200
	flowcontrol:
	      0=disabled 1=enabled
	databits:
	      7 or 8
	parity:
	      "NO", "ODD" or "EVEN"
	stopbits:
	      1 or 2	

Error	Number	Description
	123700	Setting up the selected UART succeeded
	123701	User provided Invalid setup parameters
	123702	Setting up the selected UART Failed
	123703	Selected UART is not available

Example (Chrysalis)	```DS:> 1237 2 38400 0 8 NO 1```
	```123700:```
	```Test OK @```	

Example (Leco)	```DS:> 1237 2 38400 0 8 NO 1```
	```123703: The selected UART is not available```
	```Error @```	

Nucleus Name	**DS_SYS_GLinkWriteRead**	
Nucleus Number	1238	
Description	Send out some data through the G-Link UART and read back the data. The user must short-circuit the TX and RX line of the G-Link connector.	
Technical	- UART 3 setup (1200, 8, n, 1) - Send "HELLO". - Receive data. - Compare data with "HELLO".	
Execution Time	1 second	
User Input	None	
Error	Number	Description
	123800	Writing and reading back data through the G-Link succeeded
	123801	Unable to setup the G-Link UART
	123802	Failed to write data to the the G-Link connector
	123803	No data was received from the G-Link connector
	123804	Invalid data was received from the G-Link connector
Example	DS:> 1238 123800: Test OK @	

Nucleus Name	**DS_SYS_LowPowerStandby**	
Nucleus Number	1239	
Description	Send wakeup reason to ASP and set the set to low power standby.	
Technical	- Set up ASP - Send wakeup reason to ASP - Send low power standby command to ASP	
Execution Time	Vary (Maximum time will depend on the relative timer used)	
User Input	- wakeup reason - the wakeup reason for the DB to power up - timer - relative timing for the DB to power up if wakeup reason 1 or 3 is chosen	
Error	Number	Description
	123901	Invalid data was given by the user
	123902	Failed to communication to ASP
Example	DS:> 1239 Wakeup reason from Low Power Standby 1) timer only 2) local key or RC pressed only 3) any reason or press 'a' to abort 1 Enter time to wake up from low power standby. Range 1 - 5 mins: 1 Entering low power standby	

3.13 ELECTRONIC PROGRAM GUIDE BOARD (EPGB)

Nucleus Name	**DS_EPGB_VersionGet**	
Nucleus Number	1300	
Description	Returns the version of the EPG board.	
Technical	- Issue the command to get the version of the EPG board to the analogue board - Return the received information to the user	
Execution Time	3 seconds.	
User Input	None	
Error	Number	Description
	130000	Getting the version succeeded
	130001	Communication with the analogue board failed.
	130002	Communication with the EPG board failed.
	130003	There was no response from the analogue board.
	130004	No DS error code known for analogue board error.
Example	DS:> 1300 130000: Version : 6.1.9 Test OK @	

3.14 PCMCIA INTERFACE (PCMCIA)

Nucleus Name	DS_PCMCIA_Reset	
Nucleus Number	1400	
Description	Reset the PCMCIA device by sending a reset command through IDE	
Technical	- Initialise/start IDE - Send the reset (ATA) command to the PCMCIA device	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	140000	Resetting PCMCIA device succeeded
	140001	The initialisation of IDE failed
	140002	The PCMCIA device failed
	140003	The reset ATA command failed
Example	DS:> 1400 140000: Test OK @	

Nucleus Name	DS_PCMCIA_Inquiry	
Nucleus Number	1401	
Description	Get the vendor- and product identification and the product revision level of the media in the slot.	
Technical	- Initialise/start IDE - Execute the Inquiry command to get the VendorID, ProductID and FirmwareRevLevel	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	140100	Inquiry on PCMCIA device succeeded
	140101	The initialisation of IDE failed
	140102	The Inquiry command failed
Example	DS:> 1401 140100: VendorID: GENERIC , ProductId: IDE CARD READER , FirmwareRevLevel: 1382 Test OK @	

Nucleus Name	**DS_PCMCIA_WriteRead**	
Nucleus Number	1402	
Description	Perform a Write Read test to a random sector on the inserted medium in the PCMCIA device and check if the data read is equal to the data written.	
Technical	- Initialise/start IDE - Check if the device is ready to receive ATAPI commands and if there is a medium present in the PCMCIA slot (ATAPI) - Get the capacity (number of sectors and sector size) of the inserted medium (ATAPI) - Generate a random location in the range of the mediums memory - Write data to the medium (ATAPI) - Read the data from the medium (ATAPI) - Compare the written data and the data that was read back	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	140200	WriteRead to PCMCIA device succeeded
	140201	The initialisation of IDE failed
	140202	The PCMCIA device is not read
	140203	Getting the capacity parameters of the medium failed
	140204	There is no medium present in the adapter
	140205	Writing to medium failed
	140206	Reading from medium failed
	140207	The data written does not match the data that was read back

Example	`DS:> 1402`
	`140200:`
	`Test OK @`	

Nucleus Name	**DS_PCMCIA_Diagnostics**	
Nucleus Number	1403	
Description	Shall perform the internal diagnostic tests implemented by the PCMCIA slot. The electronics of the PCMCIA slot are tested here, not the inserted medium.	
Technical	- Initialise/start IDE - Send the diagnostic (ATA) command to the PCMCIA device	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	140300	The Diagnostic test on the PCMCIA device succeeded
	140301	The initialisation of IDE failed
	140302	The PCMCIA device failed
	140303	The diagnostics ATA command failed

Example	`DS:> 1403`
	`140300:`
	`Test OK @`	

3.15 HIGH-DEFINITION MULTIMEDIA INTERFACE (HDMI)

Nucleus Name	**DS_HDMI_DevTypeGet**	
Nucleus Number	1500	
Description	Get the device (revision) type information of the HDMI-IC.	
Technical	- Read out the information through IIC	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	150000	Getting the device type of the nucleus succeeded
	150001	Failed to retrieve the hardware diversity string
	150002	Failed to initialise the IIC communication
	150003	The hardware was not detected although indicated by Diversity
	150004	Failed to access HDMI transmitter chip SI9030

Example	`DS:> 1500`
	`150000:`
	`Vendor ID      : 0x 0 0x 1`
	`Device ID      : 0x91 0x42`
	`Device Revision : 0x 0`
	`Test OK @`	

Nucleus Name	**DS_HDMI_Communication**	
Nucleus Number	1501	
Description	Check the communication between the I2C controller on the Codec and the HDMI-IC by reading and writing data to one device register. This test detects faults of the I2C lines or a defected HDMI transmitter IC.	
Technical	- Read out an accessible register in the HDMI transmitter IC - Modify this register by writing a known value to it - Read back and check this value for correctness	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	150100	Communicating with the HDMI tx chip succeeded
	150101	Failed to retrieve the hardware diversity string
	150102	Failed to initialise the IIC communication
	150103	The hardware was not detected although indicated by Diversity
	150104	An IIC-bus error occurred
	150105	There was a timeout reading the device
	150106	The IIC bus was not accessible
	150107	The IIC acknowledge was not received
	150108	There was an IIC error upon the stop-condition
	150109	The IIC bus was chosen wrong
	150110	The IIC functionality is not running
	150111	An unknown error was returned by the IIC read
	150112	The data written did not equal the date read

Example	`DS:> 1501`
	`150100:`
	`Test OK @`	

Nucleus Name	**DS_HDMI_EdidParse**	
Nucleus Number	1502	
Description	Return the E-EDID (Enhanced Extended Display Identification Data) contained in the HDMI / DVI able TV attached to the DVD+RW. Parse the information retrieved to print the capabilities of the TV in user understandable format	
Technical	- Read out the E-EDID through the DDC channel (IIC) - Parse the information contained in the E-EDID - Print out the information to the user in understandable format	
Execution Time	2 seconds.	
User Input	None	
Error	Number	Description
	150200	Getting the configuration of the HDMI-IC succeeded
	150201	Failed to retrieve the hardware diversity string
	150202	Failed to initialise the IIC communication
	150203	The hardware was not detected although indicated by Diversity
	150204	Retrieving the E-EDID failed

Example	DS:> 1502
	 Checksum OK of EDID block 0.
	
	 Checking EDID Structure with 1 extensions:
	       Checking each Extension for consistency.
	 E-EDID structure contains no errors.
	 EDID structure OK.
	 Vendor Specific Data Block: 03 0c 00 10 00
	 Attached Display is an HDMI device.
	       EDID Version 1.3
	       Total Native DTD Formats = 0
	       Monitor Features (CEA Byte 3): BasicAudio YCbCr444
	 YCbCr422
	 HDMI compatible EDID
	 Supported video format 1
	 Supported video format 2
	 Supported video format 3
	 Supported video format 5
	 Supported video format 6
	 Supported video format 7
	 index:0 Linear PCM 1 channels, 48KHz, 44KHz, 32KHz,
	
	 SPK:RLC FLC RC RL FC LFE FL
	    RRC FRC .. RR .. ... FR
	
	 Attached display is HDMI compatible.
	 Display is YCbCr444 compatible.
	 Display is YCbCr422 compatible.
	
	 150200:
	 Test OK @	

Nucleus Name	**DS_HDMI_DefaultVideoSet**	
Nucleus Number	1503	
Description	Set a default video configuration in the HDMI TX chip (720x480p)	
Technical	- Write a known configuration for 720x480P in the registers of the HDMI transmitter chip	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	150300	Setting the video configuration succeeded
	150301	Failed to retrieve the hardware diversity string
	150302	Failed to initialise the IIC communication
	150303	The hardware was not detected although indicated by Diversity
	150304	Setting the video configuration failed
Example	DS:> 1503 150300: Test OK @ DS:> 101 11 ntsc all 010100: Test OK @	

Nucleus Name	**DS_HDMI_Reset**	
Nucleus Number	1504	
Description	Reset the HDMI transmitter chip by means of a hardware reset and re-initialize in order to have the HDMI transmitter chip accessible again.	
Technical	- Pull the reset line connected to the HDMI transmitter low - Wait a little while - Enable the HDMI chip again by setting the reset line high	
Execution Time	9 seconds.	
User Input	None	
Error	Number	Description
	150400	Resetting the HDMI tx chip succeeded
	150401	Failed to retrieve the hardware diversity string
	150402	Failed to initialise the IIC communication
	150403	The hardware was not detected although indicated by Diversity
	150404	Resetting the HDMI tx chip trhrough PIO failed.
	150405	Software Reset of the HDMI tx chip failed.
Example	DS:> 1504 150400: Test OK @	

Nucleus Name	**DS_HDMI_Bist**	
Nucleus Number	1505	
Description	This nucleus performs the Built In Self Test (BIST) of the SII9030	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	150500	The BIST succeeded
	150501	Failed to retrieve the hardware diversity string
	150502	Failed to initialise the IIC communication
	150503	The hardware was not detected although indicated by Diversity
	150504	The BIST failed
	150505	There was no IIC communication to the BIST registers
	150506	Counter expired in BIST test
	150507	The BIST failed due to an unknown type of error
	150508	BIST prerequisites were not met
Example	DS:> 1505 150500: Test OK @	

Nucleus Name	**DS_HDMI_DdclicWrite**	
Nucleus Number	1506	
Description	Perform an IIC write action to a device on the DDC bus	
Technical	-	
Execution Time	Less than 1 second.	
User Input	<TimeOut> <Slave address> <offset> <nr of bytes> <d1> <.> <dx>	
Error	Number	Description
	150600	Writing to the device was OK, number of bytes is echoed
	150601	Failed to retrieve the hardware diversity string
	150602	Failed to initialise the IIC communication
	150603	The hardware was not detected although indicated by Diversity
	150604	Writing the bytes to the device failed
	150605	Decoding time-out unsigned value failed
	150606	Decoding slave address unsigned value failed
	150607	Decoding offset unsigned value failed
	150608	Decoding number of bytes unsigned value failed
	150609	Number of bytes out of range. Should be less than 17.
	150610	Incorrect number of data bytes entered
	150611	Unable to initialise IIC
Example	DS:> 1506 1 0xa0 1 0 150600: Test OK @ DS:> 1506 1 0xa8 1 0 150604: Writing the bytes to the device failed. Error @	

Nucleus Name	**DS_HDMI_DdclicRead**	
Nucleus Number	1507	
Description	Perform an IIC read action to a device on the DDC bus	
Technical	-	
Execution Time	Less than 1 second.	
User Input	<TimeOut> <Slave address> <Offset> <Number of bytes>	
Error	Number	Description
	150700	
	150701	Failed to retrieve the hardware diversity string
	150702	Failed to initialise the IIC communication
	150703	The hardware was not detected although indicated by Diversity
	150704	Reading from the device on the DDC bus failed
	150705	Decoding time-out unsigned value failed
	150706	Decoding slave address unsigned value failed
	150707	Decoding offset unsigned value failed
	150708	Decoding number of bytes unsigned value failed
	150709	Unable to initialise IIC bus
Example	DS:> 1507 1 0xa0 0 15 [0]:0x0 [1]:0xff [2]:0xff [3]:0xff [4]:0xff [5]:0xff [6]:0xff [7]:0x0 [8]:0x34 [9]:0xa9 [10]:0x53 [11]:0xc0 [12]:0x1a [13]:0x0 [14]:0x0 150700: Test OK @	

Nucleus Name	**DS_HDMI_ExtendedWrite**	
Nucleus Number	1508	
Description	Perform an IIC write action on port 0/1 of the HDMI transmitter	
Technical	-	
Execution Time	Less than 1 second.	
User Input	<Port> <Register> <Data> Where 0 == Port 0 and 1 == Port 1	
Error	Number	Description
	150800	Byte was written OK
	150801	Failed to retrieve the hardware diversity string
	150802	Failed to initialise the IIC communication
	150803	The hardware was not detected although indicated by Diversity
	150804	A wrong port number was given by the user
	150805	An invalid register was given by the user
	150806	Invalid data was given by the user
	150807	There was an error writing to the register indicated

Example	`DS:> 1508 0 0x10 0x22`
	`150800:`
	`Test OK @`	

Nucleus Name	**DS_HDMI_ExtendedRead**	
Nucleus Number	1509	
Description	Perform an IIC read action on port 0 or 1 of the HDMI transmitter	
Technical	-	
Execution Time	Less than 1 second.	
User Input	<Port> <Register> Where 0 == Port0 and 1 == Port 1	
Error	Number	Description
	150900	Byte was read and echoed OK
	150901	Failed to retrieve the hardware diversity string
	150902	Failed to initialise the IIC communication
	150903	The hardware was not detected although indicated by Diversity
	150904	A wrong port number was given by the user
	150905	An invalid register was given by the user
	150906	There was an error reading the register indicated

Example	`DS:> 1509 0 0x10`
	`150900: Data read:  0x22`
	`Test OK @`	

Nucleus Name	**DS_HDMI_CheckHPDTx**	
Nucleus Number	1510	
Description	Check whether Hot-Plugging of the HDMI cable is detected by the SII9030 HDMI transmitter.	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	151000	The Hot Plug was detected OK by the HDMI transmitter
	151001	Failed to retrieve the hardware diversity string
	151002	Failed to initialise the IIC communication
	151003	The hardware was not detected although indicated by Diversity
	151004	Error writing to interrupt register
	151005	Error reading interrupt register
	151006	Test aborted by user
	151007	Unknown action

Example	`DS:> 1510`
	`Insert or remove the HDMI cable.(or type 'a' to abort):`
	`151006: Test aborted by user.`
	`Test OK @`
	
	`DS:> 1510`
	`Insert or remove the HDMI cable.(or type 'a' to abort):`
	`151000:`
	`Test OK @`	

Nucleus Name	**DS_HDMI_CheckHPDChrysalis**	
Nucleus Number	1511	
Description	Check whether Hot-Plugging of the HDMI cable is detected by the software. This tests the interrupt line to the Chrysalis.	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	151100	The Hot Plug was detected OK by software. Interrupt line OK.
	151101	Failed to retrieve the hardware diversity string
	151102	Failed to initialise the IIC communication
	151103	The hardware was not detected although indicated by Diversity
	151104	Error writing to HDMI tx register
	151105	User aborted HPD test
	151106	Error reading from HDMI tx register

Example	<pre>DS:> 1511
	Insert or remove the HDMI cable.(or type 'a' to abort):
	151100:
	Test OK @
	
	DS:> 1511
	Insert or remove the HDMI cable.(or type 'a' to abort):
	151105: User aborted HPD test.
	Test OK @</pre>	

Nucleus Name	**DS_HDMI_FLI2310_DevTypeGet**	
Nucleus Number	1512	
Description	Get the device and revision information of the FLI2310	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	151200	Retrieving the device type information succeeded
	151201	Failed to retrieve the hardware diversity string
	151202	Failed to initialise the IIC communication
	151203	The hardware was not detected although indicated by Diversity
	151204	The communication with the device failed

Example	<pre>DS:> 1512
	151200:
	Chip name : 2300
	Chip version : 4
	Test OK @</pre>	

Nucleus Name	**DS_HDMI_FLI2310_Communication**	
Nucleus Number	1513	
Description	Test whether the communication to the FLI2310 can be established	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	151300	Something is properly read so the communication is OK
	151301	Failed to retrieve the hardware diversity string
	151302	Failed to initialise the IIC communication
	151303	The hardware was not detected although indicated by Diversity
	151304	The IIC bus was not accessible
	151305	There was a timeout reading the device
	151306	The IIC acknowledge was not received
	151307	The communication with the device failed
	151308	The IIC bus initialisation failed
	151309	The read data is not the same as the written data

Example	<pre>DS:> 1513
	151300:
	Test OK @</pre>	

Nucleus Name	**DS_HDMI_FLI2310_TestImageOn**

Nucleus Number	1514	
Description	Generate a test image using the FLI2310	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	151400	Test image is generated successfully
	151401	Failed to retrieve the hardware diversity string
	151402	Failed to initialise the IIC communication
	151403	The hardware was not detected although indicated by Diversity
	151404	Unable to generate image
	151405	Unable to initialise De-inter-lacer

Example	``DS:> 1514``
	``151400:``
	``Test OK @``	

Nucleus Name	**DS_HDMI_FLI2310_TestImageOff**	
Nucleus Number	1515	
Description	Switch of test-image generation by the FLI2310	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	151500	Test image is turned off successfully
	151501	Failed to retrieve the hardware diversity string
	151502	Failed to initialise the IIC communication
	151503	The hardware was not detected although indicated by Diversity
	151504	Unable to initialise De-Inter-lacer
	151505	IIC Error during writing DENC

Example	``DS:> 1515``
	``151500:``
	``Test OK @``	

Nucleus Name	**DS_HDMI_FLI2310_Routing**	
Nucleus Number	1516	
Description	Have the FLI2310 pass the video from its input to its output	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	151600	Routing path is created successfully
	151601	Failed to retrieve the hardware diversity string
	151602	Failed to initialise the IIC communication
	151603	The hardware was not detected although indicated by Diversity
	151604	Unable to initialise the Chrysalis.
	151605	Unable to access de-inter-lacer

Example	``DS:> 1516``
	``151600:``
	``Test OK @``	

Nucleus Name	**DS_HDMI_FLI2310_ExtendedWrite**	
Nucleus Number	1517	
Description	Write to any register of the FLI2310	
Technical	-	
Execution Time	Less than 1 second.	
User Input	<Register> <RegLen:1=8bits;2=16bits> <Data>	
Error	Number	Description
	151700	The IIC write action succeeded
	151701	Failed to retrieve the hardware diversity string
	151702	Failed to initialise the IIC communication
	151703	The hardware was not detected although indicated by Diversity
	151704	Decoding register unsigned value failed
	151705	Decoding register length unsigned value failed
	151706	Decoding register data unsigned value failed
	151707	Error writing to register
Example	DS:> 1517 0x303 1 0x9a 151700: Test OK @	

Nucleus Name	**DS_HDMI_FLI2310_ExtendedRead**	
Nucleus Number	1518	
Description	Read from any register of the FLI2310	
Technical		
Execution Time	Less than 1 second.	
User Input	<Register> <RegLen:1=8bits;2=16bits>	
Error	Number	Description
	151800	The IIC read action succeeded
	151801	Failed to retrieve the hardware diversity string
	151802	Failed to initialise the IIC communication
	151803	The hardware was not detected although indicated by Diversity
	151804	Decoding register unsigned value failed
	151805	Decoding register length unsigned value failed
	151806	Error reading from the register
Example	DS:> 1518 0x303 1 151800: Data read: 0x009A Test OK @	

Nucleus Name	**DS_HDMI_FLI2310_1080I**	
Nucleus Number	1519	
Description	Set the Faroudja FLI2310 to generate a 1080I image from the video on its inputs.	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	151900	Generating the up-scaled image succeeded
	151901	Failed to retrieve the hardware diversity string
	151902	Failed to initialise the IIC communication
	151903	The hardware was not detected although indicated by Diversity
	151904	Generating the up-scaled image failed
Example	DS:> 1519 151900: Test OK @	

Nucleus Name	**DS_HDMI_Adv7302_Communication**	
Nucleus Number	1520	
Description	Test whether communication with the ADV7320 can be established	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	152000	Something is properly written so the communication is OK
	152001	Failed to retrieve the hardware diversity string
	152002	Failed to initialise the IIC communication
	152003	The hardware was not detected although indicated by Diversity
	152004	The IIC bus was not accessible
	152005	There was a timeout reading the device
	152006	The IIC acknowledge was not received
	152007	The communication with the device failed
	152008	Data read back does not match the data written
	152009	Got unknown error: xx on MIS_IIC_Read
	152010	Unable to initialise the ADV7320
Example	DS:> 1520 152000: Test OK @	

Nucleus Name	**DS_HDMI_Adv7302_TestImageOn**	
Nucleus Number	1521	
Description	Generate a test-image using the ADV7320. Generate the test images that are present on the progressive scan DENC-IC. This can be a crosshatch test pattern (horizontal and vertical white lines are displayed against a black background) or a uniform coloured frame/field test pattern. Default is a white hatch.	
Technical	-	
Execution Time	Less than 1 second.	
User Input	Image pattern type containing the next non-case sensitive string "HATCH" or "FRAME" or nothing.	
Error	Number	Description
	152100	Test image is generated successfully
	152101	Failed to retrieve the hardware diversity string
	152102	Failed to initialise the IIC communication
	152103	The hardware was not detected although indicated by Diversity
	152104	Unable to generate image
	152105	Unable to initialise DENC
	152106	Unable to reset DENC
Example	DS:> 1521 152100: Test OK @ DS:> 1521 FRAME 152100: Test OK @ DS:> 1521 HATCH 152100: Test OK @	

Nucleus Name	**DS_HDMI_Adv7302_TestImageOff**	
Nucleus Number	1522	
Description	Switch off test-image generation by the ADV7320	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	152200	Testimage is turned off successfully
	152201	Failed to retrieve the hardware diversity string
	152202	Failed to initialise the IIC communication
	152203	The hardware was not detected although indicated by Diversity
	152204	IIC Error during writing DENC
Example	DS:> 1522 152200: Test OK @	

Nucleus Name	**DS_HDMI_Adv7302_Routing**	
Nucleus Number	1523	
Description	Have the ADV7320 pass the video from its inputs to its outputs	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	152300	Routing path is created successfully
	152301	Failed to retrieve the hardware diversity string
	152302	Failed to initialise the IIC communication
	152303	The hardware was not detected although indicated by Diversity
	152304	Unable to initialise the Chrysalis
	152305	Unable to access DENC
Example	DS:> 1523 152300: Test OK @	

Nucleus Name	**DS_HDMI_Adv7302_ColSettingsSet**	
Nucleus Number	1524	
Description	Set the colour of the hatch- or frame-field to a different colour than the default white colour.	
Technical	-	
Execution Time	Less than 1 second.	
User Input	colour string or Y Cr Cb values: either one of the next non-case sensitive strings: - WHITE, BLACK, RED, GREEN, BLUE, YELLOW, CYAN, MAGENTA or 3 unsigned values, - hex: <0xYY> <0xUU> <0xVV> or decimal <YY> <UU> <VV>	
Error	Number	Description
	152400	Colour is set successfully
	152401	Failed to retrieve the hardware diversity string
	152402	Failed to initialise the IIC communication
	152403	The hardware was not detected although indicated by Diversity
	152404	Invalid parameters
	152405	IIC Error during writing DENC
Example	DS:> 1524 yellow 152400: Test OK @ DS:> 1524 0x6a 0xde 0xca 152400: Test OK @	

Nucleus Name	**DS_HDMI_Adv7302_ColSettingsGet**	
Nucleus Number	1525	
Description	Get the colour settings of the hatch- or frame-field	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	152500	Reading the colour settings succeeded
	152501	Failed to retrieve the hardware diversity string
	152502	Failed to initialise the IIC communication
	152503	The hardware was not detected although indicated by Diversity
	152504	IIC Error during accessing DENC
Example	DS:> 1525 152500: Colour Y Cr Cb values: 0x6A 0xDE 0xCA Test OK @	

Nucleus Name	**DS_HDMI_Adv7302_ExtendedWrite**	
Nucleus Number	1526	
Description	Perform an IIC write action to the ADV7320	
Technical	-	
Execution Time	Less than 1 second.	
User Input	The register to write to and the data to be written: <Register> <data>	
Error	Number	Description
	152600	Writing to the register succeeded
	152601	Failed to retrieve the hardware diversity string
	152602	Failed to initialise the IIC communication
	152603	The hardware was not detected although indicated by Diversity
	152604	Decoding register unsigned value failed
	152605	Decoding data unsigned value failed
	152606	Error writing to the register
Example	DS:> 1526 0 0x1e 152600: Test OK @	

Nucleus Name	**DS_HDMI_Adv7302_ExtendedRead**	
Nucleus Number	1527	
Description	Perform an IIC read action on the ADV7320	
Technical	-	
Execution Time	Less than 1 second.	
User Input	The register to read from: <Register>	
Error	Number	Description
	152700	Reading from the register succeeded
	152701	Failed to retrieve the hardware diversity string
	152702	Failed to initialise the IIC communication
	152703	The hardware was not detected although indicated by Diversity
	152704	Decoding register unsigned value failed
	152705	Error reading from register
Example	DS:> 1527 0 152700: Data read: 0x1E Test OK @	

Nucleus Name	**DS_HDMI_Audio**	
Nucleus Number	1528	
Description	Set the proper audio settings to the HDMI transmitter. **Note:** When **1528 spdif** is used to set the HDMI transmitter audio settings correctly and just **103** is entered i.s.o. **103 spdif** then 'clicking' audio is heard because the Chrysalis audio decoder does not use its SPDIF-path explicitly. **Note:** Currently there is an issue in the order of the tests: - Reboot the set. - First create the video, as audio is passed alongside the video on HDMI - Create the spdif audio using nucleus **103 spdif** - Create the spdif audio settings in the HDMI transmitter using nucleus **1528 spdif** - The spdif audio will be audible - Switch off spdif audio using nucleus **104** - Create i2s audio using nucleus **103** - Create the i2s audio settings in the HDMI transmitter using nucleus **1528** or **1528 I2S** - The audio will be audible - Switch off the audio using nucleus **104**	
Technical	-	
Execution Time	Less than 1 second.	
User Input	'SPDIF' - Set the HDMI transmitter's audio path to SPDIF 'I2S' or nothing - Set the HDMI transmitter's audio path to I2S	
Error	Number	Description
	152800	Creating the proper audio settings succeeded
	152801	Failed to retrieve the hardware diversity string
	152802	Failed to initialise the IIC communication
	152803	The hardware was not detected although indicated by Diversity

Example	`DS:> 1528 i2s`
	`152800:  i2s`
	`Test OK @`
	
	`DS:> 1528 spdif`
	`152800:  spdif`
	`Test OK @`	

Nucleus Name	**DS_HDMI_ColumbusTestImage**	
Nucleus Number	1529	
Description	Have the Columbus IC generate a test image	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	152900	Generating the test-image on the Columbus succeeded
	152901	Failed to retrieve the hardware diversity string
	152902	Failed to initialise the IIC communication
	152903	The hardware was not detected although indicated by Diversity
	152904	Generating the test-image on the Columbus failed
	152905	Soft reset of the Columbus failed
	152906	IIC initialisation failed
	152907	Columbus did not answer the call (reading dig. ID)

Example	`DS:> 1529`
	`152905: Soft reset of Columbus failed.`
	`Test OK @`
	
	`DS:> 1529`
	`152900:`
	`Test OK @`	

Nucleus Name	**DS_HDMI_ColumbusPass**	
Nucleus Number	1530	
Description	Have the Columbus pass the video from its inputs to its outputs	
Technical	-	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	153000	Getting the columbus to pass the video succeeded
	153001	Failed to retrieve the hardware diversity string
	153002	Failed to initialise the IIC communication
	153003	The hardware was not detected although indicated by Diversity
	153004	Getting the columbus to pass the video failed
Example	DS:> 1530 153000: Test OK @	

3.16 ANALOGUE SLAVE PROCESSOR (ASP)

Nucleus Name	**DS_ASP_Communication**	
Nucleus Number	1600	
Description	This nucleus checks the communication between the IIC controller of the Codec and the ASP.	
Technical	- Initialise IIC-bus. - Read something from ASP. - Handle the errorcode.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	160000	Communicating with the ASP succeeded
	160001	The IIC bus was not accessible
	160002	There was a timeout reading the device
	160003	The IIC acknowledge was not received
	160004	An IIC-bus error occurred
	160005	Got unknown IIC bus error
	160006	The IIC bus initialisation failed
Example	DS:> 1600 160000: Test OK @	

Nucleus Name	**DS_ASP_Version**	
Nucleus Number	1601	
Description	This nucleus returns the version number of the software running on the ASP or MCU and if available that of the display driver.	
Technical	- Read versions from ASP and display it.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	160100	Retrieving the software versions succeeded
	160101	The IIC bus initialisation failed.
	160102	The IIC bus failed.
	160103	The CRC checksum of the message is wrong.
Example ASP	DS:> 1601 160100: Software version : 0.9 Display driver version: 0.1 Hardware version : 0x02 Hardware layout : 0x03 Hardware revision : 0x00 Test OK @	
Example MCU	DS:> 1601 160100: Software main version: 0.3 Software sub version: 0.0 Test OK @	

Nucleus Name	**DS_ASP_RealTimeClockSetValues**	
Nucleus Number	1602	
Description	This nucleus is used to set the real time clock to the correct values.	
Technical	- Decode the user input. - Write RTC value to ASP.	
Execution Time	Less than 1 second.	
User Input	User must give time and date like this: hh:mm:ss dd/mm/yy	
Error	Number	Description
	160200	Setting the real time clock succeeded
	160201	The ASP initialisation failed.
	160202	The IIC bus failed.
	160203	Wrong user input.
Example	DS:> 1602 03:20:01 22/06/03 160200: Test OK @	

Nucleus Name	**DS_ASP_RealTimeClockGetValues**	
Nucleus Number	1603	
Description	This nucleus is used to retrieve the actual real time from the ASP	
Technical	- Read RTC value from ASP. - Decode the RTC value.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	160300	Retrieving the real time succeeded
	160301	The ASP initialisation failed.
	160302	The IIC bus failed.
	160303	The CRC checksum of the message is wrong.
	160304	The Real Time Clock has been found invalid or was not found.
Example	DS:> 1603 Time: 03:20:17 Date: 22/06/03 (dd/mm/yy) 160300: Test OK @	

Nucleus Name	**DS_ASP_RealTimeClockAdjustment**	
Nucleus Number	1605	
Description	This nucleus sets a test signal for clock crystal measurement. The signal with a frequency of 1 kHz and duty cycle of 50% appears on pin RCC.	
Technical	- Send 'Clock Adjustment' command to the ASP.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	160500	The test succeeded
	160501	The ASP initialisation failed.
	160502	The IIC bus failed.
Example	DS:> 1605 160500: Test OK @	

Nucleus Name	**DS_ASP_NTCGet**	
Nucleus Number	1606	
Description	This nucleus reads the value of the NTC-resistor connected to the ASP, which tells the ambient temperature to the processor.	
Technical	- Read the ADC input pin of the ASP that is connected to the NTC-resistor. - Display this value.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	160600	Getting the NTC-value succeeded
	160601	The IIC bus failed
Example	DS:> 1606 160600: Temperature(NTC) ADC input value = 0x94 Test OK @	

Nucleus Name	**DS_ASP_FanSpeedSet**	
Nucleus Number	1607	
Description	This nucleus sets the speed of the fan that controls the temperature within the set.	
Technical	- Decode user input. - Set pio-pins FAN_C1 and FAN_C2.	
Execution Time	Less than 1 second.	
User Input	Speed to be set: off, low, medium, high	
Error	Number	Description
	160700	Setting the new fan speed succeeded
	160701	The IIC bus failed
	160702	The user provided wrong input
Example	DS:> 1607 low 160700: Test OK @	

Nucleus Name	**DS_ASP_LightDisplay**	
Nucleus Number	1608	
Description	This nucleus lights the entire display.	
Technical	- Set all segments on in the display buffer. - Set the grids correct in the display buffer. - Send the display buffer to the ASP.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	160800	Lighting the entire display succeeded
	160801	IIC-bus communication failed
Example	DS:> 1608 160800: Test OK @	

Nucleus Name	**DS_ASP_BlinkDisplay**	
Nucleus Number	1609	
Description	This nucleus lights the entire display, and lets it blink. Only for ASP	
Technical	- Set all segments on in the blink buffer. - Set the grids correct in the blink buffer. - Send the blink buffer to the ASP.	
Execution Time	Less than 1 second.	
User Input	None or 'on' to start the blinking of the display. 'off' To stop the blinking of the display.	
Error	Number	Description
	160900	The test succeeded
	160901	IIC-bus communication failed
	160902	The user provided wrong input

Example ASP	`DS:> 1609`
	`160900:`
	`Test OK @`
	
	`DS:> 1609 off`
	`160900:`
	`Test OK @`	

Example MCU	`DS:> 1609`
	`160900: Empty function`
	`Test OK @`	

Nucleus Name	**DS_ASP_DimmingDisplay**	
Nucleus Number	1610	
Description	This nucleus lights the entire display, and dims it.	
Technical	- Change in a loop the display brightness from maximum to minimum.	
Execution Time	Less than 1 second.	
User Input	'ON' or 'OFF'	
Error	Number	Description
	161000	The test succeeded
	161001	IIC-bus communication failed
	161002	The user provided wrong input

Example	`DS:> 1610 ON`
	`161000:`
	`Test OK @`	

Nucleus Name	**DS_ASP_ClearDisplay**	
Nucleus Number	1611	
Description	This nucleus clears the display and deactivates dimming/blinking functionality	
Technical	- Make the display buffer empty. - Make the blink buffer empty. - Send the display buffer to the ASP. - Send the blink buffer to the ASP.	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	161100	The test succeeded
	161101	IIC-bus communication failed

Example	`DS:> 1611`
	`161100:`
	`Test OK @`	

Nucleus Name	**DS_ASP_KeyBoard**	
Nucleus Number	1612	
Description	This nucleus checks all keys of the keyboard by having the user confirm the key-code displayed of all keys. If the user presses 'a' or 'A' the test is aborted. If the user presses 'o' or 'O' the test is indicated as OK. If the user holds down 'PLAY' for more than a second the test is indicated as OK, if the user holds down 'RECORD' the test is indicated as failed. Indicate the number of keys pressed to the user, both in the terminal logging and on the display.	
Technical	- Initialise the display. - Display the key pressed by the user on the display. - Monitor the service port for an abort and get the next key pressed. - Update the display and repeat previous steps until user stops / confirms. - Display the number of keys that were pressed.	
Execution Time	Depends on the user.	
User Input	None	
Error	Number	Description
	161200	Checking all keys succeeded
	161201	IIC-bus communication failed
	161202	The user signals a failure of the keyboard
	161203	The user aborted the test
Example	DS:> 1612 161200: 3 keys were pressed. Test OK @	

Nucleus Name	**DS_ASP_RemoteControl**	
Nucleus Number	1613	
Description	This nucleus checks the interface to the remote control by having the user confirm the key-code displayed. At least one key must be tested. If the user presses 'a' or 'A' the test is aborted. If the user presses 'o' or 'O' the test is indicated as OK. If the user holds down 'PLAY' for more than a second the test is indicated as OK, if the user holds down 'RECORD' the test is indicated as failed. Indicate the number of keys pressed to the user, both in the terminal logging and on the display.	
Technical	- Initialise the display. - Display the key pressed by the user on the display. - Monitor the service port for an abort and get the next key pressed. - Update the display and repeat previous steps until user stops / confirms. - Display the number of keys that were pressed.	
Execution Time	Depends on the user.	
User Input	None	
Error	Number	Description
	161300	The test succeeded
	161301	IIC-bus communication failed
	161302	The user signals a failure of the remote control
	161303	The user aborted the test
Example	DS:> 1613 161300: 4 keys were pressed. Test OK @	

Nucleus Name	**DS_ASP_LEDsOn**	
Nucleus Number	1614	
Description	Switches on the display leds.	
Technical	ASP specific - Check if the analogue board is a MOBO board, if so: - Read the ASP pio port. - Set the RECORD-LED bit on in this port. - Write the ASP pio port. - Read the ASP pio port. - Set the TRAY-LED bit on in this port. - Write the ASP pio port. - Read the ASP pio port. - Set the EPG-LED bit on in this port. - Write the ASP pio port. - Else - Set the RECORD-LED bit on. - Write the external ASP pio port. - Set the TRAY-LED bit on. - Write the external ASP pio port. - Set the EPG-LED bit on. - Write the external ASP pio port. MCU Specific - Get the user input and capitalize it and check validity - Check which lights should be turned on - Write the command to the MCU	
Execution Time	Less than 1 second.	
User Input	None, Green or Red: Choose which colour of the bi-led should be lit with the rest (only for OLAL22PREMIER variant)	
Error	Number	Description
	161400	Switching on the LEDs succeeded
	161401	IIC-bus communication failed
	161402	Invalid parameter
Example	DS:> 1614 161400: Test OK @	

Nucleus Name	**DS_ASP_LEDsOff**	
Nucleus Number	1615	
Description	This nucleus switches off the display leds.	
Technical	ASP specific	
	- Check if the analogue board is a MOBO board, if so:	
	- Read the ASP pio port.	
	- Set the RECORD-LED bit off in this port.	
	- Write the ASP pio port.	
	- Read the ASP pio port.	
	- Set the TRAY-LED bit off in this port.	
	- Write the ASP pio port.	
	- Read the ASP pio port.	
	- Set the EPG-LED bit off in this port.	
	- Write the ASP pio port.	
	- Else	
	- Set the RECORD-LED bit off.	
	- Write the external ASP pio port.	
	- Set the TRAY-LED bit off.	
	- Write the external ASP pio port.	
	- Set the EPG-LED bit off.	
	- Write the external ASP pio port.	
	MCU Specific	
	- Write the command to the MCU to turn all display leds off	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	161500	Switching off the LEDs succeeded
	161501	IIC-bus communication failed
Example	DS:> 1615 161500: Test OK @	

Nucleus Name	**DS_ASP_Reset**	
Nucleus Number	1616	
Description	This nucleus resets the ASP.	
Technical	- Reset the ASP by toggling the reset wire by a GPIO pin of the codec.	
	- Wait 500ms according to the HSI.	
	- Read Status from ASP.	
	- Put ASP in normal mode.	
	- Configure general ASP PIO.	
	- Make a ASP pio pin low to read the version.	
	- Get GPP40 - GPP47 and GPP48 - GPP55.	
	- Decode hardware version, revision, and layout.	
	- Configure the ASP clock.	
	- Configure display, part 1.	
	- Configure display, part 2.	
	- Configure blinking.	
	- Configure external ASP PIO.	
	- Configure ADC input.	
	- Configure remote control input.	
	- Enable power on the AV3.	
Execution Time	3 seconds.	
User Input	None	
Error	Number	Description
	161600	Reset command succeeded
	161601	IIC-bus communication failed
Example	DS:> 1616 161600: Test OK @	

Note:	Expert use only!	
Nucleus Name	**DS_ASP_Extended**	
Nucleus Number		
Description	With this nucleus, possible problems in the factory can be worked around. It: - Enables the user to switch the General Purpose Pins of the ASP - Lets the user read out an ADC input value.	
Technical	- Decode user input. - Execute the parameter command.	
Execution Time	Less than 1 second.	

User Input	**Either <GPP> <0|1>**
	* GPP = The General Purpose I/O Pin:
	* 8SC1
	* ASC1
	* AUD_MUX2 or DTT_SEL
	* AUD_MUX3/ YC_REAR
	* DD_ON
	* DISP_CLK
	* DISP_CS
	* DISP_DATA
	* EEPROM_CLS
	* EEPROM_SDA
	* EPG_LED
	* FAN_C1
	* FAN_C2
	* FBOUT
	* HDD_LED
	* IMUTE
	* IPRO
	* LOOP_THRU_ON
	* P50_OUT
	* REC_LED
	* SEL_KEY2_3
	* STDBY
	* STDBY_LED
	* TRAY_LED
	* VCR_CS
	* VCR_DIN
	* VCR_RESET
	* VCR_SCLK
	* VFD_CLK
	* WSRO
	* YUV_ACTIVE
	  Or <PIO pin>
	* P50_IN
	* RC_IN
	* REG_SELA
	* REG_SELB
	* VCR_DOUT
	  Or <ADC pin>
	* 8SC2 or WSRI
	* WSFI
	* TEMP
	* FBIN
	* FOME or AFC
	* WU
	* KEY1
	* KEY2
	See example below	

Error	Number	Description
	161700	The test succeeded
	161701	The IIC-bus failed.
	161702	Invalid user input.

| Example | ```
DS:> 1617 temp
161700: TEMP ADC input value: 143
Test OK @

DS:> 1617 rec_led 1
161700:
Test OK @
``` |
|---------|--------|

Nucleus Name	**DS_ASP_Watchdog**	
Nucleus Number	1618	
Description	This nucleus configures the watchdog timer of the ASP, and waits till the watchdog expires. The watchdog time-out is 10 seconds. On expiry of the watchdog timer, the ASP switching off, and on its power supply, and resets the main controller. So, this nucleus will not return an error code when the test succeeded, but the system will restart again.	
Technical	- Configure watchdog timer. - Wait till the watchdog expired.	
Execution Time	10 seconds.	
User Input	None	
Error	Number	Description
	161801	IIC-bus communication failed.
	161802	The ASP did not reset the host processor.

Example	`DS:> 1618`
	`Waiting till the watchdog expires.`
	
	`Factory Diagnostics and Service Software`
	`DVD Video Recorder (Sep 10 2004, 08:11:24)`
	
	`Version :662       Build    :20040910_0515`
	`Release :C1_1       Buildtype :no`
	`Baseline :F_C1_195   Variant  :verum:dvdrw2_lib`
	
	`DS:>`	

Nucleus Name	**DS_ASP_Reboot**	
Nucleus Number	1619	
Description	This command forces a reboot of the main controller. The ASP shutdown the digital board power supply and then switch it on to force reset. So, this nucleus will not return an error code when the test succeeded, but the system will restart again.	
Technical	- Send command reboot to ASP.	
Execution Time	2 seconds.	
User Input	None	
Error	Number	Description
	161901	IIC-bus communication failed.
	161902	The ASP did not reset the host processor.

Example	`DS:> 1619`
	`Factory Diagnostics and Service Software`
	`DVD Video Recorder (Sep 10 2004, 08:11:24)`
	
	`Version :662       Build    :20040910_0515`
	`Release :C1_1       Buildtype :no`
	`Baseline :F_C1_195   Variant  :verum:dvdrw2_lib`
	
	`DS:>`	

Nucleus Name	**DS_ASP_DetectVideo**	
Nucleus Number	1620	
Description	Checks if an active video signal is available on the CVBS input of SCART 1 or SCART 2.	
Technical	- Read out the WU ADC pin on the ASP	
Execution Time	2 seconds.	
User Input	None	
Error	Number	Description
	162000	Detecting the Active video succeeded.
	162001	Detecting the Active video failed.
	162002	This test is not applicable for current HW layout.
	162003	Could not retrieve hardware version from ASP.

Example	`DS:> 1620`
	`162000: Active video is ON`
	`Test OK @`	

Nucleus Name	**DS_ASP_GlinkRcLoop**	
Nucleus Number	1621	
Description	Checks if an RC command can be transmitted via the G-Link connector and test if the sent command can be read back. The user must connect the G-Link to the rear G-Link connector and place the RC transmitter in front of the RC receiver of the front panel.	
Technical	- Send IR data to the ASP. - Check the RC input of the ASP.	
Execution Time	2 seconds.	
User Input	None	
Error	Number	Description
	162100	Detecting the Active video succeeded.
	162101	Sending RC command failed.
	162102	Receiving RC command failed.
	162103	No RC command was received
	162104	Could not retrieve hardware version from ASP
Example	DS:> 1621 162100: Test OK @	

Nucleus Name	**DS_ASP_VcrControl**
Nucleus Number	1622
Description	This nucleus makes it possible to control the VCR module. It puts the VCR module into specified operation. It configures VCR play parameters. It configures VCR record parameters. It returns the status of the VCR module.
Technical	- Get the parameters from the user input and then execute the correct test
Execution Time	1 seconds.
User Input	<Command> <parameters> 1 Command:

OPERATE:

User input	Meaning of value
0	Stop
1	Eject
2	Play
3	Pause
4	Fast Forward (FF)
5	Rewind (REW)
6	Slow
7	Enter Index Search
8	Forward Index Search
9	Reverse Index Search
10	Record (REC)
11	DVDR->VCR Dubbing Standby
12	VCR->DVDR Dubbing Standby
13	Start Dubbing
14	Cancel Dubbing
15	*Reserved*
16	Increase Tracking Value
17	Decrease Tracking Value
18	Restore Default Tracking Value
19	Cancel Tracking
20-31	*Reserved*

SETUPPLAY: (One byte)

7	6	5	4	3	2	1	0
N.U.	HiFiAudioSelect			SmartPicture		Videosystem	

VideoSystem: (Selects type of video system for playback.)
0 Auto
1 SECAM
2 PAL
3 ME-SECAM

SmartPicture: (Selects how video is enhanced during playback.)
0 Natural
1 Distinct
2 Soft
3 Sharp

HiFiAudioSelect: (type of audio for playback of recorded HiFi tape.)
0 Stereo left & right channels
1 Left channel only
2 Right channel only
3 Mono channel
4 Mixed left & right channels
5..7   Reserved

NotUsed:

User Input Continued	**SETUPRECORD**: (One Byte)

7	6	5	4	3	2	1	0
Not Used		T.E.	S.	M.A.	A.	VideoSys	

VideoSystem:
Selects type of video system to record.
Value range: [0..3]
Default value: 0
 Meaning of values:
0 Auto
1 SECAM
2 PAL
3 ME-SECAM

Aspect:
Selects video aspect ratio during DVDR→VCR dubbing.
Value range: [0..1]
Default value: 0
 Meaning of values:
0 4:3
1 16:9

MonoAudio:
Selects type of audio to record on monoaural audio track.
Value range: [0..1]
Default value: 0
 Meaning of values:
0 Mixed left & right channels
1 Left channel only

Speed:
Selects tape speed for recording.
Value range: [0..1]
Default value: 0
 Meaning of values:
0 SP
1 LP

TapeEnd:
Selects how tape end condition is handled during recording.
Value range: [0..1]
Default value: 0
 Meaning of values:
0 Auto-rewind and go to Stop
1 Eject and go to Stop

NotUsed:

STATUS:
No Parameters needed

Error	Number	Description
	162200	succeeded.
	162201	The IIC bus failed.
	162202	The CRC checksum of the message is wrong.
	162203	Invalid parameter.
Example	DS:> 1622 operate 0 162200: Test OK @	

3.17 ANALOGUE BOARD EEPROM (AROM)

Nucleus Name	**DS_AROM_Communication**	
Nucleus Number	1700	
Description	Check the communication between the IIC controller of the Codec and the EEPROM	
Technical	- Initialise IIC - Read from a location in AROM	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	170000	Something is properly read so the communication is OK
	170001	The IIC bus was not accessible
	170002	There was a timeout reading the device
	170003	The IIC acknowledge was not received
	170004	The communication with the device failed
	170005	The IIC bus failed
	170006	The IIC bus initialisation failed
Example	DS:> 1700 170000: Test OK @	

3.18 VIDEO MATRIX (VMIX)

Nucleus Name	**DS_VMIX_Communication**	
Nucleus Number	1800	
Description	This nucleus checks the communication between the IIC controller of the Codec and the Video Matrix on the analogue board	
Technical	- Try to read anything from the video matrix by means of IIC	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	180000	Communicating wit the Video Matrix succeeded
	180001	An IIC-bus error occurred
	180002	There was a timeout reading the device
	180003	The IIC bus was not accessible
	180004	The IIC acknowledge was not received
	180005	There was an IIC error upon the stop-condition
	180006	The IIC bus was chosen wrong
	180007	The IIC functionality is not running
	180008	An unknown error was returned
Example	DS:> 1800 180000: Test OK @	

Nucleus Name	**DS_VMIX_Routing**	
Nucleus Number	1801	
Description	This nucleus performs the routing of the video signals in the set. It sets the video path according to the user input.	
Technical	- Determine whether the set is NAFTA/APAC or EUROPE - Switch the videomatrix according to the input specified by the user	
Execution Time	Less than 1 second.	
User Input	The user inputs the path Id of choice, as specified in tables below for Europe/NAFTA-APAC	
Error	Number	Description
	180100	Routing the video path succeeded
	180101	The user provided wrong input
	180102	There was no response from the video matrix
	180103	Could not retrieve region from analogue slave processor
Example	DS:> 1801 00 180100: Test OK @	

*Table 6: Available VIDEO path-Ids for **EUROPE** routing*

EURO Path ID	Description
	(DbOut=Digital Board Output, DbIn = Digital Board Input)
00	DbOut-CVBS/YC/RGB to RearOut-CVBS/YC and Scart_1-RGB.
01	- DbOut-CVBS to RearOut-CVBS. - FrontIn-CVBS to DbIn-CVBS. - FrontIn-CVBS to VcrIn-CVBS. (If a VCR module is present)
02	- DbOut-YC to RearOut-YC. - FrontIn-YC to DbIn-YC.
03	- DbOut-CVBS to Scart_1-CVBS. - Scart_2-CVBS to DbIn-CVBS. - Scart_2-CVBS to VcrIn-CVBS. (If a VCR module is present)
04	- DbOut-YC to Scart_1-YC. - Scart_2-YC to DbIn-YC. - Scart_2-YC to VcrIn-YC. (If a VCR module is present)
05	- DbOut-RGB to Scart_1-RGB. - Scart_2-RGB to DbIn-RGB.
06	- DbOut-CVBS to RearOut-CVBS. - Tuner-CVBS to DbIn-CVBS. - Tuner-CVBS to VcrIn-CVBS. (If a VCR module is present)
07	- DbOut-CVBS to DbIn-CVBS. - DbOut-CVBS to VcrIn-CVBS. (If a VCR module is present
08	DbOut-PSCAN to RearOut-YUV.
09	DbOut-YUV to RearOut-YUV.
10	- DbOut-CVBS to Scart_2-CVBS. - Scart_1-CVBS to DbIn-CVBS.
11	- DbOut-YC to Scart_2-YC. - Scart_1-YC to DbIn-YC.
12	Scart_2-RGB to Scart_1-RGB.
13	Scart_2-CVBS to Scart_1-CVBS.
14	Scart_1-CVBS to Scart_2-CVBS.

*Table 7: Available VIDEO path-Ids for **NAFTA / APAC** routing*

NAFTA PathID	Description
	(DbOut=Digital Board Output, DbIn = Digital Board Input)
00	DbOut-CVBS/YC/YUV to RearOut-CVBS/YC/YUV.
01	- DbOut-CVBS to RearOut-CVBS. - FrontIn-CVBS to DbIn-CVBS.
02	- DbOut-YC to RearOut-YC. - FrontIn-YC to DbIn-YC.
03	- DbOut-CVBS to RearOut-CVBS. - RearIn-CVBS to DbIn-CVBS.
04	- DbOut-YC to RearOut-YC. - RearIn-YC to DbIn-YC.
05	- DbOut-YUV to RearOut-YUV. - RearIn-YUV to DbIn-YUV.
06	- DbOut-CVBS to RearOut-CVBS. - Tuner-CVBS to DbIn-CVBS.
07	DbOut-CVBS to DbIn-CVBS.
08	DbOut-PSCAN to RearOut-YUV.

Note	Expert use only!
Nucleus Name	**DS_VMIX_Extended**
Nucleus Number	1802
Description	With this nucleus, possible problems in the factory can be worked around. It enables the user to switch the STV6618 to all possibilities provided by that chip. The routing is numbered in the following fashion: **<Reg. Addr**.**><Path>** This all is derived from the table in chapter 3 of the STV6618 datasheet: October 2001: Rev. 1.5. Page 14. Example: 1802 100 : First path of Reg.Addr. 1 will be set. Update afterwards needed in separate call. The path set in this example is DsVMixYCVBSIN_TV_TO_YCVBSOUT_AUX. Note: in determining path, skip the '**not allowed**' paths when counting Paths: Eg. Path 0104 = Mute Aux (scart2) Y/CVBS Path 0105 = Mute Aux (scart2) Chroma Path 0203 = RGB/YprPb_Aux to RGB/YprPb out **See tables below**
Technical	- Parse the user input to determine the switching to perform and see if an update or reset is needed
Execution Time	Less than 1 second
User Input	The path number to set followed by a 1 if update to STV6618 is needed. Also 1802 followed by 'RESET' or 'UPDATE' do tricks. 1802 100 1 =>First path of sub address 1 will be set and updated. 1802 RESET =>STV6618 switched to defaults 1802 UPDATE => STV6618 switched to new path
Error	Number	Description
	180200	The extended function succeeded
	180201	The extended function failed

Example	`DS:> 1802 100 1`
	`180200:`
	`Test OK @`

Reg. Addr (Hex)	Description	Bits	Data								Comments	Path:
			d7	d6	d5	d4	d3	d2	d1	d0		
00	Recorder Y/CVBS Output Selection	3	X	X	X	X	X	0	0	0	Mute	0000
			X	X	X	X	X	0	0	1	YIN_ENC	0001
			X	X	X	X	X	0	1	0	CVBSIN_ENC	0002
			X	X	X	X	X	0	1	1	Y/CVBSIN_AUX	0003
			X	X	X	X	X	1	0	0	Y/CVBSIN_TV	0004
			X	X	X	X	X	1	0	1	YCVBSIN_TUN	0005
			X	X	X	X	X	1	1	0	Not allowed	
			X	X	X	X	X	1	1	1	Not allowed	
	TV Y/CVBS Output Selection	2	X	X	X	0	0	X	X	X	Y/CVBS_AUX	0006
			X	X	X	0	1	X	X	X	YIN_ENC	0007
			X	X	X	1	0	X	X	X	CVBSIN_ENC	0008
			X	X	X	1	1	X	X	X	Mute	0009
	DigOUT6 Control	1	0	X	X	X	X	X	X	X	0 = Low Level	0010
			1	X	X	X	X	X	X	X	1 = High Level	0011
01	AUX (SCART2) Y/CVBS Output Selection	3	X	X	X	X	X	0	0	0	Y/CVBSin_TV	0100
			X	X	X	X	X	0	0	1	YIN_ENC	0101
			X	X	X	X	X	0	1	0	CVBSIN_ENC	0102
			X	X	X	X	X	0	1	1	YCVBSIN_TUN	0103
			X	X	X	X	X	1	0	0	Mute	0104
			X	X	X	X	X	1	0	1	Not allowed	
			X	X	X	X	X	1	1	0	Not allowed	
			X	X	X	X	X	1	1	1	Not allowed	
	AUX (SCART2) Chroma Output Selection	2	X	X	X	0	0	X	X	X	Mute	0105
			X	X	X	0	1	X	X	X	CIN_ENC	0106
			X	X	X	1	0	X	X	X	CIN_TV	0107
			X	X	X	1	1	X	X	X	CIN_TUN	0108
	DigOUT5 Control	1	0	X	X	X	X	X	X	X	0 = Low Level	0109
			1	X	X	X	X	X	X	X	1 = High Level	0110

*Figure 3-1 Signal routing table for **sub-addresses 0 and 1***

Reg. Addr (Hex)	Description	Bits	d7	d6	d5	d4	d3	d2	d1	d0	Comments	Path:
	Fast Blanking Output Control	2	X	X	X	X	X	X	0	0	FBIN_AUX	200
			X	X	X	X	X	X	0	1	FB forced to Low Level	201
			X	X	X	X	X	X	1	0	FB forced to High Level	202
			X	X	X	X	X	X	1	1	Not allowed	
	RGB/YPrPb Output Selection	2	X	X	X	X	0	0	X	X	RGB/YPrPb_AUX	203
			X	X	X	X	0	1	X	X	RGB/YPrPb_ENC	204
			X	X	X	X	1	0	X	X	CIN_ENC (pin 6) at R/Pr/COUT_TV, B/PbOUT & G/YOUT muted	205
			X	X	X	X	1	1	X	X	RGB/YPrPb mute	206
02	RGB or YPrPb or C Selection	2	X	X	0	0	0	0	X	X	RGB mode selection, bottom clamp at RGB inputs, AUX. input selected	207
			X	X	0	0	0	1	X	X	RGB mode selection, bottom clamp at RGB inputs, ENC. input selected	208
			X	X	0	1	0	0	X	X	CIN_AUX (pin 17)selected, average clamp at R/Pr/CIN_AUX input, GIN_AUX (bottom clamp) selected, BIN_AUX (bottom clamp) selected	209
			X	X	0	1	0	1	X	X	CIN_ENC (pin 9)selected, average clamp at R/Pr/CIN_ENC input, GIN_ENC (bottom clamp) selected, BIN_ENC (bottom clamp) selected	210
			X	X	1	0	0	0	X	X	YPrPb mode selection, sync pulse clamp at Pr Pb inputs, black clamp at Y input, AUX. input selected	211
			X	X	1	0	0	1	X	X	YPrPb mode selection, sync pulse clamp at Pr Pb inputs, black clamp at Y input, ENC. input selected	212
			X	X	1	1	0	0	X	X	YPrPb mode selection, delayed sync pulse clamp at Pr Pb inputs, black clamp at Y input, AUX. input select	213
			X	X	1	1	0	1	X	X	YPrPb mode selection, delayed sync pulse clamp at Pr Pb inputs, black clamp at Y input, ENC. input select	214
	RGB/YPrPb Control	2	0	0	X	X	X	X	X	X	RGB/YPrPb outputs active	215
			0	1	X	X	X	X	X	X	RGB/YPrPb outputs high imp state	216
			1	X	X	X	X	X	X	X	Red output active, Green and Blue high imp. state	217

*Figure 3-2 Signal routing table for **sub-address 2***

Reg. Addr (Hex)	Description	Bits	d7	d6	d5	d4	d3	d2	d1	d0	Comments	Path:
03	C_Gate Output Control	1	X	X	X	X	X	X	X	0	Low Level	300
			X	X	X	X	X	X	X	1	High Level	301
	DIGOUT1	2	X	X	X	X	X	0	X	X	Low Level	302
			X	X	X	X	X	1	0	X	Mid Level	303
			X	X	X	X	X	1	1	X	High Level	304
	DIGOUT2	2	X	X	X	0	X	X	X	X	Low Level	305
			X	X	X	1	0	X	X	X	Mid Level	306
			X	X	X	1	1	X	X	X	High Level	307
	DIGOUT3	2	X	0	X	X	X	X	X	X	Low Level	308
			X	1	0	X	X	X	X	X	Mid Level	309
			X	1	1	X	X	X	X	X	High Level	310
	DIGOUT4 Control	1	0	X	X	X	X	X	X	X	0 = Low Level	311
			1	X	X	X	X	X	X	X	1 = High Level	312
04	ENC Inputs	1	X	X	X	X	X	X	X	0	Inputs Active	400
			X	X	X	X	X	X	X	1	Inputs Disabled	401
	TUN Inputs	1	X	X	X	X	X	X	0	X	Inputs Active	402
			X	X	X	X	X	X	1	X	Inputs Disabled	403
	TV Inputs	1	X	X	X	X	X	0	X	X	Inputs Active	404
			X	X	X	X	X	1	X	X	Inputs Disabled	405
	AUX Inputs	1	X	X	X	X	0	X	X	X	Inputs Active	406
			X	X	X	X	1	X	X	X	Inputs Disabled	407
	REC Outputs	1	X	X	X	0	X	X	X	X	Y/CVBSOUT_REC Outputs ON	408
			X	X	X	1	X	X	X	X	Y/CVBSOUT_REC Outputs OFF	409
	AUX Outputs	1	X	X	0	X	X	X	X	X	Y/CVBSOUT_AUX Outputs ON	410
			X	X	1	X	X	X	X	X	Y/CVBSOUT_AUX Outputs OFF	411
	COUT_AUX Output	1	X	0	X	X	X	X	X	X	COUT_AUX Outputs ON	412
			X	1	X	X	X	X	X	X	COUT_AUX Outputs OFF (high imped.)	413
	TV Outputs	1	0	X	X	X	X	X	X	X	TV Video Outputs ON	414
			1	X	X	X	X	X	X	X	TV Video Outputs OFF	415
	Full Stop	8	1	1	1	1	1	1	1	1	Only I²C bus supplied, and digital outputs	416

*Figure 3-3 Signal routing table for **sub-addresses 3 and 4***

Nucleus Name	**DS_VMIX_FastBlankingCheck**	
Nucleus Number	1803	
Description	Check if the Fast Blanking signal can be set low and high. The user must connect SCART2 (pin16) to SCART1 (pin16) on the outside of the set. Works on EURO sets only.	
Technical	- Set the Fast blanking pin of the Video Matrix low - Measure the value on the ASP Fast blanking input ADC - Set the Fast blanking pin of the Video Matrix high - Measure the value on the ASP Fast blanking input ADC	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	180300	Detecting Fast blanking signal succeeded
	180301	Detecting Fast blanking signal failed
	180302	This test is not applicable for current HW layout
	180304	Could not retrieve hardware version from AS

Example	`DS:> 1803`
	`180300:`
	`Test OK @`	

Nucleus Name	**DS_VMIX_8SC2Check**	
Nucleus Number	1804	
Description	Check if the 8SC2 signal (slow blanking) can be set low, medium and high. The user must connect SCART2 (pin8) to SCART1 (pin8) on the outside of the set. Works on EURO sets only.	
Technical	- Set the Digital out 3 pin of the Video Matrix low - Measure the value on the ASP 8SC2 input ADC - Set the Digital out 3 pin of the Video Matrix to medium level - Measure the value on the 8SC2 input ADC - Set the Digital out 3 pin of the Video Matrix high - Measure the value on the ASP 8SC2 input ADC	
Execution Time	Less than 1 second	
User Input	None	
Error	Number	Description
	180400	Detecting 8SC2 signal succeeded
	180401	Detecting 8SC2 signal failed
	180402	This test is not applicable for current HW layout
	180403	Could not retrieve hardware version from AS
Example	DS:> 1804 180400: Test OK @	

Nucleus Name	**DS_VMIX_WideScreenSignallingCheck**	
Nucleus Number	1805	
Description	Check if the wide screen signal can be set low and high The user must specify if he uses the Rear In-YC or the Front In-YC. Before starting this nucleus, Rear Out-YC must be connected to Rear In-YC to Front In-YC. Works on NAFTA and APAC sets only.	

Technical	- Check user input
	- In case of Rear In YC
	    - Set the Digital out 5 & 6 pin of the Video Matrix low
	    - Measure the value on the ASP AIN0 input ADC
	    - Set the Digital out 5 to HIGH and 6 to LOW
	    - Measure the value on the ASP AIN0 input ADC
	- In case of Front In YC
	    - Set the Digital out 5 to HIGH and 6 to LOW
	    - Measure the value on the ASP AIN1 input ADC
	    - Set the Digital out 5 to HIGH and 6 to HIGH
	    - Measure the value on the ASP AIN1 input ADC	

Execution Time	Less than 1 second	
User Input	The route to check i.e. - "REAR": to test the Rear In-YC - "FRONT": to test the Front In-YC	
Error	Number	Description
	180400	Detecting wide screen signal succeeded
	180401	Detecting wide screen signal failed
	180402	This test is not applicable for current HW layout
	180403	Could not retrieve hardware version from ASP
	180404	Invalid user input
Example	DS:> 1805 rear 180500: Test OK @	

3.19 AUDIO MATRIX (SOUND PROCESSOR) (AMIX)

Nucleus Name	**DS_AMIX_Communication**	
Nucleus Number	1900	
Description	This nucleus checks the communication between the IIC controller of the Codec and the Audio Matrix (sound processor) on the analogue board	
Technical	- Test whether anything can be read from the sound processor	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	190000	Communicating wit the Audio Matrix succeeded
	190001	An IIC-bus error occurred
	190002	There was a timeout reading the device
	190003	The IIC bus was not accessible
	190004	The IIC acknowledge was not received
	190005	There was an IIC error upon the stop-condition
	190006	The IIC bus was chosen wrong
	190007	The IIC functionality is not running
	190008	An unknown error was returned

Example	`DS:> 1900`
	`190000:`
	`Test OK @`	

Nucleus Name	**DS_AMIX_Routing**	
Nucleus Number	1901	
Description	This nucleus performs the routing of the audio signals in the set. It sets the audio path according to the user input.	
Technical ASP	- Determine whether the set is of type NAFTA-APAC or EUROPE - Parse the user input to determine the routing - According to parameters set the sound processor and multiplexers	
Technical MCU	- Determine whether the set is of type NAFTA-APAC or EUROPE - Configure the UDA1380 - Parse the user input to determine the routing - According to parameters set the sound processor and multiplexers	
Execution Time	Less than 1 second.	
User Input	The user inputs the path ID of his/her choice, as specified in tables below for Europe/NAFTA	
Error	Number	Description
	190100	Routing the audio path succeeded
	190101	Routing the audio path failed
	190102	There was an error resetting the sound processor
	190103	The user provided wrong input
	190104	There was no response from the ASP

Example	`DS:> 1901 00`
	`190100:`
	`Test OK @`	

*Table 8: Available AUDIO path-Ids for **EUROPE** routing*

EURO Path ID	Description
	(DbOut=Digital Board Output, DbIn = Digital Board Input)
00	DbOut to All Outs.
01	- DbOut to RearOut for CVBS/YC, and RearOut for YUV. - FrontIn to DbIn. - FrontIn to VcrIn. (If a VCR module is present)
02	- DbOut to Scart_1-AOut. - Scart_2-AIn to DbIn. - Scart_2-AIn to VcrIn. (If a VCR module is present)
03	- DbOut to Scart_2-AOut. - Scart_1-AIn to DbIn. - Scart_1-AIn to VcrIn. (If a VCR module is present)
04	- DbOut to RearOut for CVBS/YC. - Tuner to DbIn. - Tuner to VcrIn. (If a VCR module is present)
05	DbOut to RearOut-5.1.
06	DbOut to DbIn
07	Scart_2-AIn to Scart_1-AOut.
08	Scart_1-AIn to Scart_2-AOut.
09	VcrOut to DbIn (If a VCR module is present)

*Table 9: Available AUDIO path-Ids for **NAFTA / APAC** routing*

NAFTA PathID	Description
	(DbOut=Digital Board Output, DbIn = Digital Board Input)
00	DbOut to All Outputs.
01	- DbOut to RearOut for CVBS/YC, and RearOut for YUV. - FrontIn to DbIn.
02	- DbOut to RearOut for CVBS/YC, and RearOut for YUV. - RearIn1 (**EXT2**) for CVBS/YC to DbIn.
03	- DbOut to RearOut for CVBS/YC, and RearOut for YUV. - RearIn2 (**EXT1**) for YUV to DbIn.
04	- DbOut to RearOut for CVBS/YC, and RearOut for YUV. - Tuner to DbIn.
05	DbOut to RearOut-5.1.
06	DbOut to DbIn.

Nucleus Name	**DS_AMIX_VersionGet**	
Nucleus Number	1902	
Description	This nucleus gets the version information from the sound processor.	
Technical	- Read the information from the sound processor using IIC	
Execution Time	Less than 1 second	
User Input	-	
Error	Number	Description
	190200	Getting the version info from the sound processor succeeded
	190201	Getting the version info from the sound processor failed
Example	DS:> 1902 Hardware Version:0x 2, Revision Code :0x 7 MSP Product Code:0x19, ROM Version Code:0x48 190200: Test OK @	

Nucleus Name	DS_AMIX_Control	
Nucleus Number	1903	
Description	Test the controllability of the sound processor by performing a controlled reset	
Technical	Test the control register, contains 0x80 after reset and 0x0 after first read of this control register. MSP is reset and the control register is tested for the 0x80 reset indication	
Execution Time	1 second	
User Input	None	
Error	Number	Description
	190300	Testing the controllability succeeded
	190301	Accessing the MSP failed
	190302	Accessing the MSP succeeded, but wrong data was returned
Example	DS:> 1903 190300: Test OK @	

Note	European sets only !!	
Nucleus Name	DS_AMIX_Beep	
Nucleus Number	1904	
Description	Test the beeper functionality of the sound processor	
Technical	-	
Execution Time	3 seconds	
User Input	'ON' or 'OFF'	
Error	Number	Description
	190400	Testing the beeper succeeded
	190401	Testing the beeper failed
	190402	There was an error routing the test path
	190402	The user provided the wrong input
Example	DS:> 1904 ON 190400: Test OK @	

Note:	Expert use only!	
Nucleus Name	DS_AMIX_Extended	
Nucleus Number	1905	
Description	This nucleus extends the functionality implemented in the AMIX tests. With this nucleus it is possible to access the MSP registers directly. **Expert use only!!**	
Technical	- Parse the user input and determine which routing to perform - Perform the routing through the sound processor, the multiplexers or the ASP	
Note	This information is retrieved from the preliminary data sheet 'MSP34X5G Multi-standard Sound Processor Family', March 5, 2001, 6251-480-3PD, Micronas.	
Execution Time	- Less than 1 second.	

User Input	The following possibilities are supported :
	`1905 W DSP 0xaddress 0xdata: Write data to DSP address`
	`1905 R DEM 0xaddress      : Read data from Demodulator address`
	`1905 W CTL 0xdata         : Write data to control register`
	`1905 R CTL               : Read data from control register`
	`1905 SA 2                : Switch HEF4052 at position 7501 to HL`
	`1905 SB 2                : Switch HEF4052 at position 7504 to HL`
	`1905 ASP init            : Initialise the ASP`
	`1905 ASP ASC1 1          : Switch the ASC1 line high`
	`1905 ASP IMUTE 1         : Switch the IMUTE line high`	

Error	Number	Description
	190500	The extended function succeeded
	190501	The extended function failed
Example	DS:> 1905 SA 1 190500: Test OK @	

Nucleus Name	**DS_AMIX_CommunicationAdcDac**	
Nucleus Number	1906	
Description	This nucleus checks the communication between the IIC controller of the Codec and the ADC/DAC chip (UDA 1380) on the analogue board	
Technical	- Test whether anything can be read from the ADC/DAC	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	190600	Communicating with the ADC/DAC succeeded
	190601	The IIC bus was not accessible
	190602	There was a timeout reading the device
	190603	The IIC acknowledge was not received
	190604	An IIC-bus error occurred
	190605	Got unknown IIC bus error
	190606	The IIC bus initialisation failed
Example	DS:> 1906 190600: Test OK @	

Nucleus Name	**DS_AMIX_Mute**	
Nucleus Number	1907	
Description	Set or unset the master mute of the ADC/DAC chip (UDA 1380) on the analogue board	
Technical	- Send the master mute command via IIC	
Execution Time	Less than 1 second.	
User Input	'ON' or 'OFF'	
Error	Number	Description
	190700	Muting the sound processor succeeded
	190701	Muting sound processor failed
Example	DS:> 1907 190700: Test OK @	

3.20 FRONTEND (TUNER) (FRE)

Nucleus Name	**DS_FRE_Communication**	
Nucleus Number	2000	
Description	This nucleus checks the communication between the IIC controller of the Codec and the Front End (Tuner) on the analogue board	
Technical	- Determine whether anything can be read from the FRE through IIC	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	200000	Communicating with the front end succeeded
	200001	The IIC bus was not accessible
	200002	There was a timeout reading the device
	200003	The IIC acknowledge was not received
	200004	An IIC-bus error occurred
	200005	Got unknown IIC bus error
	200006	The IIC bus initialisation failed
Example	DS:> 2000 200000: Test OK @	

Nucleus Name	**DS_FRE_ChannelSelect**			
Nucleus Number	2001			
Description	This nucleus sets the tuner to receive a valid audio and video signal			
Technical	- Parse the user input to determine all parameters to set - Pass these parameters to the respective parts using IIC			
Execution Time	Less than 1 second			
User Input	<Frequency*16> <video standard id> <Tuner> Tuner frequency: to tune the tuner to e.g. 216 MHz, this parameter must be 3456. (Since 216*16 = 3456. This is to avoid the decimal points to the parameter list.)			

Name	Colour system	Transmission standard	Sound modulation
PAL_BG_S	PAL	BG	FM-Stereo
PAL_BG_M	PAL	BG	FM-Mono / NICAM
PAL_I_M	PAL	I	FM-Mono / NICAM
PAL_DK_S	PAL	DK	FM-Stereo
PAL_DK_M	PAL	DK	FM-Mono / NICAM
NTSC_M_S	NTSC	M	FM-Stereo

Video Standard ID: The table below shows which video standards are possible

ID	Europe	Nafta / Apac
0	PAL_BG_S	NTSC
1	PAL_BG_M	Invalid
2	PAL_I_M	Invalid
3	PAL_DK_S	Invalid
4	PAL_DK_M	Invalid

Tuner: Select the tuner type that you want to tune. This input is not mandatory. (If no input is detected, tuner will be defined run-time (if recognised).)

Tuner	Tuner ID	Runtime Detected
1	FE1316 (Europe Philips)	V
2	FE1319 (Europe Philips)	V
3	TMQZ2-403A (Europe ALPS)	
4	JS6B2-L121 (Europe Xuguang)	
5	TCPK0601 (APAC Samsung)	
6	TCMN0682 (NAFTA Samsung)	V
7	TCPK0600 (APAC Samsung)	
8	TCPD0601 (APAC Samsung)	
9	VPC12R_ENG56PPG1F (Panasonic)	

Error	Number	Description
	200100	Setting the tuner channel succeeded
	200101	Invalid user input
	200102	Getting the version of the set failed
	200103	Configuration of the tuner failed
	200104	Configuration of the IF module failed

Example	`DS:> 2001 3456 0 1`
	`200100:`
	`Test OK @`	

Note	**European sets only!!**		
Nucleus Name	**DS_FRE_CommunicationIfModule**		
Nucleus Number	2003		
Description	This nucleus checks the communication with the IF(Intermediate Frequency) module of the front end		
Technical	- Determine whether the IF module can be read through IIC		
Execution Time	Less than 1 second		
User Input	<Tuner> Tuner: Select the tuner type that you want to tune. This input is not mandatory. (If no input is detected, tuner will be defined run-time (if recognised).)		

Tuner	Tuner ID	Runtime Detected
1	FE1316 (Europe Philips)	V
2	FE1319 (Europe Philips)	V
3	TMQZ2-403A (Europe ALPS)	

Error	Number	Description
	200300	Communicating with the front end succeeded
	200301	The IIC bus was not accessible
	200302	There was a timeout reading the device
	200303	The IIC acknowledge was not received
	200304	An IIC-bus error occurred
	200305	Got unknown IIC bus error
	200306	The IIC bus initialisation failed
	200307	Not a Europe set
Example	DS:> 2003 3 200300: Test OK @	

3.21 HARD DISK DRIVE (HDD)

Nucleus Name	**DS_HDD_Communication**	
Nucleus Number	2100	
Description	Check the communication between the digital board and the hard disk drive by querying the device type of the hard disk drive	
Technical	- Initialise/start IDE - Check for an ATA device on the IDE interface	
Execution Time	3 seconds	
User Input	None	
Error	Number	Description
	210000	Communication with the hard disk drive succeeded
	210001	The initialisation of IDE failed
	210002	Communication with the hard disk drive failed
Example	```DS:> 2100 210000: Found a hard disk drive: MASTER device on IDE interface 1 Test OK @```	

Nucleus Name	**DS_HDD_Reset**	
Nucleus Number	2101	
Description	Reset the hard disk drive	
Technical	- Initialise/start IDE - Check for an ATA device on the IDE interface - Toggle the IDE reset pin of the selected interface	
Execution Time	1 second	
User Input	None	
Error	210100	Resetting the hard disk drive succeeded
	210101	The initialisation of IDE failed
	210102	Communication with the hard disk drive failed
	210103	Failed to reset the hard disk drive
Example	```DS:> 2101 210100: Resetting IDE interface 1 succeeded Test OK @```	

Nucleus Name	**DS_HDD_VersionGet**	
Nucleus Number	2102	
Description	Get the vendor- and product identification and the product revision level of the hard disk drive	
Technical	- Initialise/start IDE - Send ATA command IDENTIFY DRIVE - Display the serial, firmware revision and model information	
Execution Time	Less than 1 second.	
User Input	None	
Error	210200	Version info successfully
	210201	The initialisation of IDE failed
	210202	Communication with the hard disk drive failed
	210203	Failed to get version info from the hard disk drive
Example	```DS:> 2102 210200: Serial number = F19LP8WE,Firmware rev. = VAM51JJ0 ,Model nu mber = Maxtor 2F040L0 Test OK @```	

Nucleus Name	DS_HDD_WriteRead	
Nucleus Number	2103	
Description	Write data to the hard disk, read it back and verify the data read back.	
Technical	- Initialise/start IDE - Generate a random sector number - Generate test data to write to the disk - Read the data from the sector using READ_SECTOR(S) and store this in a temporarily buffer - Transfer the test data to the disk location using ATA command WRITE_SECTOR(S) - Read back the data from the disk location using ATA command READ_SECTOR(S) - Compare the two data areas and check whether the areas are equal - Write back the data from the temporarily buffer	
Execution Time	3 seconds	
User Input	None	
Error	210300	Version info successfully
	210301	The initialisation of IDE failed
	210302	Communication with the hard disk drive failed
	210303	Unable to retrieve device capabilities from HDD
	210304	Writing data to HDD failed
	210305	Reading back data from HDD failed
	210306	Data read back did not equal written data

Example	`DS:> 2103`
	`210300: OK, writing to sector 3f95776`
	`Test OK @`	

Nucleus Name	DS_HDD_CapabilitiesGet	
Nucleus Number	2104	
Description	Get the cylinders, heads and track information of the hard disk drive	
Technical	- Initialise/start IDE - Send ATA command Identify drive information - Display all required capabilities	
Execution Time	Less than 1 second.	
User Input	None	
Error	210400	Capabilities are displayed correctly
	210401	The initialisation of IDE failed
	210402	Communication with the hard disk drive failed
	210403	Failed to get information from the hard disk drive

Example	`DS:> 2104`
	`Number of cylinders              16383`
	`Number of heads                  16`
	`Number of sectors per track      63`
	`Capacity in sectors              80293248`
	`Number of current cylinders      16383`
	`Number of current heads          16`
	`Number of current sectors per track   63`
	`Current capacity in sectors      16514064`
	`Number of unformatted bytes per track  0`
	`Number of unformatted bytes per sector 0`
	`210400:`
	`Test OK @`	

Nucleus Name	**DS_HDD_Diagnostics**	
Nucleus Number	2105	
Description	Shall perform the internal diagnostic tests implemented by the hard disk drive.	
Technical	- Initialise/start IDE - Send the diagnostic (ATA) command to the HDD device	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	210500	The Diagnostic test on the hard disk drive device succeeded
	210501	The initialisation of IDE failed
	210502	The hard disk drive failed
	210503	The diagnostics ATA command failed
Example	DS:> 2105 210500: Test OK @	

Nucleus Name	**DS_HDD_UploadImage**	
Nucleus Number	2106	
Description	Upload raw data from the HDD to a DVD+RW	
Technical	- Initialise/start IDE - Check for an ATA device on the IDE interface - Check for an ATAPI DVD+RW drive - Calibrate the DVD+RW laser - Repeat until transfer is completed - Read x MB from HDD source sector into SDRAM - Write x MB from SDRAM to the destination sector on DVD+RW - Read sector 0x34000 on DVD containing the transfer table to use - Update the contents of the table and write it back	
Execution Time	Depending on the number of sectors to transfer it may take approximately 2 MB per second.	

User Input	The user can enter 3 parameters in the next format:
	                                 <COMMAND> <HDD sector> <nr of HDD sectors>
	<COMMAND> is one of the next strings:
	    • NEW: Create a new transfer image table, <HDD sector> and <nr of HDD sectors> must be entered. The tray of the DVD drive is sent out an the user is asked to insert a DVD+RW
	    • ADD: Add a section to the current transfer table, <HDD sector> and <nr of HDD sectors> must be entered
	    • READ: Read the current transfer image table from the DVD. The tray of the DVD drive is sent out an the user is asked to insert a DVD+RW
	    • VIEW: View the contents of the current transfer table
	    • GO: Copy data from the HDD to the DVD+RW according to the currently entered transfer table
	<HDD sector> = the sector on HDD to start reading from
	<HDD sectors> = the number of HDD sectors to transfer	

Error	Number	Description
	210600	Uploading image succeeded
	210601	The initialisation of IDE failed
	210602	Communication with the hard disk drive failed
	210603	Communication with the AV3 failed
	210604	No DVD+RW is available
	210605	Calibrating DVD+RW failed
	210607	Error while reading image data from HDD
	210608	Error while writing image to DVD+RW
	210609	Unable to update the transfer table on the DVD+RW

| Example | ```
DS:> 2106
210605: Invalid user input
Error @

DS:> 2106 READ
Please insert a writable DVD+RW
210609: Unable to update transfer table
Error @

DS:> 2106 NEW 0x1 2048
Creating new transfer table
Adding entry 1 to transfer table
Length 1 entries
210605:  NEW 0X1 2048
Test OK @

DS:> 2106 VIEW
Length 1 entries
Entry 1:
  hddPosition  : 0x1
  nrHddSectors : 0x800
  dvdPosition  : 0x34040
  nrDvdSectors : 0x200
210605:  VIEW
Test OK @

DS:> 2106 ADD 0x2001 20480
Adding entry 2 to transfer table
Length 2 entries
210605:  ADD 0X2001 20480
Test OK @

DS:> 2106 GO
Please insert a writable DVD+RW
Executing transfer table 1 of 1, size 1048576 bytes (=1 MB)
Calibrating laser of DVD drive
Start creating image on DVD at 0x34040. Checking ... <OK>
210600: Transfer OK
Test OK @
``` |

Nucleus Name	**DS_HDD_DownloadImage**	
Nucleus Number	2107	
Description	Download a raw image from a DVD+RW disc to the hard disc drive. This image will be written on the hard disc drive.	
Technical	- Initialise/start IDE - Check for an ATA device on the IDE interface - Check for an ATAPI DVD+RW drive - Mount the DVD containing the image to transfer - Read sector x containing the transfer table to use - Read the source sector, destination sector and transfer length from the transfer table - Repeat until transfer is completed - Read x MB from DVD source sector into SDRAM - Write x MB from SDRAM to the destination sector on HDD	
Execution Time	Assumption based on 4.3GB data → 11 movies of 3 minutes. 33 minutes	
User Input	Actions: The tray of the DVD drive is sent out and the user is asked to insert a DVD+RW	
Error	Number	Description
	210700	Downloading image succeeded
	210701	The initialisation of IDE failed
	210702	Communication with the hard disk drive failed
	210703	Communication with the AV3 failed
	210704	No disc is available
	210705	Invalid medium is mounted
	210706	Unable to read the transfer table from DVD
	210707	Error while reading image from DVD
	210708	Error while writing image to HDD
Example	```DS:> 2107```	

```
DS:> 2107
Please insert the Master DVD <OK>
Executing transfer table 1 of 4
524288 bytes
  Dvd Sector      0x50000
  Dvd Sector Count 256
  Hdd Sector      0x40000
  Hdd Sector Count 1024
please wait ..<OK>
Executing transfer table 2 of 4
10485760 bytes (=10 MB)
  Dvd Sector      0x70000
  Dvd Sector Count 5120
  Hdd Sector      0x60000
  Hdd Sector Count 20480
please wait ..<OK>
Executing transfer table 3 of 4
524288 bytes
  Dvd Sector      0x50000
  Dvd Sector Count 256
  Hdd Sector      0x40000
  Hdd Sector Count 1024
please wait ..<OK>
Executing transfer table 4 of 4
524288 bytes
  Dvd Sector      0x50000
  Dvd Sector Count 256
  Hdd Sector      0x40000
  Hdd Sector Count 1024
please wait ..<OK>
210700: Transfer OK
Test OK @
```

Nucleus Name	**DS_HDD_RandomReadScan**	
Nucleus Number	2108	
Description	Perform a short random read scan of x times 1000 commands (x is selectable between 1 to 20) to test the servo. If anything would be wrong with the servo or tracking, the result would be too slow. Recheck the LBA addresses that caused the disc to fail in order to avoid incorrect failure caused by shock or vibrations during the measurement.	

Technical	- Initialise the HDD connection
	- Get the user input
	- Generate a random sequence of test sectors
	- For every sector in the random sequence do
	  - Read 1000 sectors and measure the time to perform this action
	  - Update a list of statistics about the measurement
	- Display statistical information about the test sequence
	- If more than 10% above 160 ms and/or more than 1 request in between 200 & 250ms and/or requests above 250 ms make the result of the test fail.	

Execution Time	Depending on the user input x times 4 minutes	
User Input	parameters in the next format: \<nr_cmds\>\<GRAPH\> - Number of commands to send (in multiples of 1000), if no input is given 1000 commands will be sent - "GRAPH" optional to print out the measured read scan graph	
Error	Number	Description
	210800	Communication with the hard disk drive succeeded
	210801	The initialisation of the HDD failed
	210802	Invalid user input
	210803	Performance failure: more than 10% above 160 ms and/or more than 1 request in between 200 & 250ms and/or requests above 250 msec
	210804	Read error, unable to read a specified sector from disc

Example	<pre>DS:> 2108 1
	210800:
	Minimum access time = 142 msec
	Maximum access time = 159 msec
	Average access time = 146 msec
	Number of commands below 160 msec = 1000
	Number of commands between 160 and 200 msec = 0
	Number of commands between 200 and 250 msec = 0
	Number of commands above 250 = 0
	Test OK @</pre>	

Nucleus Name	**DS_HDD_LinearSurfaceScan**	
Nucleus Number	2109	
Description	Perform a linear surface scan so that most of the disc is covered.	

Technical	- Initialise the HDD connection
	- Get the user input
	- Generate a sequence of test sectors according to the user input
	- For every sector in the sequence do
	   - Read the sector and measure the time to perform this action
	   - Update a list of statistics about the measurement
	- Display statistical information about the test sequence
	- If more than 1% above 100 ms and/or more than 0.1% above 200 msec and/or requests above 300 msec make the result of the test fail.	

Execution Time	Depending on the user input and HDD size	

User Input	parameters in the next format:
	   <SECTORS> <STEP> <LOW> <HIGH>
	 where
	- SECTORS: Specifies the number of sectors to read in each access
	- STEP: Specifies the step (in sectors) between each access.
	- LOW: The start sector address of an explicit range of LBA
	                addresses to be used for testing. If no value is entered LBA
	                0 will be used
	- HIGH: The end sector address of an explicit range of LBA
	                addresses to be used for testing. If no value is entered the
	                maximum LBA will be used.
	The user must enter either no parameter or all parameters
	If no parameters are entered the next defaults will be used:
	  1000 sector each access, steps of 1000 sectors and an address
	  range from 0 to the maximum LBA	

Error	Number	Description
	210900	Communication with the hard disk drive succeeded
	210901	The initialisation of the HDD failed
	210902	Invalid user input
	210903	Performance failure: more than 10% above 160 ms and/or more than 1 request in between 200 & 250ms and/or requests above 250 msec
	210904	Read error, unable to read a specified sector from disc

Example	`DS:> 2109 1000 1000 0 100000`
	`210900:`
	`Executed 100 linear seeks of 1000 sectors each`
	`Minimum access time = 141 msec`
	`Maximum access time = 148 msec`
	`Average access time = 141 msec`
	`Number of commands below 160 msec = 100`
	`Number of commands between 160 and 200 msec = 0`
	`Number of commands between 200 and 250 msec = 0`
	`Number of commands above 250 = 0`
	`Test OK @`	

Nucleus Name	**DS_HDD_SpinOff**	
Nucleus Number	2110	
Description	Put the HDD in parking position by sending the sleep command so it can be moved without endangering the mechanical parts	
Technical	- Initialise/start IDE - Send the Sleep (ATA) command to the HDD device	
Execution Time	Less than 1 second.	
User Input	None	
Error	Number	Description
	211000	The spin off of the hard disk drive device succeeded
	211001	The initialisation of IDE failed
	211002	The hard disk drive failed
	211003	The sleep ATA command failed
Note	**All other HDD nuclei will not work until DS_HDD_Reset is executed**	

Example	`DS:> 2110`
	`211000:`
	`Test OK @`	

Nucleus Name	**DS_HDD_SectorRead**	
Nucleus Number	2111	
Description	Read 512 bytes from a specified sector on HDD	
Technical	- Get the user input - Read the data from the sector using READ_SECTOR(S) and display the contents	
Execution Time	Less than 1 second.	

User Input	3 parameters in the next format: \<sector> \<offset> \<length>
	  where
	   - sector is the sector to read from
	   - offset is the byte-offset in the sector buffer (0 .. 256)
	   - length the length (in bytes) of the data to display (1 .. 256)	

Error	Number	Description
	211100	Reading from HDD succeeded
	211101	Invalid user input
	211102	The initialisation of IDE failed
	211103	The hard disk drive failed
	211104	The read command failed

Example	`DS:> 2111 0x80001 0 128`
	`211100:`
	`0x00 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x08 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x10 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x18 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x20 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x28 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x30 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x38 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x40 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x48 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x50 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x58 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x60 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x68 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x70 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	`0x78 : 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF`
	
	`Test OK @`	

Nucleus Name	**DS_HDD_SetPower**	
Nucleus Number	2112	
Description	Set the power of the HDD On or Off	
Technical	- Get user input - Set the IDE1_POWER PIO line to the desired value	
Execution Time	Less than 1 second.	
User Input	1 parameter: "ON" , enables the power of the HDD "OFF" , turn off the power of the HDD	
Error	Number	Description
	211200	Setting the HDD power mode succeeded
	211201	Setting the HDD power mode failed
	211202	Invalid user input
Note	**All other HDD nuclei will not work until DS_HDD_Reset is executed**	
Example	DS:> 2112 off 211200: Test OK @	

3.22 DIGITAL TERRESTRIAL TUNER MODULE (DTTM)

Nucleus Name	DS_DTTM_Reset	
Nucleus Number	2200	
Description	Resets the DTTM module in diagnostic mode, and the communication to it.	
Note	This reset action is also done before the first of the other executed DTTM nuclei, to set-up communications with the DTT module.	
Technical	- Setup of the Basic Engine UART port, which connects to the DTT Module. - Make RTS pin of the UART inactive - Toggle the reset-pin of the DTT Module - Wait for DTTM to become online - Send the Boot loader start character to the DTT Module - Check if the DTT Module boot loader accepted the character. It must return "READY>" - Put the DTTM into D&S command mode. - Empty the DTTM output buffer - Set Reset flag to prevent resetting before every nucleus.	
Execution Time	Approx. 5 sec.	
User Input	None	
Error	Number	Description
	220000	The DTT Module has been successfully reset.
	220001	The DTT Module could not be reset.
	220002	DTT Module initialisation failed.
Example	DS:> 2200 220000: Test OK @	

Nucleus Name	DS_DTTM_TransparentCommand	
Nucleus Number	2201	
Description	Sends any DTTM DSW command to the DTT Module, and returns the response transparently.	
Note	No response will be returned before the required number of parameters (zero or more) has been supplied.	
Technical	- Sends all the parameters of this nucleus, starting with the DTTM command ID, to the DTT module. The parameter separator is changed into a single space character.	
Execution Time	Varies between 1 and 30 sec., depending on the supplied DTTM command.	
User Input	Any command ID with parameters, as described in the IBOZapper User Manual. [DTTM_UM]	
Error	Number	Description
	220100	Send/receive of DTTM command successful. (Irrespective of the result of this DTTM command)
	220101	Communication with the DTT Module failed.
	220102	DTT Module initialisation failed.
Example	DS:> 2201 1503 0x0111 0x0112 0x0111 220100: >0000: Test OK @	

Nucleus Name	DS_DTTM_Communication	
Nucleus Number	2202	
Description	Checks the communication between the digital board and the DTT Module.	
Technical	- Send the DTTM DSW command ID 9101 ("switch to command mode")	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	220200	Communication with the DTT Module succeeded.
	220201	Communication with the DTT Module failed.
	220202	DTT Module initialisation failed.

Example	DS:> 2202 220200: Test OK @

Nucleus Name	**DS_DTTM_FlashDeviceType**	
Nucleus Number	2203	
Description	Get the manufacture code and the device ID of the boot flash.	
Technical	- Send DTTM command ID 2701	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	220300	Retrieving Flash device type succeeded.
	220301	Flash device type could not be returned
	220302	Communication with the DTT Module failed.
	220303	DTT Module initialisation failed.
Example	DS:> 2203 220300: Flash manufacture code: 0x00002000 Flash device ID : 0x0000DF22 Test OK @	

Nucleus Name	**DS_DTTM_DiagSwVersion**	
Nucleus Number	2204	
Description	The version of Diagnostics software of the DTT module is read from Boot Flash memory.	
Technical	- Send DTTM command ID 6101	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	220400	Retrieving the DTTM DS version succeeded
	220401	DTTM DS version could not be returned
	220402	Communication with the DTT Module failed.
	220403	DTT Module initialisation failed.
Example	DS:> 2204 220400: DTT Module Diagnostics software version: 1.2 Test OK @	

Nucleus Name	**DS_DTTM_BootSwVersion**	
Nucleus Number	2205	
Description	The version of the Boot on the DTT module is read from Boot Flash memory. It checks also the CRC-value of the Boot software.	
Technical	- Send DTTM command ID 6201 - Send DTTM command ID 6202	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	220500	Retrieving the Boot SW version succeeded
	220501	Boot SW version could not be returned
	220502	Boot SW CRC value could not be returned
	220503	Boot SW CRC value is different from stored one
	220504	Communication with the DTT Module failed.
	220505	DTT Module initialisation failed.
Example	DS:> 2205 220500: DTT Module Boot software version: 0x00000002 Stored CRC value : 0x8980C5DC Calculated CRC value : 0x8980C5DC Test OK @	

Nucleus Name	**DS_DTTM_ApplSwVersion**	
Nucleus Number	2206	
Description	The version of Application software at the DTT module is read out of Boot Flash memory.	
Technical	- Send DTTM command ID 6301	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	220600	DTTM Application software version could be returned
	220601	No Application software present
	220602	DTTM Application software version could not be returned
	220603	Communication with the DTT Module failed.
	220604	DTT Module initialisation failed.

Example	`DS:> 2206`
	`220600:`
	`DTT Module Application software version: 0x0002 0x0605  (0x0265)`
	`DTT Module Hardware version          : 0x0102 0x0101  (0x1211)`
	`Test OK @`	

Nucleus Name	**DS_DTTM_HardwareVersion**	
Nucleus Number	2207	
Description	The Hardware version of the DTT module is read from Boot Flash memory at two places, and compared.	
Technical	- Send DTTM command ID 6801 - Send DTTM command ID 6301 - Compare the results, and report if different.	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	220700	Retrieving the DTTM Hardware version succeeded
	220701	DTTM Hardware version could not be returned
	220702	Stored DTTM Hardware version could not be returned
	220703	DTTM Hardware version does not start with 0x12
	220704	Downloaded DTTM Hardware version is different
	220705	No Application software present
	220706	Communication with the DTT Module failed.
	220707	DTT Module initialisation failed.

Example	`DS:> 2207`
	`220700:`
	`DTT Module Hardware model/version: 0x0102 0x0101  (0x1211)`
	`Test OK @`	

Nucleus Name	**DS_DTTM_SdramWriteRead**	
Nucleus Number	2208	
Description	Checks all data lines, address lines, and memory locations of the DTT module's SDRAM.	
Technical	- Send DTTM command ID 2201 (SDRAM stuck-at fault) with parameters: 0xa0000000 0x00800000 - Send DTTM command ID 2202 (SDRAM address w/r test) with parameters: 0xa0000000 0x00800000	
Execution Time	Approx. 45 sec.	
User Input	None	
Error	Number	Description
	220800	SDRAM WR test succeeded
	220801	SDRAM WR stuck-at test failed at given address
	220802	Other SDRAM WR stuck-at test failure
	220803	SDRAM WR write/read test failed at given address
	220804	Other SDRAM WR write/read test failure.
	220805	Communication with the DTT Module failed.
	220806	DTT Module initialisation failed.

Example	`DS:> 2208`
	`220800:`
	`Test OK @`	

Nucleus Name	**DS_DTTM_ SdramWriteReadFast**	
Nucleus Number	2209	
Description	Checks all datalines, address lines, and some memory locations of the DTT module's SDRAM.	
Technical	- Send DTTM command ID 2202	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	220900	SDRAM WR test succeeded
	220901	SDRAM WR test failed at given address
	220902	SDRAM WR fast test failed w.r.t. data lines.
	220903	Other fast SDRAM test failure
	220904	Communication with the DTT Module failed.
	220905	DTT Module initialisation failed.

Example	`DS:> 2209`
	`220900:`
	`Test OK @`	

Nucleus Name	**DS_DTTM_EepromWriteRead**	
Nucleus Number	2210	
Description	Checks whether the bit cells in the User EEPROM can toggle.	
Technical	Send the DTTM command ID 2402 (stuck-at fault test)	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	221000	EEPROM WR test succeeded
	221001	EEPROM WR test failed at given address
	221002	Other EEPROM test failure
	221003	Communication with the DTT Module failed.
	221004	DTT Module initialisation failed.

Example	`DS:> 2210`
	`221000:`
	`Test OK @`	

Nucleus Name	**DS_DTTM_FatalErrorRead**	
Nucleus Number	2211	
Description	Reads the fatal error database from the User EEPROM.	
Technical	- Send DTTM command ID 6303	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	221100	Retrieving the Fatal error list succeeded
	221101	Fatal error list could not be returned
	221102	Communication with the DTT Module failed.
	221103	DTT Module initialisation failed.

Example	`DS:> 2211`
	`221100: Fatal error database content:`
	`0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00`
	`0x00 0x00 0x00`
	`0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00`
	`0x00 0x00 0x00`
	`0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00`
	`0x00 0x00 0x00`
	`0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00`
	`0x00 0x00 0x00`
	
	`Test OK @`	

Nucleus Name	**DS_DTTM_FatalErrorClear**	
Nucleus Number	2212	
Description	Clears the fatal error database in the User EEPROM.	
Technical	- Send DTTM command ID 6304	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	221200	Clearing the Fatal error list succeeded
	221201	Fatal error list could not be cleared
	221202	Communication with the DTT Module failed.
	221203	DTT Module initialisation failed.
Example	DS:> 2212 221200: Test OK @	

Nucleus Name	**DS_DTTM_FactoryBitSet**	
Nucleus Number	2213	
Description	The factory bit is set in the user EEPROM.	
Technical	- Send DTTM command ID 6203	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	221300	Setting the Factory bit succeeded
	221301	Factory bit could not be set
	221302	Communication with the DTT Module failed
	221303	DTT Module initialisation failed.
Example	DS:> 2213 221300: Test OK @	

Nucleus Name	**DS_DTTM_PllVcxoFrequencySet**	
Nucleus Number	2214	
Description	Set the PLL/VCXO frequency values of the processor. The M, N, and P values determine the PLL's clockspeed.	
Technical	- Send DTTM command ID 3101, with the given parameters.	
Execution Time	Approx. 2 sec.	
User Input	1. PLLNumber: The seq. nr of PLL to be changed [0,3] 2. Mvalue : PLL M value [0x1,0x7FF] 3. NValue : PLL N value [0x1,0xFF] 4. Pvalue : PLL P value [0x1,0x1F]	
Error	Number	Description
	221400	Setting the PLL/VCXO parameter values was successful
	221401	Insufficient number of input data supplied
	221402	One of the parameters not within range
	221403	The PLL/VCXO values could not be set
	221404	Communication with the DTT Module failed.
	221405	DTT Module initialisation failed.
Example	DS:> 2214 0 0xef 0x03 0x01 221400: Test OK @	

Nucleus Name	**DS_DTTM_PllVcxoFrequencyGet**	
Nucleus Number	2215	
Description	Retrieves the PLL/VCXO values of the processor.	
Technical	- Send DTTM command ID 3102 with the PLL number.	
	- Parse and format the response values.	
Execution Time	< 1 sec.	
User Input	PLLNumber: The seq. nr of PLL to be queried [0,3]	
Error	Number	Description
	221500	Retrieving the PLL/VCXO parameter values was successful
	221501	Insufficient number of input data supplied
	221502	Non-existent PLL number
	221503	The PLL/VCXO values of the processor could not be retrieved.
	221504	Communication with the DTT Module failed
	221505	DTT Module initialisation failed.
Example	DS:> 2215 0 221500: PLL M parameter value: 0x00EF PLL N parameter value: 0x0003 PLL P parameter value: 0x0001 Test OK @	

Nucleus Name	**DS_DTTM_IicWrite**	
Nucleus Number	2216	
Description	Performs an IIC write action on the DTT module.	
Technical	- Send DTTM command ID 2902 with the supplied parameters, separated by a single space character.	
Execution Time	< 1 sec.	
User Input	1. IicChannel : IIC channel of the device 2. IicDeviceAddress : address of IIC device to write to 3. NrOfSubAddressBytes: number of sub-address bytes (=x) 4. SubAddressBytes : x sub-address bytes 5. NrOfValues : number of values to write (=y) 6. Data : y bytes data to write	
Error	Number	Description
	221600	The test was successful
	221601	Insufficient number of input data supplied
	221602	No response from the given device-address
	221603	Incorrect device address was given
	221604	Unable to send IIC start-condition
	221605	Error during write to IIC-address
	221606	Device does not support IIC write
	221607	The IIC write action failed.
	221608	Communication with the DTT Module failed.
	221609	DTT Module initialisation failed.
Example	DS:> 2216 0x00 0x00 0 2 0xAA 0xBB 221600: Test OK @	

Nucleus Name	**DS_DTTM_IicRead**	
Nucleus Number	2217	
Description	Performs an IIC read action on the DTT module.	
Technical	- Send DTTM command ID 2901 with the supplied parameters, separated by a single space character.	
Execution Time	< 1 sec.	
User Input	1. IicChannel : IIC channel of the device 2. IicDeviceAddress : address of IIC device to read from 3. NrOfSubAddressBytes: number of sub-address bytes (=x) 4. SubAddressBytes : x sub-address bytes 5. NrOfValues : number of values to read (=y)	
Error	Number	Description
	221700	The test was successful
	221701	Insufficient number of input data supplied
	221702	No response from the given device-address
	221703	Incorrect device address was given
	221704	Unable to send IIC start-condition
	221705	Error during read from IIC-address
	221706	Device does not support IIC read
	221707	The IIC read action failed.
	221708	Communication with the DTT Module failed.
	221709	DTT Module initialisation failed.
| Example | ```
DS:> 2217 0x00 0x10 2 0x00 0x00 2
221700: Read values: 0x17 0x00
Test OK @
``` | |

Nucleus Name	**DS_DTTM_AvTsPidSet**	
Nucleus Number	2218	
Description	Sets the PID values of the transport stream.	
Technical	- Send the DTTM command ID 1503, with the supplied parameters.	
Execution Time	< 1 sec.	
User Input	1. Video PID value [0x0000-0x1FFF] 2. Audio PID value [0x0000-0x1FFF] 3. PRC PID value [0x0000-0x1FFF]	
Error	Number	Description
	221800	The TS PID's are set successfully
	221801	Insufficient number of input data supplied
	221802	One or more PID values is out of range
	221803	The TS PID's could not be set.
	221804	Communication with the DTT Module failed
	221805	DTT Module initialisation failed.
| Example | ```
DS:> 2218 0x79 0x7a 0x79
221800:
Test OK @
``` | |

Nucleus Name	**DS_DTTM_AvMojoBeepOn**	
Nucleus Number	2219	
Description	Generates the Mojo beep.	
Technical	- Send the DTTM command ID 1605.	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	221900	The Mojo beep has been turned on successfully
	221901	Can not start another AV test (one is already running)
	221902	The Mojo beep could not be turned on
	221903	Communication with the DTT Module failed
	221904	DTT Module initialisation failed.
| Example | ```
DS:> 2219
221900:
Test OK @
``` | |

Nucleus Name	**DS_DTTM_AvMojoBeepOff**	
Nucleus Number	2220	
Description	Stops generating the Mojo beep.	
Technical	- Send the DTTM command ID 1606.	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	222000	The Mojo beep has been turned off successfully
	222001	The Mojo beep could not be turned off
	222002	Communication with the DTT Module failed
	222003	DTT Module initialisation failed.
Example	DS:> 2220 222000: Test OK @	

Nucleus Name	**DS_DTTM_ AvAudioVideoStreamPlay**	
Nucleus Number	2221	
Description	Selects a predefined stream, and configures the peripherals to enable streaming, and starts playing the selected audio and video streams.	
Technical	- Send the DTTM command ID 1002 with the selected stream number - Send the DTTM command ID 1001. - Ignore possible error code 2203 (AV play test already started)	
Execution Time	< 2 sec.	
User Input	Stream number: Stream number to be selected. [0-9]	
Error	Number	Description
	222100	The given predefined stream has been selected and started successfully
	222101	Insufficient number of input data supplied
	222102	The given stream could not be selected
	222103	The given stream number is not within range
	222104	The predefined stream has an out-of-range value
	222105	No carrier found
	222106	The selected predefined stream could not be started
	222107	Communication with the DTT Module failed
	222108	DTT Module initialisation failed.
Example	DS:> 2221 2 222100: Test OK @	

Nucleus Name	**DS_DTTM_ AvPredefinedStreamGet**	
Nucleus Number	2222	
Description	Retrieves the settings of the currently selected stream.	
Technical	- Send the DTTM command ID 1003 - Parse and format the response values.	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	222200	The settings of the currently selected predefined stream are retrieved successfully
	222201	The settings of the currently selected predefined stream could not be retrieved
	222202	Communication with the DTT Module failed
	222203	DTT Module initialisation failed.

Example	DS:> 2222
	222200: The settings of the selected stream are:
	        current video standard : 0 = PAL
	        current video PID : 0x0083
	        current audio PID : 0x0084
	        current PCR PID : 0x0083
	        tuner frequency : 506000000 Hz
	        tuner bandwidth : 8000000 Hz
	        tuner spectral inversion: 0 = Normal
	Test OK @	

Nucleus Name	**DS_DTTM_ AvPredefinedStreamChange**	
Nucleus Number	2223	
Description	Adds or changes the settings of a predefined stream.	
Note	No parameter validity check is being performed. This is done when this stream is selected. Stream no 0 is built-in and cannot be changed.	
Technical	- Send the DTTM command ID 1004, with the supplied parameters.	
Execution Time	< 1 sec.	
User Input	1. Stream number : The stream to be changed. [1-9] 2. VideoStandard : video standard (0=PAL, 1=SECAM) 3. VideoTypeCh3 : TV channel video type (0=RGB, 1=YPbPr, 2=YC) 4. VideoTypeCh2 : TV channel video type (0=CVBS, 1=YC) 5. VideoTypeCh1 : AUX channel video type (0=YC, 1=CVBS) 6. VideoPid : current video PID [0x0000-0x1FFF] 7. AudioPid : current audio PID [0x0000-0x1FFF] 8. PCRPid : current PCR PID [0x0000-0x1FFF] 9. Frequency : tuner frequency [Hz] [5000000, 859000000] 10. Bandwidth : tuner bandwidth (0=7 MHz, 1=8 MHz) 11. SpectralInversion: tuner spectral inversion (0=normal, 1=inverse)	
Error	Number	Description
	222300	A predefined stream has been added or changed successfully
	222301	Insufficient number of input data supplied
	222302	Could not change or add a predefined stream
	222303	Communication with the DTT Module failed
	222304	DTT Module initialisation failed.

Example	`DS:> 2223 4 0 0 0 1 0x79 0x7a 0x79 506000000 1 0`
	`222300:`
	`Test OK @`	

Nucleus Name	**DS_DTTM_ AvMojoColourbarOn**	
Nucleus Number	2224	
Description	Activates the Mojo colour bar.	
Note	This nucleus will return with error 222401, if another AV test is already running.	
Technical	- Send the DTTM command ID 1607	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	222400	The Mojo colour bar has been activated successfully
	222401	Can not start another AV test (one is already running)
	222402	The Mojo colour bar could not be activated
	222403	Communication with the DTT Module failed
	222404	DTT Module initialisation failed.

Example	`DS:> 2224`
	`222400:`
	`Test OK @`	

Nucleus Name	**DS_DTTM_ AvMojoColourbarOff**	
Nucleus Number	2225	
Description	Turns off the Mojo colour bar.	
Technical	- Send the DTTM command ID 1608	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	222500	The Mojo colour bar has been turned off successfully
	222501	The Mojo colour bar could not be turned off
	222502	Communication with the DTT Module failed
	222503	DTT Module initialisation failed.

Example	`DS:> 2225`
	`222500:`
	`Test OK @`	

Nucleus Name	**DS_DTTM_ AvVideoStandardSet**	
Nucleus Number	2228	
Description	Configures the Mojo video channel to the given video standard.	
Technical	- Send the DTTM command ID 1501, together with supplied input value.	
Execution Time	< 1 sec.	
User Input	VideoStandard: Video standard to set the channel to (0=PAL, 1=SECAM)	
Error	Number	Description
	222800	Succeeded in configuring the Mojo video channel
	222801	Insufficient number of input data supplied
	222802	Non-existent video standard
	222803	Configuring the Mojo video channel was not successful
	222804	Communication with the DTT Module failed.
	222805	DTT Module initialisation failed.

Example	`DS:> 2228  0`
	`222800:`
	`Test OK @`	

Nucleus Name	**DS_DTTM_ AvVideoOutputSet**	
Nucleus Number	2229	
Description	Configures the video output to the selected video standard.	
Technical	- Send the DTTM command ID 1504, together with supplied input values.	
Execution Time	< 1 sec.	

User Input	1. VideoDAC : The video DAC to configure
	                    0 = RGB / YUV / YC (TV DAC's)
	                    1 = CVBS / Y (TV DAC)
	                    2 = YC / CVBS (VCR DAC's)
	2. VideoOutput: The video output to set the DAC's to
	                    0 = RGB or CVBS or YC (resp. the chosen DAC's)
	                    1 = YUV or YC or CVBS
	                    2 = YC	

Error	Number	Description
	222900	Video output could be set successfully
	222901	Insufficient number of input data supplied
	222902	One of the parameter values is out of range
	222903	Video output could not be set
	222904	Communication with the DTT Module failed
	222905	DTT Module initialisation failed.

Example	`DS:> 2229 0 1`
	`222900:`
	`Test OK @`	

Nucleus Name	**DS_DTTM_FreRegisterRead**	
Nucleus Number	2230	
Description	Reads a single byte of data out of a demodulator register.	
Technical	- Send the DTTM command ID 3601, together with supplied input value.	
Execution Time	< 1 sec.	
User Input	Address: register address to read from	
Error	Number	Description
	223000	The selected address register could be read successfully
	223001	Insufficient number of input data supplied
	223002	The register address value is out-of-range
	223003	The selected address register could not be read
	223004	Communication with the DTT Module failed
	223005	DTT Module initialisation failed.

Example	`DS:> 2230 0x12`
	`223000: The value of this register: 0x00`
	`Test OK @`	

Nucleus Name	**DS_DTTM_FreRegisterWrite**	
Nucleus Number	2231	
Description	Writes a single byte of data out to a demodulator register.	
Technical	- Send the DTTM command ID 3602, together with supplied input values.	
Execution Time	< 1 sec.	
User Input	Address: register address to write to	
	Data : the value to be written to the register	
Error	Number	Description
	223100	The selected address register has been written successfully
	223101	Insufficient number of input data supplied
	223102	The register address value is out-of-range
	223103	The selected address register could not be written
	223104	Communication with the DTT Module failed
	223105	DTT Module initialisation failed.
Example	DS:> 2231 0x12 0xb1 223100: Test OK @	

Nucleus Name	**DS_DTTM_FreLockStatusGet**	
Nucleus Number	2232	
Description	Checks and returns the lock status of the front-end.	
Technical	- Send the DTTM command ID 3607.	
	- Parse and format the response values.	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	223200	The lock status of the front-end is returned successfully
	223201	The lock status of the front-end could not be returned
	223202	Communication with the DTT Module failed
	223203	DTT Module initialisation failed.

Example	DS:> 2232
	223200: Front-end lock status: 0x0F
	        Internal PLL locked : YES
	        Frequency Locked : YES
	        Time locked : YES
	        TPS locked : YES
	
	Test OK @	

Nucleus Name	**DS_DTTM_FreLockingParamSet**	
Nucleus Number	2233	
Description	Configures the tuner and the demodulator according to the given parameters. First the configuration mode of the front-end is set to Manual or Autoconfig mode, depending on the number of supplied parameters.	
Technical	- Send the DTTM command ID 3604, with parameter value '0' to put the front-end to Manual configuration mode, or '1' for AutoConfig configuration mode. - Send the DTTM command ID 3605, together with supplied input value.	
Execution Time	< 1 sec.	
User Input	1. Frequency : Tuner frequency [Hz] [5000000 – 859000000] 2. Bandwidth : Tuner bandwidth (0=7MHz, 1=8MHz) 3. SpectralInversion : Spectral inversion (0=Normal, 1=Inverse) The following parameters are optional (Manual mode): 4. Constellation : Constellation type (0=QPSK, 1=QAM16, 2=QAM64, or 3=unknown) 5. Hierarchy : Hierarchy (0=None, 1=Alpha 1,2=Alpha 2, or 3=Alpha 4) 6. CodeRateHigh : High priority CodeRate (0=1_2, 2=2_3, 2=3_4, 3=5_6, 4=7_8, 5=unknown) 7. CodeRateLow : Low priority CodeRate (0-5) 8. GuardInterval : Guard interval (0=1/32, 1=1/16, 2=1/8, 3=1/4, 4=unknown) 9. TransmissionMode : Transmission mode (0=2 KO, 1=8 KO, or 3=unknown) 10. FrequencyOffset : Frequency offset [MHz] (0=none, 1=+1/6, 2=-1/6, 3=+2/6, 4=-2/6, 5=+3/6, 6=-3/6,7=unknown) 11. Priority : Priority (0=High, 1=Low, 2=Both, or 3=unknown)	
Error	Number	Description
	223300	The tuner and demodulator have been configured successfully
	223301	Insufficient number of input data supplied
	223302	One or more parameters is out-of-range
	223303	No carrier could be found with these parameters
	223304	The tuner and demodulator could not be configured
	223305	False lock achieved (incorrect parameters).
	223306	Communication with the DTT Module failed
	223307	DTT Module initialisation failed.
Example	DS:> 2233 506000000 1 0 2 0 4 0 0 0 0 0 223300: Test OK @	

Nucleus Name	**DS_DTTM_FreLockingParamGet**	
Nucleus Number	2234	
Description	Retrieves the tuner and demodulator settings.	
Technical	- Send the DTTM command ID 3606.	
	- Parse and format the response values.	
Execution Time	> 1 sec.	
User Input	None	
Error	Number	Description
	223400	The tuner and demodulator settings have been retrieved successfully
	223401	The tuner and demodulator settings could not be retrieved
	223402	Communication with the DTT Module failed
	223403	DTT Module initialisation failed.

Example	<pre>DS:> 2234
	223400: The front-end locking parameters are:
	        Tuner frequency : 506000000 Hz
	        Tuner bandwidth : 8000000 Hz
	        Spectral inversion : 0 = Normal
	        Constellation type : 2 = QAM64
	        Hierarchy : 0 = None
	        High Priority CodeRate: 4 = 7_8
	        Low Priority CodeRate: 0 = 1_2
	        Guard Interval : 0 = 1/32
	        Transmission mode : 0 = 2 KO
	        Frequency offset : 0 = None
	        Priority : 0 = High
	Test OK @</pre>	

Nucleus Name	**DS_DTTM_FreSignalStatusGet**	
Nucleus Number	2235	
Description	Retrieves the status of the current signal.	
Technical	- Send the DTTM command ID 3608.	
	- Parse and format the response values.	
Execution Time	> 1 sec.	
User Input	None	
Error	Number	Description
	223500	The current signal status has been retrieved successfully
	223501	The current signal status could not be retrieved
	223502	Communication with the DTT Module failed
	223503	DTT Module initialisation failed.

Example	<pre>DS:> 2235
	223500: Signal status:
	        CBER : 25e-7
	        VBER : 0e-6
	        AGC IF : 160
	        AGC RF : Unknown
	        SNR : 254
	        Cell ID: 0x0000
	Test OK @</pre>	

Nucleus Name	**DS_DTTM_SwitchCVBSPath**	
Nucleus Number	2236	
Description	This function switches the CVBS path on the DTTM module by having the MOJO (on the DTTM module) toggle a PIO pin. There are two paths: - Passing video from the analogue board to the digital board - Passing video from the analogue board through the DTT module to the digital board (where the signal might be changed by DTT)	
Technical	- Send the DTTM command ID 3103. - Parse the response values and change bit two of the PIO pin. - Set the new PIO value using DTTM command ID 3104	
Execution Time	> 1 sec.	
User Input	There are three possibilities here: - 'pass' - The video is passed from the analogue board to the digital board - '' - The video is passed from the analogue board to the digital board - 'dttm' - The video is passed from the analogue board through the DTT module to the digital board (where the signal might be changed by DTT)	
Error	Number	Description
	223600	Switching the CVBS path through DTTM PIO succeeded
	223601	Executing the DTTM PIO write failed
	223602	Switching the CVBS path through DTTM PIO failed
	223603	DTT Module initialisation failed.
Example	DS:> 2236 pass 223600: Test OK @ DS:> 2236 dttm 223600: Test OK @ DS:> 2236 223600: Test OK @	

3.23 UNIVERSAL SERIAL BUS (USB)

Nucleus Name	DS_USB_Communication	
Nucleus Number	2300	
Description	This nucleus tests whether the USB controller can be communicated with properly.	
Technical	- Test whether data can be written to and read back from the scratch register in the USB controller chip	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	230000	Communicating with the USB controller succeeded
	230001	Communicating with the USB controller failed
Example	DS:> 2300 230000: Test OK @	

Nucleus Name	DS_USB_DevTypeGet	
Nucleus Number	2301	
Description	This nucleus retrieves the device and type information of the USB controller	
Technical	- Read out the chip-ID and revision register and return the info to the user	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	230100	Retrieving the device type information succeeded
Example	DS:> 2301 230100: USB Controller chip ID: 0x6123 Revision:0x10. Test OK @	

Nucleus Name	DS_USB_Reset	
Nucleus Number	2302	
Description	This nucleus performs a software reset of the controller and tests whether the functional state of the controller has become USBReset	
Technical	- Write the command to software reset the controller and read back the functional status of the controller	
Execution Time	< 1 sec.	
User Input	None	
Error	Number	Description
	230200	Resetting the host controller succeeded
	230201	Resetting the host controller failed
Example	DS:> 2302 230200: Test OK @	

3.24 AUDIO VIDEO LINK (AVL) BOARD

Nucleus Name	DS_AVL_Communications	
Nucleus Number	2600	
Description	This nucleus attempts to communicate with the AVL board by requesting the AVL controller to transmit its software major and minor versions.	
Technical	- Packetize the AVL *ReadVersion* command. - Send the command to the AVL board via IIC interface. - Read the major and minor version bytes (2 bytes total) from the AVL board. - Display the read versions via the diagnostics serial interface.	
Execution Time	Less than 1 sec.	
User Input	None	
Error	Number	Description
	260000	Communications with the AVL board succeeded
	260001	AVL board communications failed
	260002	AVL board communications timeout
	260003	IIC bus not accessible
	260004	IIC ACK not received
	260005	IIC stop condition error
	260006	Unknown error
Example	DS:> 2600 260000: Software Version: 0x 1 0x 4 Test OK @	

Nucleus Name	DS_AVL_Reset	
Nucleus Number	2601	
Description	This nucleus resets the AVL controller by sending it a AVL reset message via the IIC interface.	
Technical	- Packetize the AVL *DS_AVL_WriteReadAVLInRC* command with "On" as argument. - Send message to AVL controller. - Read the AVLInRC bit from the AVL controller to make sure it has been set. - Packetize the AVL *SendReset* command. - Send the command to the AVL board via IIC interface. - Wait 150 milliseconds. - Packetize and send the DS_*AVL_ReadAVLInRC* version command to the AVL controller - Read one byte from the AVL controller, if the controller has been reset properly, this value will be zero if reset has completed successfully. - Display the reset results to user.	
Execution Time	Less than 1 sec.	
User Input	None	
Error	Number	Description
	260100	AVL board reset successful
	260101	IIC bus error
	260102	Timeout trying to read from AVL board
	260103	IIC bus is not accessible
	260104	IIC ACK not received
	260105	IIC stop condition error
	260106	Unknown error
	260107	AVL reset fail
	260108	Unable to set test mode bit in AVL board
Example	DS:> 2601 260100: Test OK @	

Nucleus Name	DS_AVL_MXConfigRead	
Nucleus Number	2602	
Description	This nucleus retrieves the MX Config information from the AVL board and displays it.	
Technical	- Packetize the AVL *ReadMxConfig* command. - Send the command to the AVL board via IIC interface. - Read one byte from the AVL board. - Decode and display the MX Config information.	
Execution Time	Less than 1 sec.	
User Input	None	
Error	Number	Description
	260200	Read MX Configuration settings successful.
	260201	IIC bus error
	260202	Timeout trying to read from AVL board
	260203	IIC bus is not accessible
	260204	IIC ACK not received
	260205	IIC stop condition error
	260206	Unknown error
Example	DS:> 2602 260200: MX mode Test OK @	

Nucleus Name	DS_AVL_MXConfigWriteRead	
Nucleus Number	2603	
Description	This nucleus writes the MX Config information to the AVL board. It then reads back the information from the AVL board and displays it.	
Technical	- Packetize the AVL *WriteMxConfig* command with user argument. - Send the command to the AVL board via IIC interface. - Packetize the AVL *ReadMxConfig* command. - Send command to AVL board via IIC interface. - Read one byte from the AVL board. - Decode and display the MX Config information.	
Execution Time	Less than 1 sec.	
User Input	"On" or "Off"	
Error	Number	Description
	260300	MX configuration setting written to and verified successfully.
	260301	IIC bus error
	260302	Timeout trying to read from AVL board
	260303	IIC bus is not accessible
	260304	IIC ACK not received
	260305	IIC stop condition error
	260306	Unknown error
	260307	Invalid parameter supplied to nucleus
	260308	The write-read operation on the MX Configuration setting failed.
Example	DS:> 2603 off 260200: Non MX mode Test OK @	

Nucleus Name	DS_AVL_UARTByteWrite
Nucleus Number	2604
Description	This nucleus writes one byte to the UART of the AVL board for transmission.
Technical	- Packetize the AVL *WriteUart* command with user byte to send. - Send the command to the AVL board via IIC interface. - The AVL controller receives the message and transmits the byte via its UART interface. - If the AVL Tx and Rx lines has been shorted for testing, the AVL controller receives the transmitted byte immediately and buffers it for a possible read operation later.
Execution Time	Less than 1 sec.

User Input	Data byte to send. Byte supplied must be printable. Can be in hexadecimal or just the character to send. See example.	
Error	Number	Description
	260400	Command successful, byte written to AVL UART output.
	260401	IIC bus error
	260402	Timeout trying to read from AVL board
	260403	IIC bus is not accessible
	260404	IIC ACK not received
	260405	IIC stop condition error
	260406	Unknown error
	260407	Invalid parameter supplied to nucleus
	260408	The byte write to AVL UART output port has failed.
Example	DS:> 2604 0x42 260400: Character sent successfully: B Test OK @ DS:>2604 c 260400: Character sent successfully: c Test OK @	

Nucleus Name	DS_AVL_UARTByteRead	
Nucleus Number	2605	
Description	This nucleus tells the AVL controller to retrieve from its internal memory, the previously received byte from the UART interface and send the data byte back to the host processor for display on the diagnostics logging port. Sending this command without a previous **DS_AVL_UARTByteWrite** command will retrieve whatever data buffered in the AVL controller's UART receive buffer at that time.	
Technical	- Packetize the AVL *ReadUart* command. - Send the command to the AVL board via IIC interface. - The AVL controller receives the message and retrieves the data byte previously received. - This data is transmitted to the host processor and displayed via the diagnostics UART interface.	
Execution Time	Less than 1 sec.	
User Input	Data byte to send	
Error	Number	Description
	260500	One printable byte read successfully from AVL and displayed.
	260501	IIC bus error
	260502	Timeout trying to read from AVL board
	260503	IIC bus is not accessible
	260504	IIC ACK not received
	260505	IIC stop condition error
	260506	Unknown error
Example	DS:> 2605 260500: Character received: c Test OK @	

Nucleus Name	DS_AVL_UARTByteWriteRead
Nucleus Number	2606
Description	This nucleus executes an AVL UART write and AVL UART read operation back to back. For this test to work, the Tx and Rx UART lines on the AVL board needs to be shorted.

Technical	- Packetize the AVL *WriteUart* command with user byte to send.
	- Send the command to the AVL board via IIC interface.
	- The AVL controller receives the message and transmits the byte via its UART interface.
	- If the Tx and Rx lines are shorted for testing, the AVL controller receives the transmitted byte almost immediately and buffers it.
	- The *ReadUart* command is packetized and transmitted to the AVL controller.
	- The AVL controller receives the command, reads the UART receive buffer, and returns the byte to the host processor.
	- The host processor receives the read byte from the AVL controller, performs a comparison with the byte that was sent and displays the appropriate pass/fail message via the diagnostics UART interface.
Execution Time	Less than 1 sec.
User Input	Data byte to send, byte needs to be a printable character. Input byte can be the character itself or its hexadecimal representation. See example.

Error	Number	Description
	260600	One printable byte has been sent
	260601	IIC bus error
	260602	Timeout trying to read from AVL board
	260603	IIC bus is not accessible
	260604	IIC ACK not received
	260605	IIC stop condition error
	260606	Unknown error
	260607	Invalid parameter supplied to nucleus
	260608	Byte write read to /from AVL board has failed.
Example	``` DS:> 2606 0x45 260600: Test OK @ DS:> 2606 k 260600: Test OK @ ```	

Nucleus Name	**DS_AVL_AVLInRCWriteRead**	
Nucleus Number	2607	
Description	This nucleus enables or disables the test mode of the AVL board.	
	1. This mode is meant for board level testing.	
	2. A periodic signal is generated externally (e.g. 1KHz pulse) and injected into the SC1_Pin8 input of the AVL circuit. Pin8 biasing input from ASP can be grounded.	
	3. The AVL controller polls the AVL_IN input pin, samples the level on this pin and output the sampled level on the RC6 output line (intended for the ASP processor).	
	4. A signal generator needs to be connected to the input source and an oscilloscope/logic analyzer needs to be connected to the RC6 line to measure and verify the output signal.	
Technical	- Packetize the *WriteTestAVLInRC* command with on/off byte to send.	
	- Send the message to the AVL controller.	
	- Packetize the *ReadTestAVLInRC* command and send it to the AVL controller.	
	- Read back one byte from the AVL controller.	
	- Decode the results and display via diagnostics UART interface.	
Execution Time	Less than 1 sec.	
User Input	"On" or "Off".	
Error	Number	Description

	260700	Setting the AVLInRC bit is successful
	260701	IIC bus error
	260702	Timeout trying to read from AVL board
	260703	IIC bus is not accessible
	260704	IIC ACK not received
	260705	IIC stop condition error
	260706	Unknown error
	260707	Invalid parameter supplied as nucleus input
	260708	Write and read back operation for this bit has failed.
Example	DS:> 2607 on 260700: Test OK @ DS:> 2607 off 260700: Test OK @	

Nucleus Name	**DS_AVL_AVLInRCRead**	
Nucleus Number	2608	
Description	This nucleus requests the AVL controller to read the test mode field and send it back to the host processor.	
Technical	- Packetize and send the *ReadTestAVLInRC* command to the AVL controller. - Read back one byte from the AVL controller. - Decode the results and display via diagnostics UART interface.	
Execution Time	Less than 1 sec.	
User Input	None.	
Error	Number	Description
	260800	Test mode has been read successfully and displayed.
	260801	IIC bus error
	260802	Timeout trying to read from AVL board
	260803	IIC bus is not accessible
	260804	IIC ACK not received
	260805	IIC stop condition error
	260806	Unknown error
Example	DS:> 2608 260800: Test Mode: OFF Test OK @	

Nucleus Name	**DS_AVL_AVLFormatInRead**	
Nucleus Number	2609	
Description	This nucleus requests the AVL controller to read the FORMAT_IN pin of the AVL controller and send the logic level back to the host processor. This pin should be HIGH when the DVDR is in low power standby and LOW otherwise.	
Technical	- Packetize and send the *ReadFormatIn* command to the AVL controller. - Read back one byte from the AVL controller. - Decode the results and display via diagnostics UART interface.	
Execution Time	Less than 1 sec.	
User Input	None.	
Error	Number	Description
	260900	AVL_FORMAT_IN information received and displayed
	260901	IIC bus error
	260902	Timeout trying to read from AVL board
	260903	IIC bus is not accessible
	260904	IIC ACK not received
	260905	IIC stop condition error
	260906	Unknown error

Example	DS:> 2609
	260900: Format In: LOW
	Test OK @

3.25 SCRIPT (SCRIPT)

Nucleus Name	**DS_IH_ScriptHandler**
Nucleus Number	Script
Description	The test requires no user interaction. A number of nuclei will be run before a message is returned indicating if there is a failure in the DVD Recorder. When a nucleus failed, the script stops and displays the message "**FAIL**". Otherwise it displays "**PASS**" at the end when all nuclei are executed. During the execution of a script, a progress indicator is displayed on the display of the DVD Recorder.
Technical	Execute the included nuclei one by one If a nucleus fails quit and display the failed nucleus on the local display and service port
Execution Time	16 seconds
Included tests:	1. DS_ANAB_COMMUNICATIONECHO_NUC 2. DS_DCB_COMMUNICATIONECHO_NUC 3. DS_BROM_COMMUNICATION_NUC 4. DS_SYS_SETTINGSDISPLAY_NUC 5. DS_CHR_DEVTYPEGET_NUC 6. DS_CHR_INT_PIC_NUC 7. DS_CHR_DMA_NUC 8. DS_BROM_WRITEREAD_NUC 9. DS_NVRAM_COMMUNICATION_NUC 10. DS_NVRAM_WRITEREAD_NUC 11. DS_SDRAM_WRITEREADFAST_NUC 12. DS_FLASH_WRITEREAD_NUC 13. DS_FLASH_CHECKSUMPROGRAM_NUC 14. DS_SYS_HARDWAREVERSIONGET_NUC 15. DS_VIP_DEVTYPEGET_NUC 16. DS_VIP_COMMUNICATION_NUC 17. DS_DVIO_LINKDEVTYPEGET_NUC 18. DS_DVIO_PHYDEVTYPEGET_NUC 19. DS_DVIO_LINKCOMMUNICATION_NUC 20. DS_DVIO_PHYCOMMUNICATION_NUC 21. DS_PSCAN_COMMUNICATIONDENC_NUC 22. DS_PSCAN_COMMUNICATIONDEINTERLACER_NUC 23. DS_BE_COMMUNICATIONECHO_NUC 24. DS_ANAB_COMMUNICATIONIICNVRAM_NUC 25. DS_ANAB_COMMUNICATIONIICTUNER_NUC 26. DS_ANAB_COMMUNICATIONIICSOUNDPROCESSOR_NUC 27. DS_ANAB_COMMUNICATIONIICAVSELECTOR_NUC 28. DS_ANAB_CHECKSUMPROGRAM_NUC
Note!	**Invocation by holding down the PLAY button when powering up the system**
Note!	The following example is for a generation 2.1 DVD+RW recorder. The variant you test may behave differently. For a detailed description of the script-behaviour of your variant under test refer to the [RW2_1_SWA_DS].

| Example | ```
DS:> script
Executing User/Dealer script.
Busy executing NUC1100 1-28
Hello Analogue Board
Busy executing NUC1000 2-28


Busy executing NUC200 3-28


Busy executing NUC1228 4-28


Settings ID:  4C4541440D0000000003030001010102010100020080000
Board name:                      LEAD
Hardware ID:                     0
Codec IC:                        PNX7100_MF3
Video Input Processor IC:        SAA7118
Progressive Scan Deinterlacer IC: None
Progressive Scan Denc IC:        ADV7196
I-Link physical layer circuit IC: PDI1394P25
I-Link link layer circuit IC:    PDI1394P40
Audio clock:                     Clock scheme 1
Bit engine connector:            available
IDE connector 1:                 available
IDE connector 2:                 not available
PCI connector:                   not available
RAM size                         32MByte
ROM size (NOR FLASH bank 1)      8MByte
ROM size (NOR FLASH bank 2)      Not available
ROM size (NAND FLASH)            Not available
Bit Engine: AV 2.0

Busy executing NUC100 5-28


Device ID  7100
Codec ID   PNX7100_MF3
F-BCU  (0x0102) 1.0    INTC   (0x011d) 1.0    PCI-XIO(0x0113) 1.0
SIF    (0x013b) 1.0    EJTAG  (0x0104) 0.0    S-BCU  (0x0102) 1.0
BOOT   (0x010a) 1.0    CONFIG (0x013f) 1.0    RESET  (0x0123) 1.0
DEBUG  (0x0116) 0.0    UART0  (0x0107) 0.1    UART1  (0x0107) 0.1
UART2  (0x0107) 0.1    UART3  (0x0107) 0.1    I2C0   (0x0105) 0.1
I2C1   (0x0105) 0.1    GPIO   (0x013c) 1.0    SYNC   (0x013a) 1.0
DISP0  (0xa015) 0.2    DISP1  (0xa00f) 0.0    OSD    (0x0136) 0.1
SPU    (0xa00e) 0.0    MIXER  (0x0137) 1.0    DENC   (0x0138) 0.1
CCIR   (0x0139) 1.0    VDEC   (0x0133) 0.1    PARSER (0xa00d) 0.0
DV     (0xa00c) 0.0    BEI    (0xa00a) 0.0    IDE    (0xa009) 0.0
SGDX   (0xa008) 0.0    BYTE   (0xa00b) 0.0    OUTPUT (0xa003) 0.0
ACOMP  (0xa000) 0.0    VFE    (0xa001) 0.0    VCOMP  (0xa002) 0.0
SCR    (0x0000) 0.0    SIFF   (0xa011) 0.0    WMD    (0xa010) 0.0
AUDIO0 (0xa015) 0.2    AUDIO1 (0xa00f) 0.0    PSCAN  (0xa018) 0.0

Busy executing NUC114 6-28


Busy executing NUC115 7-28


Busy executing NUC201 8-28


Busy executing NUC300 9-28


Busy executing NUC301 10-28


Busy executing NUC401 11-28


Busy executing NUC501 12-28


Busy executing NUC503 13-28


BootCode    checksum is: 0xBABEB432, which is correct
Diagnostics checksum is: 0xBABED22B, which is correct
Download    checksum is: 0xBABE025F, which is correct
Application checksum is: 0xBABE2825, which is correct

Busy executing NUC1200 14-28
Hardware ID = 00
Busy executing NUC600 15-28
Found SAA7118
``` |

| Example | ```
Busy executing NUC601 16-28

Busy executing NUC700 17-28
Device type of the link layer IC: ffc00301
Busy executing NUC701 18-28
Device type of the phy layer IC: 0
Busy executing NUC702 19-28

Busy executing NUC703 20-28

Busy executing NUC801 21-28

Busy executing NUC808 22-28
The IIC acknowledge was not received, which is correct
Busy executing NUC900 23-28

Busy executing NUC1101 24-28
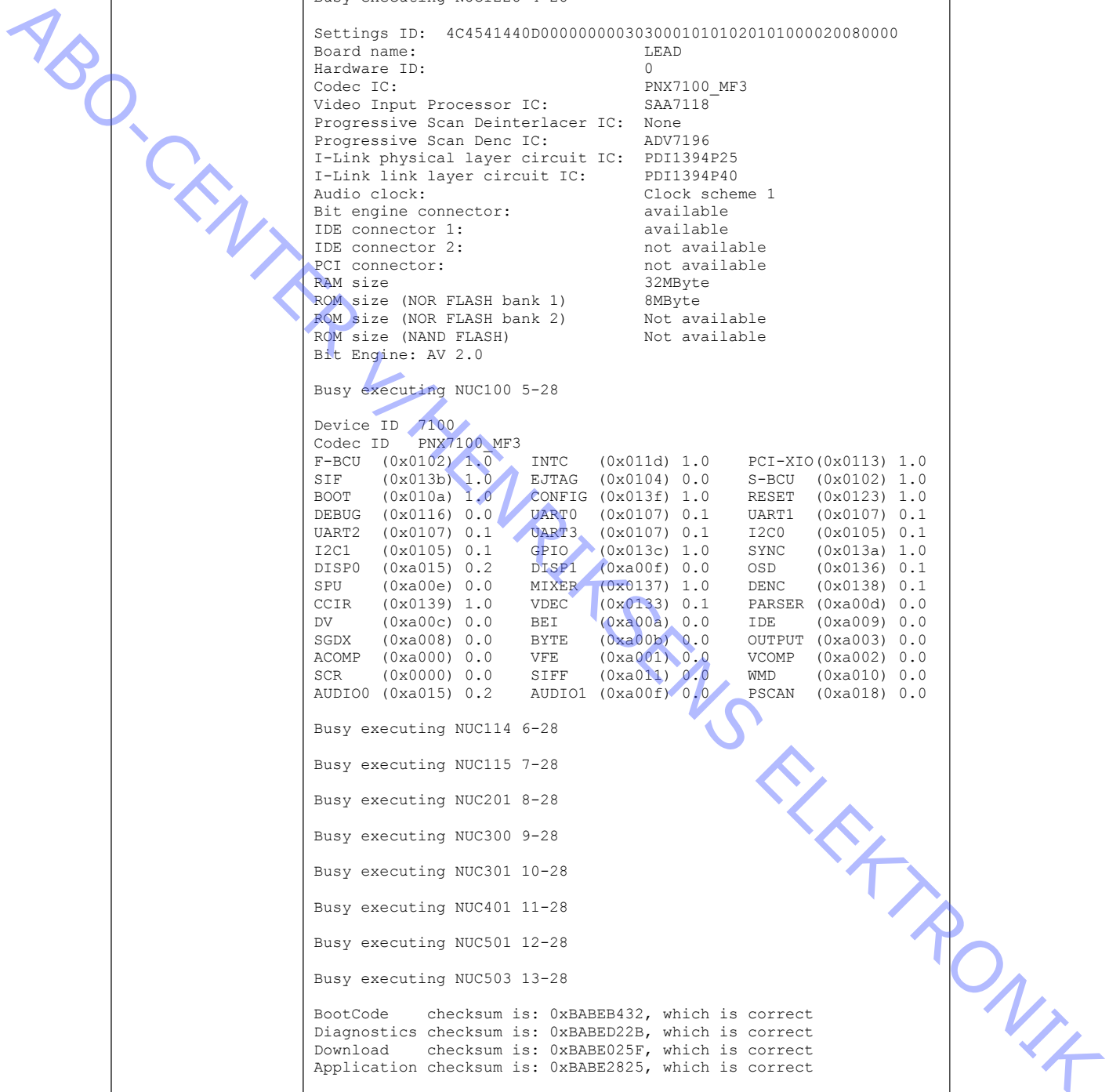
Busy executing NUC1102 25-28

Busy executing NUC1104 26-28

Busy executing NUC1105 27-28

Busy executing NUC1111 28-28

BootCode     checksum is: 0xBABE6240, which is correct
Diagnostics checksum is: 0xBABEDC9A, which is correct
Download     checksum is: 0xBABEA6B7, which is correct
Application checksum is: 0xBABE5968, which is correct

PASS

DS:>
``` |

4 DIGITAL BOARD DIVERSITY

The D&S software needs to know what kind of system it must diagnose, in other words it must know what components can be tested on the hardware at hand. This to avoid misjudgement of components: e.g. indicating error when the component is not mounted on this specific board.
So, DS needs some settings that tell DS which hardware components are available.

In the boot EEPROM on the digital board a section is reserved for digital board settings. These settings contain which hardware components are available.

When the factory is building digital boards, the first thing that must be done when DS is started, is to execute nucleus DS_SYS_SettingsSet (1226) that programs these settings into the boot EEPROM. This nucleus must have a string value as parameter. This string contains the settings.

The service department must take the following remark into account. When some components in the DVD Recorder must be replaced (for example: replacing the digital board), the following nucleus must be executed: DS_SYS_SettingsSet (1226).

The nucleus DS_BROM_WriteRead will not clear these settings in the BOOT EEPROM.

When DS detects (by testing the checksum) that the settings are not valid, it gives a warning. In this case some nuclei executed in DS mode may return errors because of the corrupt settings string. Most nuclei however will behave correctly.

So, it is possible that the next message will appear when starting the Recorder for the first time:

```
[MIS_DIV,WARNING,Digital Board Hardware Information is corrupt,]
Factory Diagnostics and Service Software
DVD Video Recorder (Dec 13 2003, 10:55:37)

Version  :258         Build     :20031213_1030
Release  :P1_7_b      Buildtype :no
Baseline :I_P1_8_63   Variant   :verum:dvdrw2_lib
WARNING,Digital Board Hardware Information is corrupt

DS:>
```

- In this case the boot EEPROM of the digital board does not contain a string with the required hardware information. To update the digital board with the correct string, nucleus DS_SYS_SettingsSet (1226) must be executed. With the delivery of the software the correct HW-diversity strings are shipped. These can be used as parameters for the nucleus.

The latest overview of all diversity strings can be found on:
http://cww.ehv.pdsl.philips.com/dvdrw2/html/div_strings.shtml
If you need access to this site please contact the DS-team. Access will be granted or the latest information will be sent to you.

APPENDIX A TERMINAL INTERFACE

The DVD+RW set needs to be connected to a terminal in order to see the message when starting the set e.g.:

```
Factory Diagnostics and Service Software
DVD Video Recorder (Dec 13 2003, 10:55:37)

Version  :258        Build     :20031213_1030
Release  :P1_7_b     Buildtype :no
Baseline :I_P1_8_63  Variant   :verum:dvdrw2_lib

DS:>
```

A.1 SOFTWARE SETTINGS:

The terminal needs to be set to **19200** Baud, **8** Data bits, **n**o Parity, **1** Stop bit, **n**o Flow control, and no XON/XOFF usage.

A.2 HARDWARE CONNECTION:

Pin-out of the 'Service' connector on the board:

1 - Txd
2 - PIO 'Service' Pin
3 - Rxd
4 - RTS
5 - Gnd
6 - CTS
7 - +5V

The 'Service' connector provided to you will connect pin 2 to pin 5, in order to have the software detect that service mode is requested.

APPENDIX B LIST OF COMMANDS

A quick reference list of all available commands in the *command-line-interface* is given below:

Command	Description
100	Executing nucleus DS_CHR_DevTypeGet.
101	Executing nucleus DS_CHR_TestImageOn.
102	Executing nucleus DS_CHR_TestImageOff.
103	Executing nucleus DS_CHR_SineOn
104	Executing nucleus DS_CHR_SineOff
105	Executing nucleus DS_CHR_SineBurst
106	Executing nucleus DS_CHR_MuteOn
107	Executing nucleus DS_CHR_MuteOff
108	Executing nucleus DS_CHR_DvLedOn
109	Executing nucleus DS_CHR_DvLedOff
110	Executing nucleus DS_CHR_MacroVisionOn.
111	Executing nucleus DS_CHR_MacroVisionOff.
112	Executing nucleus DS_CHR_Peek
113	Executing nucleus DS_CHR_Poke
114	Executing nucleus DS_CHR_INT_PICInterrupts
115	Executing nucleus DS_CHR_DMA_TestDMA

Table 10 Commands for testing the Codec Host processor.

Command	Description
200	Executing nucleus DS_BROM_Communication
201	Executing nucleus DS_BROM_WriteRead

Table 11 Commands for testing the Boot EEPROM.

Command	Description
300	Executing nucleus DS_NVRAM_Communication.
301	Executing nucleus DS_NVRAM_WriteRead.
302	Executing nucleus DS_NVRAM_Clear.
303	Executing nucleus DS_NVRAM_Modify.
304	Executing nucleus DS_NVRAM_Read.

Table 12 Commands for testing the NVRAM.

Command	Description
400	Executing nucleus DS_SDRAM_WriteRead.
401	Executing nucleus DS_SDRAM_WriteReadFast.
402	Executing nucleus DS_SDRAM_Write.
403	Executing nucleus DS_SDRAM_Read.
404	Executing nucleus DS_SDRAM_DmaWriteRead.

Table 13 Commands for testing the SDRAM.

Command	Description
500	Executing nucleus DS_FLASH_DevTypeGet.
501	Executing nucleus DS_FLASH_WriteRead.
502	Executing nucleus DS_FLASH_Read.
503	Executing nucleus DS_FLASH_ChecksumProgram.
504	Executing nucleus DS_FLASH_CalculateChecksum.
505	Executing nucleus DS_FLASH_CalculateChecksumFast.

Table 14 Commands for testing the FLASH.

Command	Description
600	Executing nucleus DS_VIP_DevTypeGet.
601	Executing nucleus DS_VIP_Communication.
602	Executing nucleus DS_VIP_ClockOutputOn.
603	Executing nucleus DS_VIP_ClockOutputOff.
604	Executing nucleus DS_VIP_SelectInput.

Table 15 Commands for testing the Video Input Processor.

Command	Description
700	Executing nucleus DS_DVIO_LinkDevTypeGet.
701	Executing nucleus DS_DVIO_PhyDevTypeGet.
702	Executing nucleus DS_DVIO_LinkCommunication.
703	Executing nucleus DS_DVIO_PhyCommunication.
704	Executing nucleus DS_DVIO_Routing.
705	Executing nucleus DS_DVIO_DetectNode.
706	Executing nucleus DS_DVIO_DetectStream.

Table 16 Commands for testing the DVIO.

Command	Description
800	Executing nucleus DS_PSCAN_DevTypeGetDenc.
801	Executing nucleus DS_PSCAN_CommunicationDenc.
802	Executing nucleus DS_PSCAN_TestImageOn.
803	Executing nucleus DS_PSCAN_TestImageOff.
804	Executing nucleus DS_PSCAN_TestImageCoulourSettingsSet
805	Executing nucleus DS_PSCAN_TestImageCoulourSettingsGet
806	Executing nucleus DS_PSCAN_Routing
807	Executing nucleus DS_PSCAN_DevTypeGetDeInterlacer
808	Executing nucleus DS_PSCAN_CommunicationDeinterlacer.

Table 17 Commands for testing the Progressive Scan.

Command	Description
900	Executing nucleus DS_BE_CommunicationEcho
901	Executing nucleus DS_BE_Reset
902	Executing nucleus DS_BE_GetSelfTestResult
903	Executing nucleus DS_BE_VersionGet
904	Executing nucleus DS_BE_TrayOut
905	Executing nucleus DS_BE_TrayIn
906	Executing nucleus DS_BE_WriteReadDvdRw
907	Executing nucleus DS_BE_WriteReadDvdR
908	Executing nucleus DS_BE_StatisticaInformationGet
909	Executing nucleus DS_BE_StatisticaInformationReSet

910	Executing nucleus DS_BE_ErrorLogGet
911	Executing nucleus DS_BE_ErrorLogReset
912	Executing nucleus DS_BE_JitterOptimise
913	Executing nucleus DS_BE_FocusOn
914	Executing nucleus DS_BE_FocusOff
915	Executing nucleus DS_BE_MotorOn
916	Executing nucleus DS_BE_MotorOff
920	Executing nucleus DS_BE_Tilt
921	Executing nucleus DS_BE_CheckDisc
922	Executing nucleus DS_BE_SledgeMotor
924	Executing nucleus DS_BE_ReadTocInfo
925	Executing nucleus DS_BE_DiscErase
928	Executing nucleus DS_BE_RegionCodeSet
929	Executing nucleus DS_BE_RegionCodeGet
930	Executing nucleus DS_BE_RegionCounterReset
931	Executing nucleus DS_BE_AdjustLaserControl
932	Executing nucleus DS_BE_WriteReadDvdRDualLayer

Table 18 Commands for testing the Basic Engine.

Command	Description
1000	Executing nucleus DS_DCB_CommunicationEcho
1001	Executing nucleus DS_DCB_VersionGet
1002	Executing nucleus DS_DCB_Display
1004	Executing nucleus DS_DCB_ Keyboard
1005	Executing nucleus DS_DCB_RemoteControl
1006	Executing nucleus DS_DCB_Led

Table 19 Commands for testing the Display and Control Board.

Command	Description
1100	Executing nucleus DS_ANAB_CommunicationEcho
1101	Executing nucleus DS_ANAB_CommunicationIicNvram
1102	Executing nucleus DS_ANAB_CommunicationIicTuner
1103	Executing nucleus DS_ANAB_CommunicationIicDataSlicer
1104	Executing nucleus DS_ANAB_CommunicationIicSoundProcessor
1105	Executing nucleus DS_ANAB_CommunicationIicAVSelector
1106	Executing nucleus DS_ANAB_HardwareVersionGet
1107	Executing nucleus DS_ANAB_SoftwareVersionBootGet
1108	Executing nucleus DS_ANAB_SoftwareVersionDownloadGet
1109	Executing nucleus DS_ANAB_SoftwareVersionApplGet
1110	Executing nucleus DS_ANAB_SoftwareVersionDiagnosticsGet
1111	Executing nucleus DS_ANAB_ChecksumProgram
1112	Executing nucleus DS_ANAB_VideoRouting
1113	Executing nucleus DS_ANAB_AudioRouting
1114	Executing nucleus DS_ANAB_SelectTunerChannel
1115	Executing nucleus DS_ANAB_IICWriteRead
1116	Executing nucleus DS_ANAB_ClockAdjust
1117	Executing nucleus DS_ANAB_ClockReference
1118	Executing nucleus DS_ANAB_ClockCorrection
1119	Executing nucleus DS_ANAB_TunerAFCReferenceVoltage
1120	Executing nucleus DS_ANAB_TunerFrequencyDownload
1121	Executing nucleus DS_ANAB_StoreExternalPresets
1122	Executing nucleus DS_ANAB_BargraphLevelAdjust

Table 20 Commands for testing the Analogue Board.

Command	Description
1200	Executing nucleus DS_SYS_HardwareVersionGet.
1201	Executing nucleus DS_SYS_SoftwareVersionBootGet.
1202	Executing nucleus DS_SYS_SoftwareVersionDownloadGet.
1203	Executing nucleus DS_SYS_SoftwareVersionApplGet.
1204	Executing nucleus DS_SYS_SoftwareVersionDiagnosticsGet.
1205	Executing nucleus DS_SYS_EepromUpload.
1206	Executing nucleus DS_SYS_EepromDownload.
1207	Executing nucleus DS_SYS_DvIdNumberSet
1208	Executing nucleus DS_SYS_DvIdNumberGet
1209	Executing nucleus DS_SYS_IicWrite
1210	Executing nucleus DS_SYS_IicRead
1211	Executing nucleus DS_SYS_UartWrite
1212	Executing nucleus DS_SYS_UartRead
1213	Executing nucleus DS_SYS_VideoLoopThroughStart
1214	Executing nucleus DS_SYS_VideoLoopThroughStop
1215	Executing nucleus DS_SYS_VideoLoop
1216	Executing nucleus DS_SYS_AudioLoop
1217	Executing nucleus DS_SYS_SlashVersionSet
1218	Executing nucleus DS_SYS_SlashVersionGet
1219	Executing nucleus DS_SYS_Virginize
1220	Executing nucleus DS_SYS_VirginModeOn
1221	Executing nucleus DS_SYS_VirginModeOff
1222	Executing nucleus DS_SYS_VirginModeGet

1223	Executing nucleus DS_SYS_DisplayFatalOn
1224	Executing nucleus DS_SYS_DisplayFatalOff
1225	Executing nucleus DS_SYS_DisplayFatalGet
1226	Executing nucleus DS_SYS_SettingsSet
1228	Executing nucleus DS_SYS_SettingsDisplay
1229	Executing nucleus DS_SYS_SettingsGet
1230	Executing nucleus DS_SYS_AudioLoopThroughStart
1231	Executing nucleus DS_SYS_AudioLoopThroughStop
1232	Executing nucleus DS_SYS_SettingsHwIdSet
1233	Executing nucleus DS_SYS_SettingsDoubleCheck
1234	Executing nucleus DS_SYS_SettingsDlTableFilenameSet
1235	Executing nucleus DS_SYS_IicWriteRead
1236	Executing nucleus DS_SYS_BuildInfoGet
1237	Executing nucleus DS_SYS_UartSetup
1238	Executing nucleus DS_SYS_GlinkWriteRead

Table 21 Commands for testing (parts of) the System.

Command	Description
1300	Executing nucleus DS_EPGB_VersionGet.

Table 22 Commands for testing the EPG Board.

Command	Description
1400	Executing nucleus DS_PCMCIA_Reset.
1401	Executing nucleus DS_PCMCIA_Inquiry.
1402	Executing nucleus DS_PCMCIA_WriteRead.
1403	Executing nucleus DS_PCMCIA_Diagnostics.

Table 23 Commands for testing the PCMCIA interface.

Command	Description
1500	Executing nucleus DS_HDMI_DevTypeGet
1501	Executing nucleus DS_HDMI_Communication
1502	Executing nucleus DS_HDMI_EdidParse
1503	Executing nucleus DS_HDMI_DefaultVideoSet
1504	Executing nucleus DS_HDMI_Reset
1505	Executing nucleus DS_HDMI_Bist
1506	Executing nucleus DS_HDMI_DdcIicWrite
1507	Executing nucleus DS_HDMI_DdcIicRead
1508	Executing nucleus DS_HDMI_ExtendedWrite
1509	Executing nucleus DS_HDMI_ExtendedRead
1510	Executing nucleus DS_HDMI_CheckHPDTx
1511	Executing nucleus DS_HDMI_CheckHPDCodec
1512	Executing nucleus DS_HDMI_FLI2310_DevTypeGet
1513	Executing nucleus DS_HDMI_FLI2310_Communication
1514	Executing nucleus DS_HDMI_FLI2310_TestImageOn
1515	Executing nucleus DS_HDMI_FLI2310_TestImageOff
1516	Executing nucleus DS_HDMI_FLI2300_Routing
1517	Executing nucleus DS_HDMI_FLI2310_ExtendedWrite
1518	Executing nucleus DS_HDMI_FLI2310_ExtendedRead
1519	Executing nucleus DS_HDMI_FLI2310_1080I
1520	Executing nucleus DS_HDMI_Adv7302_Communication
1521	Executing nucleus DS_HDMI_Adv7302_TestImageOn
1522	Executing nucleus DS_HDMI_Adv702_TestImageOff
1523	Executing nucleus DS_HDMI_Adv7302_Routing
1524	Executing nucleus DS_HDMI_Adv7302_ColSettingsSet
1525	Executing nucleus DS_HDMI_Adv7302_ColSettingsGet
1526	Executing nucleus DS_HDMI_Adv7302_ExtendedWrite
1527	Executing nucleus DS_HDMI_Adv7302_ExtendedRead
1528	Executing nucleus DS_HDMI_Audio
1529	Executing nucleus DS_HDMI_ColumbusTestImage
1530	Executing nucleus DS_HDMI_ColumbusPass

Table 24 Commands for testing the HDMI interface.

Command	Description
1600	Executing nucleus DS_ASP_Communication.
1601	Executing nucleus DS_ASP_Version
1602	Executing nucleus DS_ASP_RealTimeSetClockValues.
1603	Executing nucleus DS_ASP_RealTimeGetClockValues.
1604	Executing nucleus DS_ASP_RealTimeSetClockCorrection.
1605	Executing nucleus DS_ASP_RealTimeClockAdjustment.
1606	Executing nucleus DS_ASP_NTCGet.
1607	Executing nucleus DS_ASP_FanSpeedSet.
1608	Executing nucleus DS_ASP_LightDisplay.
1609	Executing nucleus DS_ASP_BlinkDisplay.
1610	Executing nucleus DS_ASP_DimmingDisplay.
1611	Executing nucleus DS_ASP_ClearDisplay.
1612	Executing nucleus DS_ASP_KeyBoard.
1613	Executing nucleus DS_ASP_RemoteControl.
1614	Executing nucleus DS_ASP_LEDsOn.
1615	Executing nucleus DS_ASP_LEDsOff.
1616	Executing nucleus DS_ASP_Reset.
1617	Executing nucleus DS_ASP_Extended.
1618	Executing nucleus DS_ASP_Watchdog.
1619	Executing nucleus DS_ASP_Reboot.
1620	Executing nucleus DS_ASP_DetectVideo.
1621	Executing nucleus DS_ASP_GlinkRcLoop.
1622	Executing nucleus DS_ASP_VcrControl.

Table 25 Commands for testing the Analogue Slave Processor.

Command	Description
1700	Executing nucleus DS_AROM_Communication.

Table 26 Commands for testing the Analogue Board EEPROM.

Command	Description
1800	Executing nucleus DS_VMIX_Communication
1801	Executing nucleus DS_VMIX_Routing
1802	Executing nucleus DS_VMIX_Extended
1803	Executing nucleus DS_VMIX_FastBlankingCheck
1804	Executing nucleus DS_VMIX_8SC2Check
1805	Executing nucleus DS_VMIX_WideScreenSignallingCheck

Table 27 Commands for testing the Video Matrix.

Command	Description
1900	Executing nucleus DS_AMIX_Communication.
1901	Executing nucleus DS_AMIX_Routing.
1902	Executing nucleus DS_AMIX_VersionGet.
1903	Executing nucleus DS_AMIX_Control
1904	Executing nucleus DS_AMIX_Beep
1905	Executing nucleus DS_AMIX_Extended
1906	Executing nucleus DS_AMIX_CommunicationAdcDac
1907	Executing nucleus DS_AMIX_Mute

Table 28 Commands for testing the Audio Matrix (Sound Processor).

Command	Description
2000	Executing nucleus DS_FRE_Communication.
2001	Executing nucleus DS_FRE_ChannelSelect.
2003	Executing nucleus DS_FRE_CommunicationIfModule

Table 29 Commands for testing the Front End (Tuner).

Command	Description
2100	Executing nucleus DS_HDD_Communication.
2101	Executing nucleus DS_HDD_Reset.
2102	Executing nucleus DS_HDD_VersionGet.
2103	Executing nucleus DS_HDD_WriteRead.
2104	Executing nucleus DS_HDD_CapabilitiesGet.
2105	Executing nucleus DS_HDD_Diagnostics.
2106	Executing nucleus DS_HDD_UploadImage.
2107	Executing nucleus DS_HDD_DownloadImage.
2108	Executing nucleus DS_HDD_RandomReadScan
2109	Executing nucleus DS_HDD_LinearSurfaceScan
2110	Executing nucleus DS_HDD_SpinOff
2111	Executing nucleus DS_HDD_SectorRead
2112	Executing nucleus DS_HDD_SetPower

Table 30 Commands for testing the Hard Disc.

Command	Description
2200	Executing nucleus DS_DTTM_Reset.
2201	Executing nucleus DS_DTTM_TransparentCommand.
2202	Executing nucleus DS_DTTM_Communication.
2203	Executing nucleus DS_DTTM_FlashDeviceType.
2204	Executing nucleus DS_DTTM_DiagSwVersion.
2205	Executing nucleus DS_DTTM_BootSwVersion.
2206	Executing nucleus DS_DTTM_ApplSwVersion.
2207	Executing nucleus DS_DTTM_HardwareVersion.
2208	Executing nucleus DS_DTTM_SdramWriteRead.
2209	Executing nucleus DS_DTTM_SdramWriteReadFast.
2210	Executing nucleus DS_DTTM_EepromWriteRead.
2211	Executing nucleus DS_DTTM_FatalErrorRead.
2212	Executing nucleus DS_DTTM_FatalErrorClear.
2213	Executing nucleus DS_DTTM_FactoryBitSet.
2214	Executing nucleus DS_DTTM_PllVcxoFrequencySet.
2215	Executing nucleus DS_DTTM_PllVcxoFrequencyGet.
2216	Executing nucleus DS_DTTM_IicWrite.
2217	Executing nucleus DS_DTTM_IicRead.
2218	Executing nucleus DS_DTTM_AvTsPidSet.
2219	Executing nucleus DS_DTTM_AvMojoBeepOn.
2220	Executing nucleus DS_DTTM_AvMojoBeepOff.
2221	Executing nucleus DS_DTTM_AvAudioVideoStreamPlay.
2222	Executing nucleus DS_DTTM_AvPredefinedStreamGet.
2223	Executing nucleus DS_DTTM_AvPredefinedStreamChange.
2224	Executing nucleus DS_DTTM_AvMojoColoutbarOn.
2225	Executing nucleus DS_DTTM_AvMojoColourbarOff.
2228	Executing nucleus DS_DTTM_AvVideoStandardSet.
2229	Executing nucleus DS_DTTM_AvVideoOutputSet.
2230	Executing nucleus DS_DTTM_FreRegisterRead.
2231	Executing nucleus DS_DTTM_FreRegisterWrite.
2232	Executing nucleus DS_DTTM_FreLockStatusGet.
2233	Executing nucleus DS_DTTM_FreLockingParamSet.
2234	Executing nucleus DS_DTTM_FreLockingParamGet.
2235	Executing nucleus DS_DTTM_FreSignalStatusGet.

Table 31 Commands for testing the Digital Terrestrial Tuner Module.

Command	Description
2300	Executing nucleus DS_USB_Communication.
2301	Executing nucleus DS_USB_DevTypeGet.
2302	Executing nucleus DS_USB_Reset

Table 32 Commands for testing the Universal Serial Bus (USB).

User / Dealer script: This script will be executed when holding down the **PLAY**-button when powering up the set.