





**Digital Terminal Division** 

**Conditional Access Kernel** 

IRD Command Specification

V 1.3.2

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## 1 Introduction

## 1.1 Purpose

This document defines the general format of an IRD command as well as generic NagraVision commands, such as "Reset PIN Code" or "Force Tune". It also defines the rules for defining manufacturer's or operator's specific commands.

## 1.2 Document History

Version	Date	Author	Description
1.3.2	05-Jul-2002	Jean-Luc Bussy	Added the Set Network ID command.
1.3.1	02-Dec-2001	Jean-Luc Bussy	Improved description of the Mail command, added "Configure STB" command and changed the way to handle specific commands.
1.3.0	06-Juin-2001	Jean-Luc Bussy	Added Macrovision command and renamed the document StbCakIrdSpe.
1.2	06-Oct-2000	Jean-Luc Bussy	Added the Force Identification command and several manufacturer's command id.
1.1	01-Feb-2000	Patrick Schyrr	Add ADB and Microsoft specific command id. \* MERGEFORMAT
1.0	07-Sep-1999	Philippe Stransky	First issue. Extracted from the EMM and ECM descriptions. Includes a range for STB manufacturers.

Table 1 - Document History

## 1.3 Definitions, Acronyms, and Abbreviations

Acronym Abbreviation	Definition
CA	Conditional Access
CAK /	Conditional Access Kernel
DVB	_Digital Video Broadcasting
JRD7	Integrated Receiver Decoder
\$TB	Set-Top Box
NVM	Non-volatile memory

Table 2 - Definitions, Acronyms, and Abbreviations



### 1.4 Notational Conventions

All source code occurrences appear in courier writing style

## 1.5 References

[1] Force Identification, Implementation Guidelines V1.0.0

### 1.6 Trademarks

Any company's or product name(s) found herein may be the trademarks or registered trademarks of their respective companies.

#### 1.7 Overview

IRD commands allow the head-end to send messages to the set-top box in a secured way. IRD commands are carried by EMMs. They can benefit from EMM addressing mode. It means that a message can be addressed to one single set-top box or in the opposite to all set-top boxes.

The CA Kernel embedded in the set-top box is not dependent at all on IRD commands. It gets the command from the smartcard and forward it to the set-top box application without additional processing. The set-top box application is completely responsible of IRD command management. Periodicity of commands (coming from the fact that commands are carried by EMMs) has to be managed by the set-top box application by means of the sequence number. If a command has to be split in several commands due to the EMM length limitation, it is also the responsibility of the set-top box application to re-build the original command.

NagraVision has defined a set of generic commands. The table here below gives a synopsis of these commands along with the associated command identifier. Refer to §3 for a detail description.

Name	command_id	operation
Reset PIN Code	0x12	0x01
Mail	0xC0	0x01
Force Tune	0xC1	0x01
Force Identification	0xC2	0x01
Set Macrovision CPS	0xC4	0x01
Configure STB	0xC5	0x01
Set Network ID	0xC6	0x01

**Table 3 - Commands Summary** 





All commands required by a manufacturer or an operator that doesn't belongs to this list may result in a specific command. Refer to §4 for a description of the procedure allowing the definition of a specific command.



## 2 IRD Command Format

## **Description**

Defines the general format of an IRD command.

#### **Format**

```
IRD command(){
  EMM command
                               uimsbf
  length
                               uimsbf
  command body{
    sequence number
                         32
                               uimsbf
    command Id
                         8
                               uimsbf
    operation
                               uimsbf
                         8
    for (i=0; i < N; i++) {
      data
                               bslbf
    checksum
                               bslbf
```

#### **Parameters**

sequence\_number

command\_id

operation

data

checksum

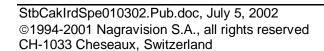
value incrementing with each command. Command with the same sequence number is processed only once. command identifier number, described in the next sections. used in conjunction with the command\_id. The couple (command\_id, operation) uniquely identifies a command. additional data.

(0x37

value 0x64

maximum value = 5/5

two's complement of the sum of all bytes from the command\_id to the last data byte. The sum of all bytes from the command\_id to the checksum must be equal to 0.





## 3 Generic IRD Commands

## 3.1 Reset PIN Code

### **Description**

Forces the STB clear the parental code. This may be required if the subscriber looses its PIN code, or when reclaiming the STB from the field.

#### **Format**

command id	0x12		Reset PIN code
operation	0x1		PIN code #1
checksum	8	bslbf	checksum

#### **Parameters**

None.

#### **Notes**

1. If multiple PIN codes are available, then the operation field indicates the PIN code number.

### 3.2 Mail

### **Description**

This command provides mail messages to the STB. The management of the messages is the STB responsibility.

#### **Format**

```
0xCO
command id
                                          Mail message
                       0x1/
operation
                                          Mail type 1
data{
  mail_id
total_segment
                       10
                              uimsbf
                                          Mail message number
                              uimsbf
                                          Total number of segments
  priority
                        2
                              wimsbf
                                          0 = normal priority, 1 = high priority,
                                          2 = emergency, 3 = reserved
  segment number
                        6
                              uimsbf
  for (i=0; i
                              uimsbf
                                          Mail message body
    message
checksum
                              bslbf
                                          Checksum
```





#### **Parameters**

mail\_id Unique mail number

total segment Total number of segments required to carry the whole/

message. It's a 6-bit variable covering the range 14.,631/

Each segment may carry up to 45 bytes.

priority Influences the STB behaviour. For example, normal priority

would not affect the display, while emergency mail would be displayed on the screen without manual intervention.

segment\_number Identifies the current segment. The first segment is equal

to 0 and the last segment is equal to total segment-1.

#### **Notes**

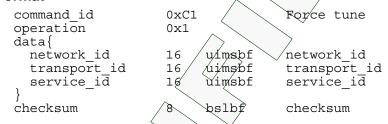
1. If the total length of a mail is larger than 45 bytes, then the message is split in several segments, each having the same mail id and consecutive segment numbers. As there is at the most 63 segments of 45 bytes per message, the maximum length of a message is equal to 2835 bytes.

### 3.3 Force Tune

#### **Description**

This command forces the STB to tune to a service defined by the network\_id/transport\_id/service\_id. If the STB is able to query the access rights needed for the service, then the tuning should occur only if the subscriber has access to the service.

#### **Format**



#### **Parameters**

network\_id corresponds to the network\_id as described in the DVB Network Information Table (NIT).

transport 4d corresponds to the network id as described in the DVB.

corresponds to the network\_id as described in the DVB Network Information Table (NIT).

corresponds to the service\_id as described in the DVB Service Description Table (SDT). It may also correspond to the program number found in the MPEG Program Map Table (PMT).



### 3.4 Force Identification

#### Description

Forces the STB to display its Nagra S/N along with the UA of its smartcard on the screen for a while.

#### **Format**

command\_id0xC2Force identificationoperation0x1checksum8bslbfchecksum

#### **Parameters**

None

#### Note

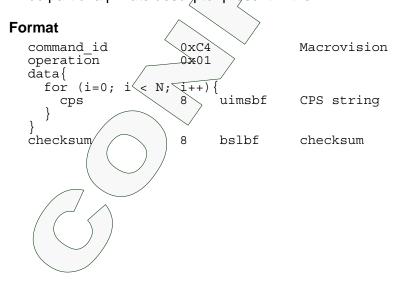
See document [1] for more information about this command:

### 3.5 Set Macrovision CPS

#### **Description**

The Macrovision system uses a chip inside the set-top box that acts on the analog video output to prevent the recording, but not the viewing. The chip accepts configuration data and operational data. Configuration data allows to parameters the different ways to mess the signal: how long to rotate the colors, how high is the peak in the signal, and so on. This is a 136-bit string called CPS by Macrovision. Operational data says which way has to be applied: turn color stripe on, turn v sync off, and so on. This is a 8-bit string called the Mode byte by Macrovision.

The purpose of this IRD command is to provide the CPS string to a set-top box, in order to parameter its Macrovision chip. The Mode byte is not transmitted through this command and will be part of a private descriptor present in the EIT.







#### **Parameters**

cps

CPS (Copy Protection Setup) string defined by Macrovision. The actual Macrovision chip expects this string to be 136 bits long (17 bytes). However the current specification defines it of variable length in order to support future version. The length can be deduced from global "length" field of the IRD command.

## 3.6 Configure STB

#### **Description**

This command allows the head-end to enable or disable features in a set-top box. Each feature is associated to a single bit set to 1 when enabled and 0 when disabled. All features are disabled by default. The features configuration has to be stored in NVM so that no information is lost after power-cycling the set-top box.

#### **Format** command id 0xC5Configure STB operation 0x01data{ compatible mode 1 bslbf video bslbf 1 audio 1 bslbf smartcard 1 1 bslbf smartcard 2 1 bslbf/ harddisk 1 bslbf dvd bs1/bf/ 1 serial port 1 bslbf 1 serial port 2 1 \_bsl\bf parallel port 1 bslbf usb\_port 1 bslbf 1394\_port 1 `bslbf` spare\_port\_1 spare\_port\_2 peripheral\_1 bsl\bf 1 bslbf bslbf 1 peripheral 2 bslbf 1 for (i=0; i< N; i++pattern 8 bslbf optional checksum 8 bslbf checksum





#### **Parameters**

compatible mode

video audio

smartcard\_1

smartcard\_2

harddisk

dvd

serial\_port\_1

serial port 2

parallel port

usb\_port

1394 port

spare port 1

spare port 2

peripheral 1

peripheral 2

pattern

Usually set to 1 when the set-top box is fully DVB compliant and set to 0 when the set-top box usage is restricted to a specific network only. In case the set-top box is configured for a specific network but is connected to another network, the set-top box application shall display a proper message and all features shall be disabled. The compatible mode could be used by operators willing to avoid rented set-top boxes to be used in other networks.

Video decoding shall be disabled when set to 0.

Audio decoding shall be disabled when set to 0.

Smartcard reader 1 shall be disabled when set to 0.

Smartcard reader 2 shall be disabled when set to 0.

Hard disk shall be disabled when set to 0.

Dvd shall be disabled when set to 0.

Access to serial port 1 shall be disabled when set to 0.

Access to serial port 2 shall be disabled when set to 0.

Access to parallel port shall be disabled when set to 0.

Access to usb port shall be disabled when set to 0.

Access to IEEE 1394 port shall be disabled when set to 0.

Access to spare port 1 shall be disabled when set to 0.

Access to spare port 2 shall be disabled when set to 0.

Peripheral 1 shall be disabled when set to 0.

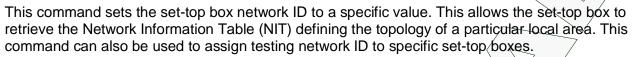
Peripheral 2 shall be disabled when set to 0.

Optional additional bit fields. Their absence shall be interpreted as value 1 by the set-top box application.



## 3.7 Set Network ID

## **Description**



#### **Format**

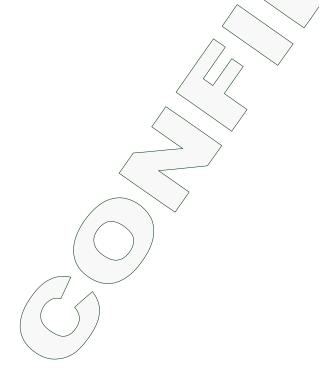
command_id	0xC6		Set network ID
operation	0x01		
data{			1 -/
network_id	16	uimsbf	Network ID
original_network_id	16	uimsbf	Original network ID
} checksum	8	bslbf	Checksum

#### **Parameters**

network\_id
original\_network\_id

Unique identifier indicating the network ID.

Unique identifier indicating the original network ID.





# 4 Specific IRD Commands

For any specific commands required by a manufacturer that doesn't belongs to the set of generic commands defined in §3, the procedure here after has to be followed:

• The manufacturer has to issue a formal document specifying the format and the behavior of the specific command. The command must comply with the general format defined in §2, but is restricted to the definition of the *operation* and *data* fields:

```
IRD command() {
  EMM command
  length
                               uimsbf
  command body{
                               uimsbf
    sequence number
                          32
    command id
                          8
                               wimsbf
    operation
                          8
                               uimsbf
    for(i=0; i < N; i++){
                               bslbf
      data
    checksum
                               bslb
```

• The specification is provided to NagraVision for approval by sending an email to the following address:

cak@nagra.com

- NagraVision evaluates the specification to know whether it is acceptable and assign a value to
  the command\_id field. This allows to guarantee a global consistency all over the networks and
  allows to avoid conflicts between different commands.
   NagraVision reserves the right to modify the command and move it in the set of generic
  commands if its usage suits a wider scope.
- In case the command remains a specific command, the manufacturer updates the specification with the *command id* assigned by NagraVision and publishes a new version of the document.
- In case the command becomes a generic command, NagraVision updates the present document with the new command and publishes a new version.

If the request for a specific commands comes from an operator instead of a manufacturer, the procedure here above remains the same, except that the specification is written by the operator. It is then provided to manufacturers providing set-top boxes over the operator network for implementation.