

Communication Solutions



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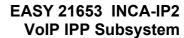
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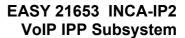
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CONFIDENTIAL Preface

Preface

This manual is a Programmer's Reference manual for the IFX_HAPI for SPINACER IP Phone that uses the INCA-IP2 chip.

Audience

This manual makes it easier for the programmers and the developers to enhance features of IFX_HAPI for their own products based on their specific requirements.

Related Documentation

Additional documentation related to IFX_HAPI is available. This includes:

- 1. SPINACER VoIP IP Phone Subsystem User's Manual Software Description (UMPR)
- 2. SPINACER VoIP IP Phone Subsystem Phone Application User's Manual Module Description (PA UMMD)

Organization of the Document

IFX HAPI UMPR comprises the following chapters:

- Introduction
- Development Environment Setup
- Interactions between IFX_HAPI and TAPI
- Driver Interface and its Usage
- ioctl Commands
- Type Definition Reference



Introduction

1 Introduction

This chapter gives an overview of VoIP IP Phone Subsystem and an overview of IFX_HAPI interface.

Overview of VoIP IP Phone Subsystem

The VoIP Subsystem provides the complete VoIP functionality for a system package. The VoIP subsystem is of two types - the VoIP IP Phone subsystem and the VoIP Gateway Subsystem. The VoIP IP Phone subsystem goes into the IP Phone system package and the VoIP Gateway subsystem goes into both the VoIP Router and the xDSL GW system packages. In general, the VoIP subsystem consists of two major components:

- Application
- VoIP Library

The Applications are of two types - the Phone Application and the Gateway Application. The Phone Application takes care of the application requirements for the IP Phone and the GW application takes care of the requirements arising out of VRT and xDSL GWs. The VoIP Library is a software library that contains the signaling protocol (SIP Toolkit), the media protocol (RTP) and the configuration modules. While the VoIP Library is common to all the system packages, the applications act as the differerentiators.

Overview of IFX_HAPI Interface

This document describes the High-level Application Programmer's Interface (HAPI) that provides general phone driver services for voice applications. The IFX_HAPI provides applications a common interface for the use of all the non voice related devices on the board like LED, keypad, display, hookswitch, and also interacts with TAPI (Telephony Application Programmer's Interface) for DTMF services. IFX_HAPI internally makes use of the drivers available for the different devices like LED, display, and keypad.

TAPI is a software layer used to control telephony features for Infineon VoIP related products. It provides voice related functionalities like AFE control, RTP functionalities, Jitter Buffer etc.

IFX_HAPI encapsulates the device drivers in the INCA-IP2 phone by using the Kernel APIs that are exported by the following drivers:

- 1. LED Matrix driver
- 2. Keypad driver
- 3. Pulse Width Modulator driver
- 4. SSC driver for display

Note: IFX_HAPI is compatible only with Linux[®] OS.

To get the complete device driver API specification refer to [1], to get the TAPI Specification refer to [4], and to get the device description refer to [2].

The block diagram depicted in Figure 1 shows the IFX_HAPI interface with the other modules:

Introduction

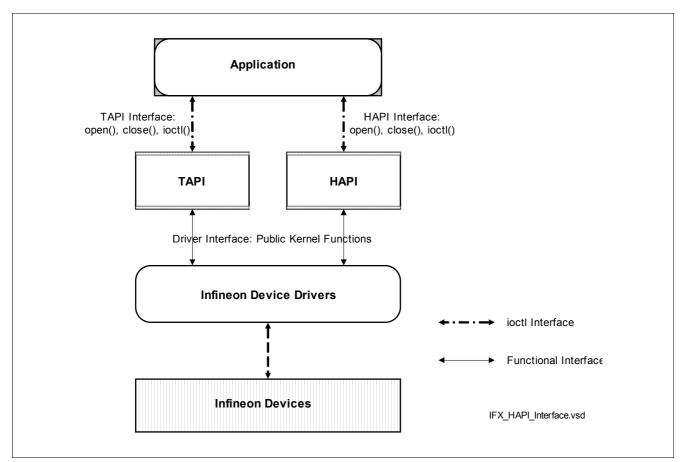


Figure 1 IFX_HAPI Interface



Development Environment Setup

2 Development Environment Setup

This chapter describes how to set up the IFX_HAPI software development environment.

2.1 Compilation

This chapter describes how to compile the IFX_HAPI device driver for Linux[®] (kernel 2.4).

To retrieve the device driver sources and to obtain the execution rights and directory structure, the following command has to be used. It will extract all sources into a directory "hapi".

```
tar -xvzf hapi.tar.gz
```

Prerequisite are the toolchain is in place, the path to the cross-compiler and the availability of path to the Linux[®] kernel header files.

Set the following macros of the make file to the appropriate path:

- CROSS_COMPILE
- LINUX_BASE

Table 1 Linux® Compiler Flags

Name	Description
NODISPLAY_SUPPORT	By default, HAPI supports character based display. To disable this support, define this flag.
DTMF_TO_TAPI	Define this flag if DTMF digits have to be passed to TAPI. For more details, refer to Interactions between IFX_HAPI and TAPI.

2.2 Support of proc File System

If CONFIG_PROC_FS is supported, the proc file system reports the status and the version of IFX_HAPI.

Example - proc File System

```
/* To retrieve the version of the HAPI */
# cat /proc/driver/hapi/version
INCA-IP2 HAPI VERSION - 0.1.1.0

/* To retrieve the version of the HAPI */
# cat /proc/driver/hapi/status
Hook Switch State: Onhook
Hookswitch and keypad fifo info:
    Fifo Size: 10
    Max elems queued up: 1
    Elems to be read: 0
```



Interactions between IFX_HAPI and TAPI

3 Interactions between IFX_HAPI and TAPI

HAPI and TAPI being Kernel modules, the interface from IFX_HAPI to TAPI is function based. When HAPI detects any DTMF digits, it passes this information to TAPI by using a function <code>IFX_TAPI_Event_Dispatch()</code> provided by TAPI. For details on this function, refer to [4].

Since Keypad driver provides digits in terms of scan codes, user has to provide the mappings of scan codes for the corresponding DTMF digits to IFX_HAPI, using the ioctl IFX_HAPI_MAP_SCANCODE_TO_DIGIT.

Default mapping of scan code to DTMF digits is given in Table 2.

Table 2 Mapping of Scan Code to DTMF Digits

DTMF digit	Scan code	
0	0	
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	
7	10	-
8	11	
9	12	
*	13	
#	14	

Note: Even though Key press is a DTMF digit, the information of the same is reported to the user in terms of scan codes, while it is reported to the TAPI as well at the same time.

4 Driver Interface and its Usage

IFX_HAPI is an fd based kernel interface and not a function based interface.

4.1 Driver Interface

If CONFIG_DEVFS_FS is supported, device node (/dev/hapi) is created by IFX_HAPI upon insmod of IFX_HAPI.

Table 3 gives the features and the driver interface functions supported by IFX HAPI:

Table 3 Driver interface

Feature	Driver Interface Function
Open the Device Driver	Open (name, flags, type)
Close the Device Driver	Close (fd)
Exchange of Control Information	ioctl (fd, cmd, arg)

4.2 Driver interface functions

Following are the driver interface functions:

4.2.1 Open the Device Driver

The IFX_HAPI file descriptor is obtained by opening the pseudo device (/dev/hapi). This file descriptor is used to obtain phone events (hook switch status change and keypad events), display messages on the display device, and switch the LED's ON or OFF.

Prototype

int open(char *name, int flags, int type);

Parameters

Data Type	Name	Description	
char8	name	/dev/hapi - To open a command file descriptor.	
int32	flags	Not used.	
int32	type	Not used.	

Return Values

Data Type	Description
int32 Error Code	
	>0 _D FD File descriptor
	<0 _D ER Error

4.2.2 Close the Device Driver

This function closes the IFX HAPI command file descriptor.

Prototype

void close(int fd);

Parameters

Data Type	Name	Description
int32	fd	IFX_HAPI command file descriptor

4.2.3 Exchange of Control Information

IFX_HAPI provides services to the user application through ioctl function.

Prototype

int ioctl(int fd, unsigned int cmd, (void*)arg)

Parameters

Data Type	Name	Description
int32	fd	IFX_HAPI command file descriptor
uint32	cmd	Command For the list of commands supported by IFX_HAPI, refer to List of ioctl Commands.
void	arg	Argument for the command

4.2.4 List of ioctl Commands

Table 4 gives an overview about the IFX_HAPI commands with a short description. A more detailed description of every single command is the content of the subsequent chapters.

Table 4 IFX_HAPI Commands

LED Services	
IFX_HAPI_LED_ON	Switches on the LED corresponding to the index.
IFX_HAPI_LED_OFF	Switches off the LED corresponding to the index.
IFX_HAPI_LED_ETH_CTRL	Defines which LED's are controlled autonomously by the Ethernet hardware.
Display Services	
IFX_HAPI_GET_MAX_ROW_COLUMN	Gets the maximum row and maximum column supported by the LCD device.
IFX_HAPI_GET_CURSOR_POS	Gets the current cursor position on the display.
IFX_HAPI_DISPLAY_CLEAR	Clears the display and returns the cursor to the home position.
IFX_HAPI_DISPLAY_GOTO	Positions the cursor at the defined place in the display.
IFX_HAPI_DISPLAY_PRINT	Prints a string starting at the current cursor position.
IFX_HAPI_DISPLAY_MOVE_CURSOR	Moves the cursor left, right, or to the home position.
IFX_HAPI_DISPLAY_POWER_CTRL	Enables or disables the power down mode.
IFX_HAPI_DISPLAY_SET_CONTRAST	Sets the contrast of the display by changing the duty cycle of the PWM1.
IFX_HAPI_DISPLAY_GET_CONTRAST	Gets the currently adjusted pulse width value (duty cycle) for contrast.
IFX_HAPI_DISPLAY_SET_BRIGHTNESS	Controls the brightness of the display by changing the duty cycle of the PWM2.



Table 4 IFX_HAPI Commands (cont'd)

IFX_HAPI_DISPLAY_GET_BRIGHTNESS	Gets the currently adjusted pulse width value (duty cycle) for brightness.
Keypad and Hook Status Event	
IFX_HAPI_GET_PHONE_EVENT	Gets the hook status or the key pressed.
Miscellaneous	
IFX_HAPI_MAP_SCANCODE_TO_DIGIT	Provides a mapping of key scan code to digit that is used for inband signaling.

4.3 General IFX_HAPI Usage

The High-level APIs are used to get telephony events and configure various device specific parameters of the INCA-IP2 board. Since IFX_HAPI imports some of the functionalities from TAPI, it must be loaded on the target only after loading TAPI. The sequence of loading IFX_HAPI includes:

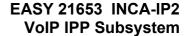
- insmod drv_tapi
- insmod drv_vmmc
- insmod hapi.o

Note: Major number and minor number for IFX_HAPI are assigned by the OS.

The IFX_HAPI is available as a pseudo device. An application intending to use the IFX_HAPI must open this device file. To send commands to any device controlled by the IFX_HAPI, the application must issue an ioctl with the corresponding command and optional parameters. To receive telephony events, an application must wait for exception events using select.

An application wishing to receive phone events has to block IFX_HAPI command file descriptor. The following code provides a sample example for applications to receive phone events (key press event and hook switch status).

```
#include<ifx hapi.h>
void main()
{
       uint32 iHapiFd, iSelMax, iRetVal;
       fd_set
                     xExceptFds;
       iHapiFd = open("/dev/hapi", 0);
       iSelMax = iHapiFd;
       FD_ZERO(&xExceptFds);
       FD_SET(iHapiFd, &xExceptFds);
       do
       {
              /* sleep till the arrival of an event */
              iRetVal = select(iSelMax + 1, NULL, NULL, &xExceptFds, NULL);
              if (iRetVal < 0)
              {
                      /* handle any errors */
              /* got an event.now get the information */
              if (ioctl(iHapiFd, IFX_HAPI_GET_PHONE_EVENT, &xPhoneEvent) != 0)
                     printf("GET PHONE EVENT failed\n");
                     break;
              }
```





```
/* process the phone events */
} while (condition);
}
```



5 ioctl Commands

This chapter describes the IFX_HAPI_Commands by mentioning the return values for each function. The organization is as follows:

5.1 LED Control

Each bit in the indexLed correspond to bits in the LED_REG. For more information on LED_REG, refer to [2]. The following services operate on the command file descriptor (fd):

5.1.1 IFX_HAPI_LED_ON

Prototype

```
Ret = ioctl(fd, IFX_HAPI_LED_ON, indexLED);
```

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	1
uint32	IFX_HAPI_LED_ON	Switches on the LED corresponding to the index	I
uint32	indexLED	Bit vector specifying which LEDs to switch ON Possible values: 0 _H _H FFFFF _H	I

Return Values

Data Type	Description
int32	$ 0_{D} $
	>0 _D

```
indexLED = 0x00001234;
Ret = ioctl(CmdFd, IFX_HAPI_LED_ON, indexLED);
if (Ret == 0)
{
    /* success - all LED's are switched ON */
}
else
{
    /* failure - Ret contains LED bits that are not available */
}
```



5.1.2 IFX_HAPI_LED_OFF

Prototype

```
Ret = ioctl(fd, IFX_HAPI_LED_OFF, indexLED);
```

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_LED_OFF	Switches off the LED corresponding to the index	1
uint32 indexLED	indexLED	Bit vector specifying which LEDs to switch OFF	I
		Possible values:	
		0 _H	
		н	
		FFFFF _H	

Return Values

Data Type	Description
int32	O_D
	>0 _D

Example

```
indexLED = 0x00001234;
Ret = ioctl(CmdFd, IFX_HAPI_LED_OFF, indexLED);
if (Ret == 0)
{
    /* success - all LED's are switched OFF */
}
else
{
    /* failure - Ret contains LED bits that are not available */
}
```

5.1.3 IFX_HAPI_LED_ETH_CTRL

Prototype

```
Ret = ioctl(fd, IFX_HAPI_LED_ETH_CTRL, pEthCtrl);
```

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_LED_ ETH_CTRL	Defines the LEDs that are controlled autonomously by the Ethernet hardware	I
x_IFX_HAPI_LEDE thCtrl	*pEthCtrl	Pointer to an ethernet control structure	I



Return Values

Data Type	Description
int32	O_D
	>0 _D

Example

```
x_IFX_HAPI_LEDEthCtrl xLEDEthCtrl;
xLEDEthCtrl.iEthPort = IFX_HAPI_LED_ETHPORT;
xLEDEthCtrl.ucEthLEDs = IFX_HAPI_LED_ETH_ACT | IFX_HAPI_LED_ETH_TL;
Ret = ioctl (CmdFd, IFX_HAPI_LED_ETH_CTRL, &xLEDEthCtrl);
```

5.2 Display and Pulse Width Modulator Services

The following services operate on the command file descriptor:

5.2.1 IFX_HAPI_GET_MAX_ROW_COLUMN

Prototype

```
Ret = ioctl(fd, IFX_HAPI_GET_MAX_ROW_COLUMN, pxRowColumn);
```

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_GET_ MAX_ROW_COL UMN	Gets the maximum row and maximum column supported by the LCD device	I
x_IFX_HAPI_MaxR owColumn	*pxRowColumn	Pointer to a structure	0

Return Values

Data Type	Description	
int32	0 _D OK OK	
	<0 _D ERR Error	



5.2.2 IFX_HAPI_GET_CURSOR_POS

Prototype

Ret = ioctl(fd, IFX_HAPI_GET_CURSOR_POS, pxCursorPos);

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_GET_ CURSOR_POS	Gets the current cursor position on the display	I
x_IFX_HAPI_Curs orPositon	*pxCursorPos	Pointer to a current cursor position structure	0

Return Values

Data Type	Description	
int32	0 _D OK OK	
	<0 _D ERR Error	

Example

5.2.3 IFX_HAPI_DISPLAY_CLEAR

Prototype

```
Ret = ioctl(fd, IFX_HAPI_DISPLAY_CLEAR, 0);
```

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_DISPL	Clears the display and returns the cursor to the initial	I
	AY_CLEAR	position (0,0)	

Return Values

Data Type	Description
int32	0 _D OK OK
	<0 _D ERR Error

```
Ret = ioctl(CmdFd, IFX_HAPI_DISPLAY_CLEAR, 0);
```



5.2.4 IFX_HAPI_DISPLAY_GOTO

Prototype

Ret = ioctl(fd, IFX_HAPI_DISPLAY_GOTO, pxDisplayGoTo);

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_DISPLAY _GOTO	Positions the cursor at the defined place in the display	I
x_IFX_HAPI_Displ ayGoTo	*pxDisplayGoTo	Pointer to a structure	I

Return Values

Data Type	Description
int32	0 _D OK OK
	<0 _D ERR Error

Example

5.2.5 IFX_HAPI_DISPLAY_PRINT

Prototype

Ret = ioctl(fd, IFX_HAPI_DISPLAY_PRINT, pxDisplayPrint);

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_DISPLAY _GOTO	Prints a string starting at the current cursor position If the end of a line is reached, the cursor moves to the beginning of the next line.	I
x_IFX_HAPI_Displ ayPrint	*pxDisplayPrint	Pointer to a structure	I

Return Values

Data Type	Description
int32	0 _D OK OK
	<0 _D ERR Error



Example

```
x_IFX_HAPI_DisplayPrint xDisplayPrint;
xDisplayPrint.pszString = Buffer; /* string to be displayed */
xDisplayPrint.iNumber = strlen(Buffer); /* string length */
Ret = ioctl(CmdFd, IFX_HAPI_DISPLAY_PRINT, &xDisplayPrint);
```

5.2.6 IFX_HAPI_DISPLAY_MOVE_CURSOR

Prototype

Ret = ioctl(fd, IFX_HAPI_DISPLAY_MOVE_CURSOR, iMove);

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_DISPL AY_MOVE_CUR SOR	Moves the cursor accordingly. Moves the cursor left, right, next line column 0, previous line last column, or to the home position (0,0). On reaching any of the edges, the cursor rolls over to the previous or to the next position appropriately.	I
uint32	iMove	Possible values are	I
		• IFX_HAPI_DISPLAY_LEFT (= 0):	
		• IFX_HAPI_DISPLAY_RIGHT	
		• IFX_HAPI_DISPLAY_HOME	
		• IFX_HAPI_DISPLAY_NEXTLINE	
		• IFX_HAPI_DISPLAY_ROWHOME	
		• IFX_HAPI_DISPLAY_PREVLINE	

Return Values

Data Type	Description
int32	0 _D OK OK
	<0 _D ERR Error

Example

Ret = ioctl(CmdFd, IFX_HAPI_DISPLAY_MOVE_CURSOR, IFX_HAPI_DISPLAY_RIGHT);



5.2.7 IFX_HAPI_DISPLAY_POWER_CTRL

Prototype

Ret = ioctl(fd, IFX_HAPI_DISPLAY_POWER_CTRL, bFlag);

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_DISPLAY _POWER_CTRL	Enables or disables the power down mode of the display device	I
uint32	bFlag	 0_D IFX_HAPI_FALSE Sets the display to the power down mode. 1_D IFX_HAPI_TRUE Enables the display power again. 	

Return Values

Data Type	Description
int32	0 _D OK OK
	<0 _D ERR Error

Example

Ret = ioctl(CmdFd, IFX_HAPI_DISPLAY_POWER_CTRL, IFX_HAPI_TRUE);

5.2.8 IFX_HAPI_DISPLAY_SET_CONTRAST

Prototype

Ret = ioctl(fd, IFX_HAPI_DISPLAY_SET_CONTRAST, ucValue);

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_DISPLAY _SET_CONTRAST	Controls the contrast of the display by changing the duty cycle of the PWM1	I
uint32	ucValue	Duty cycle value Possible values: 0 _H _H FF _H	I

Return Values

Data Type	Description
int32	Always OK



Example

5.2.9 IFX_HAPI_DISPLAY_GET_CONTRAST

Prototype

```
Ret = ioctl(fd, IFX_HAPI_DISPLAY_GET_CONTRAST, 0);
```

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_DISPL	Gets the currently adjusted pulse width value (duty cycle) for	0
	AY_GET_CONT	contrast	
	RAST		

Return Values

Data Type	Description	
int32	>0 _D CAP Currently adjusted pulse width value	
	<0 _D ERR Error	

Example

```
int32 Ret;
Ret = ioctl(CmdFd, IFX_HAPI_DISPLAY_GET_CONTRAST, 0);
```

5.2.10 IFX_HAPI_DISPLAY_SET_BRIGHTNESS

Prototype

```
Ret = ioctl(fd, IFX_HAPI_DISPLAY_SET_BRIGHTNESS, ucValue);
```

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_DISPL AY_SET_BRIGH TNESS	Controls the brightness of the display by changing the duty cycle of the PWM2	I
uint32	ucValue	Duty cycle value Possible values: 0 _H _H FF _H	I



Return Values

Data Type	Description
int32	Always OK

Example

5.2.11 IFX_HAPI_DISPLAY_GET_BRIGHTNESS

Prototype

```
Ret = ioctl(fd, IFX_HAPI_DISPLAY_GET_BRIGHTNESS, 0);
```

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_DISPL	Gets the currently adjusted pulse width value (duty cycle) for	0
	AY_GET_BRIGH TNESS	brightness	

Return Values

Data Type	Description	
int32	>0 _D CAP Currently adjusted pulse width value	
	<0 _D ERR Error	

```
int32 Ret;
Ret = ioctl(CmdFd, IFX_HAPI_DISPLAY_GET_BRIGHTNESS, 0);
```



5.3 Keypad and Hook Status Event

The following services operate on the command file descriptor:

5.3.1 IFX_HAPI_GET_PHONE_EVENT

Prototype

```
Ret = ioctl(fd, IFX_HAPI_GET_PHONE_EVENT, pxPhoneEvent);
```

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_GET_ PHONE_EVENT	Gets the hook status or key pressed	I
x_IFX_HAPI_Phon eEvent	*pxPhoneEvent	Pointer to a structure	0

Return Values

Data Type	Description	
int32	0 _D OK OK	
	<0 _D ERR Error	

```
x_IFX_HAPI_PhoneEvent
                            xPhoneEvent;
fd_set
                             xExceptFds;
int iHapiFd, iSelMax;
iHapiFd = open("/dev/hapi", 0)
iSelMax = iHapiFd;
FD_ZERO(&xExceptFds);
FD_SET(fd, &xExceptFds);
do{
       /* sleep till the arrival of an event */
       select(iSelMax, NULL, NULL, &xExceptFds, NULL);
       /* got an event.now get the information */
       if (ioctl(iHapiFd, IFX_HAPI_GET_PHONE_EVENT, &xPhoneEvent) != 0)
       {
              printf("GET_PHONE_EVENT failed\n");
              break;
       }
       if (xPhoneEvent.eEventType == IFX_HAPI_HOOK_STATUS)
       {
              /* look for offhook or onhook */
       }
       else
       {
              /* key has been pressed */
       }
```



ioctl Commands

} while (condition);

5.4 Miscellaneous

The following services operate on the command file descriptor:

5.4.1 IFX_HAPI_MAP_SCANCODE_TO_DIGIT

Prototype

```
Ret = ioctl(fd, IFX_HAPI_MAP_SCANCODE_TO_DIGIT, pxCodeToDigit);
```

Parameters

Data Type	Name	Description	Dir
uint32	fd	Command file descriptor	I
uint32	IFX_HAPI_MAP_ SCANCODE_TO _DIGIT	Provides a mapping of key scan code to digit that is used for inband signaling	I
x_IFX_HAPI_Code ToDigit	*pxCodeToDigit	Pointer to an array containing the scan codes	I

Return Values

Data Type	Name	Description
int32	errorCode	0 _D OK OK <0 _D ERR Error



6 Type Definition Reference

This chapter contains the type definitions related to the functional API.

6.1 Basic Type Definitions

This chapter contains the basic type definitions like:

- int8
- uint8
- int16
- uint16
- int32
- uint32
- char8
- uchar8

6.1.1 int8

Prototype

typedef char int8;

Parameters

Data Type	Name	Description
char	int8	This is the char 8-bit datatype

6.1.2 uint8

Prototype

typedef unsigned char uint8;

Parameters

Data Type	Name	Description
unsigned char	uint8	This is the unsigned char 8-bit datatype

6.1.3 int16

Prototype

typedef short int uint16;

Parameters

Data Type	Name	Description
short int	uint16	This is the signed short integer 16-bit datatype

6.1.4 uint16

Prototype

typedef unsigned short int uint16;

Parameters

Data Type	Name	Description
unsigned short int	uint16	This is the unsigned short integer 16-bit datatype

6.1.5 int32

Prototype

typedef int int32;

Parameters

Data Type	Name	Description
int	int32	This is the int 32-bit datatype

6.1.6 uint32

Prototype

typedef unsigned int uint32;

Parameters

Data Type	Name	Description
unsigned int	uint32	This is the unsigned int 32-bit datatype

6.1.7 char8

Prototype

typedef char char8;

Parameters

Data Type	Name	Description
char	char8	This is the char 8-bit datatype

6.1.8 uchar8

Prototype

typedef unsigned char uchar8;

Parameters

Data Type	Name	Description
unsigned char	uchar8	This is the unsigned char 8-bit datatype

6.2 Constants

This section describes the Constants that are used.

Table 5 Constants

Name and Description	Value
IFX_HAPI_DISPLAY_MAXROW	4 _D
Maximum number of rows supported on the display	
IFX_HAPI_DISPLAY_MAXCOLUMN	20 _D
Maximum number of columns supported on the display	
IFX_HAPI_DISPLAY_LEFT	0 _D
Used to move display cursor to the left	
IFX_HAPI_DISPLAY_RIGHT	1 _D
Used to move display cursor to the right	
IFX_HAPI_DISPLAY_HOME	2 _D
Used to move display cursor to the home position	
IFX_HAPI_DISPLAY_NEXTLINE	3 _D
Used to move display cursor to the next line	
IFX_HAPI_DISPLAY_ROWHOME	4 _D
Used to move display cursor to the beginning of the row	
IFX_HAPI_DISPLAY_PREVLINE	5 _D
Used to move display cursor to the previous line	
IFX_HAPI_LED_ETH_SPD	01 _H
Allows Led multiplexer to use an LED for indicating ethernet speed	
IFX_HAPI_LED_ETH_ACT	02 _H
Allows Led multiplexer to use an LED for indicating ethernet activity	
IFX_HAPI_LED_ETH_DPX	04 _H
LED ethernet duplex	
IFX_HAPI_LED_ETH_STA	08 _H
Allows Led multiplexer to use an LED for indicating ethernet status	
IFX_HAPI_LED_ETH_TL	10 _H
When this bit is set, the LED (used for indicating ethernet activity) flashes when the data is	
transmitted and not when the data is received. But, when the bit is not set, the LED flashes	
when the data is received and not when the data is transmitted.	
IFX_HAPI_HOOK_STATUS	0 _D
Indicates to the user that there is a hook status event	



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Type Definition Reference

Table 5 Constants (cont'd)

Name and Description	Value
IFX_HAPI_KEY_PRESSED	1 _D
Indicates to the user of the key press	
IFX_HAPI_KEY_RELEASED	0 _D
Indicates to the user of the key release	

6.3 Structures

This chapter lists all definitions and Structure codes.

Table 6 Structures used

Name	Description
x_IFX_HAPI_LEDEthCtrl	Structure for Ethernet hardware configuration.
x_IFX_HAPI_MaxRowColumn	Structure for getting maximum row and column supported by the LCD device.
x_IFX_HAPI_CursorPositon	Structure for determining the row and column of the current cursor position.
x_IFX_HAPI_DisplayGoTo	Structure for determining the row and column position of the defined point in the display.
x_IFX_HAPI_DisplayPrint	Structure for displaying a string at the current location.
x_IFX_HAPI_PhoneEvent	Structure for determining the hook and the key status.
x_IFX_HAPI_KeyInfo	Structure for querying on the key pressed.
x_IFX_HAPI_CodeToDigit	Structure for mapping of a key scan code to digit used for inband signaling.

6.3.1 x_IFX_HAPI_LEDEthCtrl

Description

This is the data structure for Ethernet hardware configuration.

Prototype

```
typedef struct{
    int32 iEthPort;
    uchar8 ucEthLEDs;
} x_IFX_HAPI_LEDEthCtrl;
```



Parameters

Data Type	Name	Description	Dir
int32	iEthPort	Defines the Ethernet port to which the access is applied. 0 _D ETH_PC IFX_HAPI_LED_ETHPORT_PC 1 _D ETH_LAN IFX_HAPI_LED_ETHPORT_LAN	I
uchar8	ucEthLEDs	Defines all the special function LED's that are controlled by Ethernet hardware (lower 5 bits) This is the logical OR of: 1 _D ETH_SPD IFX_HAPI_LED_ETH_SPD 2 _D ETH_ACT IFX_HAPI_LED_ETH_ACT 4 _D ETH_DPX IFX_HAPI_LED_ETH_DPX 8 _D ETH_STA IFX_HAPI_LED_ETH_STA 16 _D ETH_TL IFX_HAPI_LED_ETH_TL	1

6.3.2 x_IFX_HAPI_MaxRowColumn

Description

This is the data structure for getting maximum row and column supported by the LCD device.

Prototype

```
typedef struct{
     uchar8 ucMaxRow;
     uchar8 ucMaxColumn;
} x_IFX_HAPI_MaxRowColumn;
```

Parameters

Data Type	Name	Description	Dir
uchar8	ucMaxRow	Maximum row number	0
uchar8	ucMaxColumn	Maximum column number	0

6.3.3 x_IFX_HAPI_CursorPositon

Description

This is the data structure for determining the row and column of the current cursor position.

Prototype

```
typedef struct{
     uchar8 ucRow;
     uchar8 ucColumn;
} x_IFX_HAPI_CursorPositon;
```



Parameters

Data Type	Name	Description	Dir
uchar8	ucRow	Row number	I
uchar8	ucColumn	Column number	I

6.3.4 x_IFX_HAPI_DisplayGoTo

Description

This is the data structure for determining the row and column position of the defined point in the display.

Prototype

```
typedef struct{
     uchar8 ucRow;
     uchar8 ucColumn;
} x_IFX_HAPI_DisplayGoTo;
```

Parameters

Data Type	Name	Description	Dir
uchar8	ucRow	Row number of new cursor position	I
		(between 0 and MAX_ROW).	
uchar8	ucColumn	Column number of new cursor position (between 0 and MAX_COL).	

6.3.5 x_IFX_HAPI_DisplayPrint

Description

This is the data structure for displaying a string at the current location.

Prototype

```
typedef struct{
    int32 iNumber;
    char8 szString;
}x_IFX_HAPI_DisplayPrint;
```

Parameters

Data Type	Name	Description	Dir
int32	Number	Number of characters to be printed	I
char8*	szString	String to be printed	I

6.3.6 x_IFX_HAPI_PhoneEvent

Description

This is the data structure for determining the hook and the key status.

Prototype

Parameters

Data Type	Name	Description	Dir
uchar8	eEventType	Event Type can be either of the following	0
		0 _D HO_STA IFX_HAPI_HOOK_STATUS 1 _D KEY_PRE IFX_HAPI_KEY_PRESSED	
uxEventType		Union of ucHookStatus and xKeyInfo	О

uxEventType

Data type	Name	Description	Dir
uchar8	HookStatus	Status of the hook can be either of the following	0
		0 _D ON_HO IFX_HAPI_ON_HOOK	
		1 _D OFF_HO IFX_HAPI_OFF_HOOK	
x_IFX_HAPI_KeyIn fo	xKeyInfo	Structure of ucKey and uiDuration	0

6.3.7 x_IFX_HAPI_KeyInfo

Description

This is the data structure for querying on the key pressed.

Prototype

```
typedef struct{
    uchar8 ucKey;
    uint32 uiDuration;
    uint32 ucState;
} x_IFX_HAPI_KeyInfo
```



Parameters

Data Type	Name	Description	Dir
uchar8	ucKey	Scan code of the key pressed	0
uint32	uiDuration	Duration for which the key was pressed	0
uint32	ucState	State of the key. It can have either of the following values:	0
		HAPI_KEY_RELEASED	
		HAPI_KEY_PRESSED	

6.3.8 x_IFX_HAPI_CodeToDigit

Description

This is a structure for mapping of a key scan code to digit used for inband signaling.

Prototype

```
typedef struct{
     uchar8 ucSize;
     uchar8 ucScanCode[];
     uchar8 ucDigit[];
} x_IFX_HAPI_CodeToDigit;
```

Parameters

Data Type	Name	Description	Dir
uchar8	ucSize	Size of the scan code and the digit buffers	I
		Note: The size of the scan code and the digit buffers should be the same.	
uchar8	ucScanCode	Array of scan codes	I
uchar8	ucDigit	Array of digits	I



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