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# **73M1866B/73M1966B**

## **FXOCTL Application User Guide**

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# 1 Introduction

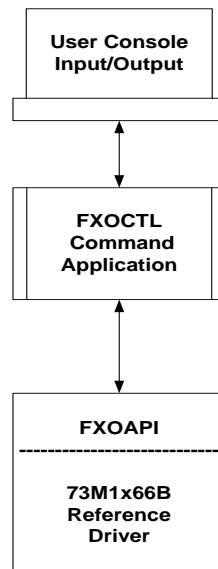
This document describes the 73M1866B/73M1966B FXOCTL Application, a software tool that is used to demonstrate and evaluate the 73M1866B/73M1966B Reference Driver and the 73M1866B/73M1966B devices in a system.

This user guide applies to both the 73M1966B and 73M1866B, which will be collectively referred to as the 73M1x66B in this document. The current FXOCTL Application version can be used on Linux<sup>®</sup> 2.4 and 2.6 kernels.

The FXOCTL Application is a command line parser that manages 73M1x66B devices via FXOAPI through the reference driver. Functions and features of the 73M1x66B supported by the 73M1866B/73M1966B Reference Driver are leveraged by this FXOCTL Application. This interactive user application is made up of an executable named `fxoctl`, which requires no parameters when executed from the Linux shell prompt.

The FXOCTL Application works in conjunction with the 73M1866B/73M1966B Reference Driver, which can be ported to a range of processors and operating systems.

## 1.1 FXOCTL User Space Application



**Figure 1: Conceptual Diagram of the Linux FXOCTL Application**

The FXOCTL Application can be used to “test drive” the reference drivers and the FXOAPI for the 73M1x66B FXO product. It is expected the user will transfer the knowledge learning from using this FXOCTL application to their own product once they are familiar with the operation of the code. The commands are not necessarily the same as those found in modems, but they do allow the 73M1x66B to perform the basic functions such as going on and off hook, pulse dialing, etc.

## 1.2 FXOCTL Command Summary

Entering `fxoctl` at the command line brings up the FXOCTL program. Refer to the individual command descriptions in [Section 2](#) for syntax and usage.

When running the FXOCTL program displays the following prompt:

```
FXOCTL:XX>           where: XX is the current active channel.
```

The FXOCTL program can manage all 16 FXO channels as supported in the 73M1x66B daisy chain configuration. Each channel is independently run on an FXO device or the 73M1x66B chip set. Upon startup the current active channel is defaulted to channel 0. In which case the prompt will look like this:

```
FXOCTL:00>
```

Most commands, without specifying channel number, apply to current active channel. However, some commands provide options for selecting a desired channel (other than the current active channel).

Table 1 provides an overview of the commands implemented in the FXOCTL Application.

**Table 1: Summary of FXOCTL Commands**

Command Syntax	Description
?	Displays the Help screen – same as the Help command.
autoanswer	Sets channel to auto answer mode. When set, the application automatically answers the incoming RING by going off-hook and performs PCM parameter setting.
answer	Manually answers a call. This command manually answers the RING by going off-hook and performs PCM parameter setting.
billingtonefilter	Billing tone filter disable/enable command.
callmonitor	Managing the setting of call progress monitor audio.
channel	Sets active channel ID.
countryconfig	Managing the default country setting parameter.
dial	Performs pulse dialing.
display	Not implemented.
exit	Exits the FXOCTL program.
gpio	Managing GPIO operation.
help	Displays the Help screen.
iet	Interval Event Table. Used to manage the IET table such as list active IET entries, delete entries and update IET entries.
loopback	Managing loopback operation.
measure	Measures voltage/current. This command initiates or terminates voltage or current measuring session.
offhook	Takes an FXO channel off-hook.
ohhook	Takes an FXO channel on-hook.
register	Manages the 73M1x66B internal registers (read/write).
samplerate	Select PCM sample rate – 8 or 16 kHz operation.
threshold	Modifying line parameter threshold.
quit	Same as exit.

## 2 Command Descriptions

This section provides the details of each FXOCTL command. The command syntax varies based on each command but in general it consists of the command verb follow by its parameters. Some commands are self-contained (no parameter is needed) while others may have optional or mandatory parameter(s).

The command verb is auto filled by the program. The user need only type enough to distinguish the command from the rest and the program will fill in the rest. A space character is also filled in so that the user is ready to type in the parameter.

The command line is always terminated by the Enter key. The Enter key at the end of each command triggers the FXOCTL program to start parsing and executing the command. The following sections describe the syntax for each command.

### 2.1 Help Command

The `help` command displays the FXOCTL command syntax.

#### Syntax

```
FXOCTL:NN> help or FXOCTL:NN> ?
```

Where:            NN        Current active channel ID.

The following is a log of the help command.

```
FXOCTL:00> help
? - Display FXOCTL command syntax.
autoanswer - Auto-answer on in coming ring.
answer - Manually answer a ring.
billingtonefilter - Billing tone filter enable/disable.
callmonitor - Call progress monitor audio setting.
channel X - Set active channel X (0..15).
countryconf - Country default parameters.
dial nnnnnn - Dial number nnnnnn.
display - Display...
exit - Exit the FXOCTL program.
gpio - Managing GPIO configuration and control.
help - Display FXOCTL command syntax.
iet - Manage IET table.
loopback - Loopback control.
measure - Measure current/voltage.
offhook - Go off-hook on current active channel.
onhook - Go on-hook on current active channel.
register rgXX - display content of reg rgXX.
register rgXX=0xYY - set value 0xYY to reg rgXX.
register display rgXX - display content of reg rgXX.
register display all - display content of all regs.
samplerate 8 or 16kHz - Select new PCM sample rate.
threshold - Line parameter threshold management.
quit - Exit the FXOCTL program.
```

**Figure 2: Help Command Logging Session**

## 2.2 1x66 Hardware Register Access

The FXOCTL provides access to the 1x66 hardware register via register read and write command as described below.

### 2.2.1 Register Read Commands

The `register` command can be used to reads the content register(s) on the current active device (NN).

#### Syntax

```
FXOCTL:NN> register <rgXX>           (read and display register XX)
FXOCTL:NN> register display <rgXX>   (read and display register XX)
FXOCTL:NN> register display all       (read and display all registers)
```

Where: XX      00 to 25 hexadecimal represent the registers from 00 to 25 hex.  
          NN      Shows the current active device ID.

Refer to the chip data sheet for registers, their usage and contents. The following is a log of the command to read register 0x03, 0x12 and all registers.

```
FXOCTL:00> register rg03
RG03 - 0xE0

FXOCTL:00> register display rg12
RG12 - 0x04

FXOCTL:00> register display all

-----+-----
RGXX | 0 1 2 3 4 5 6 7 8 9 A B C E
-----+-----
00 | 0x00 0x00 0x00 0xE0 0xE4 0x1B 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x2A 0xE0
10 | 0x00 0x0E 0x04 0x80 0x2A 0x38 0xD0 0x00 0x01 0x44 0x04 0x24 0x00 0x02
20 | 0x00 0x00 0x00 0x00 0x00 0xED 0x5C 0x40
-----+-----
FXOCTL:00>
```

**Figure 3: Register Read Command Logging Session**



## 2.2.2 Register Write Command

The `register` command can also be used to write a value to the register on the current active device (NN).

### Syntax

```
FXOCTL:NN> register rgXX=0xYY
```

Where:

XX	00 to 25 hexadecimal represent the registers from 00 to 25 hex.
YY	Hexadecimal value from 0x00 to 0xFF.
NN	Shows the current active channel ID.

Refer to the chip datasheet for registers, their usage and contents. The following is a log of the command to write register 0x12 with the value of 0xC0.

```
FXOCTL:00> register rg12=0xC0
FXOCTL:00>
```

**Figure 4: Register Write Command Logging Session**

## 2.3 Answering of Incoming Calls

The FXOCTL reports incoming RING event when one is detected. Each FXO channel can be programmed for auto answer mode to automatically answer the call, or manually answered by the user using this “answer” command.

### 2.3.1 Auto Answer Setting Command

The `autoanswer` command sets auto answer mode to the channel. In this mode the incoming call on the FXO channel will be automatically answered by the FXOCTL program. This is accomplished by bringing the channel off-hook when incoming ring is detected without user intervention.

### Syntax

```
FXOCTL:NN> autoanswer (set auto-answer mode on current active channel)
FXOCTL:NN> autoanswer <XX> (set auto-answer mode on channel XX)
```

Where:

XX	00 to 15 decimal represents the device ID.
NN	Shows the current active channel ID.

The following is a log of the command to set auto answer mode on current active channel (0) and on channel 3.

```
FXOCTL:00> autoanswer
Set auto-answer on current active channel: 0
FXOCTL:00> autoanswer 3
Set auto-answer on channel: 3
```

Set auto-answer on active channel (0).

Set auto-answer on channel 3.

**Figure 5: Autoanswer Command Logging Session**

### 2.3.2 Answer Command

The `answer` command manually answers an incoming call by bringing the FXO channel off-hook. This command is manually issued by the user when the RING event is detected.

#### Syntax

```
FXOCTL:NN> answer                (answer call on current active channel)
FXOCTL:NN> answer <XX>           (answer call on channel ID XX)
```

Where:       XX     00 to 15 decimal represent the channel ID.  
          NN     Shows the current active channel ID.

The following is a log of the command to answer incoming call on channel 0, and channel 3.

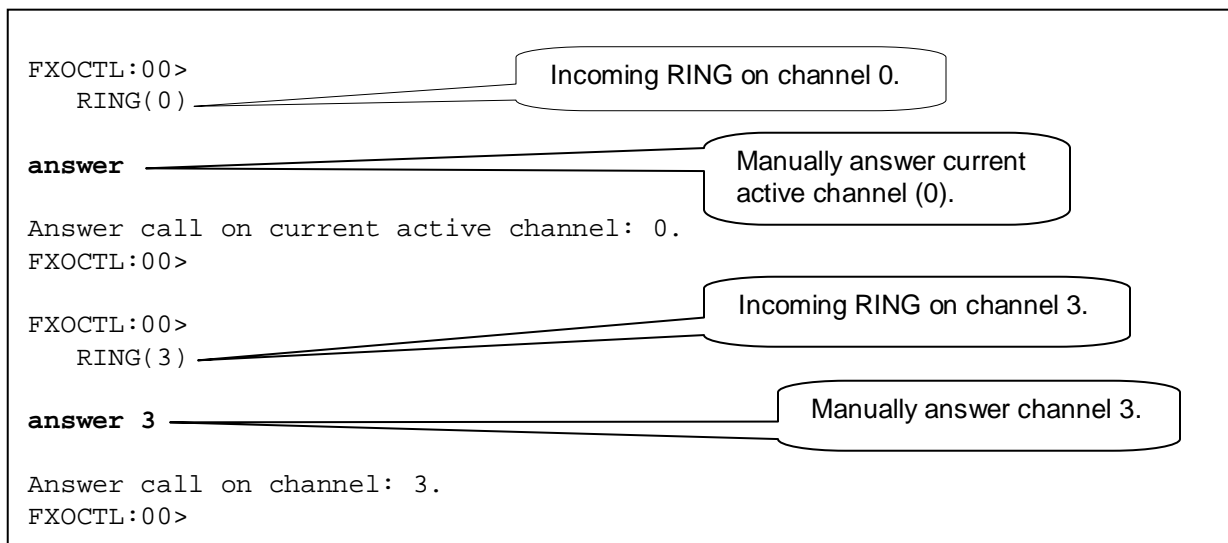


Figure 6: Answer Command Logging Session

### 2.4 Set Active Channel Command

The `channel` command sets the current active channel to a specific channel ID.

#### Syntax

```
FXOCTL:NN> channel <XX>
```

Where:       XX     New desired active channel ID – 00 to 15 (decimal).  
          NN     Shows the current active channel ID.

The following is a log of the command to set new active channel ID to channel 5.

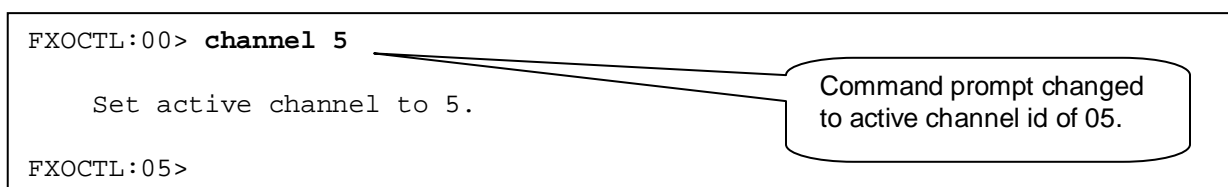


Figure 7: Set Active Channel Logging Session

## 2.5 Dial Commands

The `dial` is the command for managing pulse dial feature. With this command the user can perform pulse dialing with a numeric digit string, abort or cancel an on-going dial process, or changing or display pulse dial timing parameter. To display the dial timing parameter omit all input after the token “param”.

### Syntax

```
FXOCTL:NN> dial <nnnnnnnnnn>           (dial number nnnnnnnnnn)
             dial cancel                 (cancel dial)
             dial param <ii> <jj> <kk>  (change param to ii jj & kk)
             dial param                   (display timer parameters)
```

Where:

nnnnnnnnn	Numeric dial string.
ii	On-hook duration.
jj	Off-hook duration.
kk	Inter-digit duration.

The following is a log of the command:

1. Dial on current active channel (0) with the dial string of “7142136016”.
2. Cancel an on-going dial command.
3. Change dial timer parameters – on-hook duration to 40, off-hook duration to 60 and inter-digit duration to 800 ms.

```
FXOCTL:00> dial 7142136016
FXOCTL:00> dial cancel
Cancel pulse dial on current active channel: 0.
FXOCTL:00>
DIAL_ABORTED(0)
FXOCTL:00> dial param 40 60 800
FXOCTL:00> dial param
On-hook duration      : 40 ms.
Off-hook duration     : 60 ms.
Inter-digit duration  : 800 ms.
FXOCTL:00>
```

**Figure 8: Dial Command Logging Session**

## 2.6 Exit Command

The `exit` command terminates the FXOCTL program. When issued, the user is prompted and asked to confirm with a Y(es) or N(o). A “yes” terminates the program.

### Syntax

```
FXOCTL:NN> exit
```

Where:        NN        Shows the current active channel ID.

The following is a log of the command to exit the FXOCTL program.

```
FXOCTL:00> exit
Are you sure you want to quit? (Y or N)y

Good bye!
```

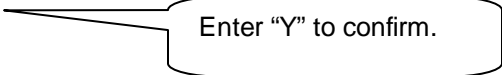


Figure 9: Exit Command Logging Session

## 2.7 Hook Switch Operation

The FXOCTL provides commands to manually control the hook switch operation of the FXO channel. The FXO channel can be switched off hook or on hook.

### 2.7.1 Off-Hook Command

The `offhook` command brings the FXO channel off-hook.

### Syntax

```
FXOCTL:NN> offhook                    (Current channel ID off-hook)
```

```
FXOCTL:NN> offhook XX                (Channel ID XX off-hook)
```

Where:        NN        Shows the current active channel ID.

The following is a log of commands that bring the current channel ID and channel 4 off-hook.

```
FXOCTL:00> offhook
Channel 0 is OFF-hook.
FXOCTL:00>
FXOCTL:00> offhook 4
Channel 4 is OFF-hook
```

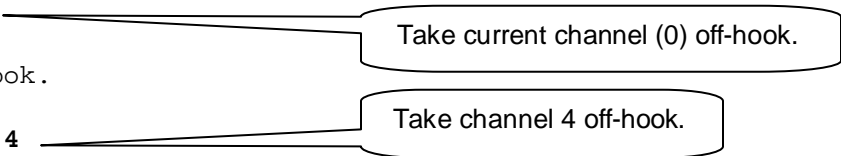


Figure 10: Off-Hook Command Logging Session

## 2.7.2 On-Hook Command

The `onhook` command brings the FXO channel on-hook.

### Syntax

```
FXOCTL:NN> onhook                (Bring current channel ID off-hook)
FXOCTL:NN> onhook <XX>          (Bring channel XX off-hook)
```

Where:       XX     Channel ID.  
              NN     Show the current active channel ID.

The following is a log of commands that bring the current channel ID and channel 4 on-hook.

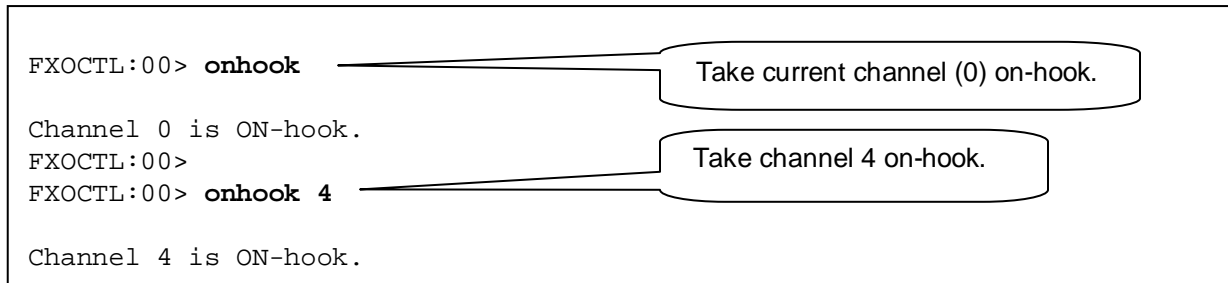


Figure 11: On-Hook Command Logging Session

## 2.8 FXO Line Status and Monitor

The FXO line's current and voltage can be autonomously monitored by setting the desired level of the IET (Interval Event Table). The FXOCTL provides commands for managing the IET and controlling the monitoring process.

## 2.8.1 IET Setting Command

The `iet` (Interval Event Table) is a table of up to 10 entries of interval threshold parameters. The driver can be instructed to monitor the line current and/or voltage and send an appropriate event when the current or voltage falls within active interval threshold.

The `iet` command can be used for managing this IET table. The command consists of setting (updating) IET entry, deleting (clearing) an IET entry from the table, or list all active IET entries.

### Syntax

```
FXOCTL:NN> iet <voltage|current> list
FXOCTL:NN> iet <voltage|current> clear <row>
FXOCTL:NN> iet <voltage|current> set <row> <min> <max> <event>
```

Where:

<row>	Row number (0 to 9).
<min>	Minimum voltage/current range.
<max>	Maximum voltage/current range.
<event>	Event ID (unsigned 32bit value).
NN	Shows the current active channel ID.

The following log consists of the following IET commands:

- 5 IET setting commands (set row 0, 1, 2, 3, and 4)
- IET list command
- IET clear command (clear row 3)
- IET list command

```
FXOCTL:00> iet voltage set 0 100 200 1000
FXOCTL:00> iet voltage set 1 200 300 2000
FXOCTL:00> iet voltage set 2 300 400 3000
FXOCTL:00> iet voltage set 3 400 500 4000
FXOCTL:00> iet voltage set 4 500 600 5000

FXOCTL:00> iet voltage list
  ROW      MIN      MAX      EVENT
-----
  0        100      200      1000
  1        200      300      2000
  2        300      400      3000
  3        400      500      4000
  4        500      600      5000

FXOCTL:00> iet voltage clear 3
FXOCTL:00> iet voltage list
  ROW      MIN      MAX      EVENT
-----
  0        100      200      1000
  1        200      300      2000
  2        300      400      3000
  4        500      600      5000
```

Set IET voltage row 0, 1, 2, 3, and 4.

List all active IET voltage entries.

Delete IET voltage row number 3.

List all active IET voltage entries.

Figure 12: IET Command Logging Session

## 2.8.2 Measure Command

The `measure` command is used to initiate or terminate a monitoring session. A monitoring session can be for line voltage or line current. Both measuring entity (voltage and current) can be active currently.

### Syntax (Stop)

```
FXOCTL:NN> measure <voltage|current> stop
```

Where:        NN        Show current active channel ID.

### Syntax (Start)

```
FXOCTL:NN> measure <voltage|current> start <XX> <YY>
```

Where:        XX        Sample time interval (in ms).  
               YY        Average Sample count (1 to 20).  
               NN        Shows the current active channel ID.

The following is a log of the measuring commands.

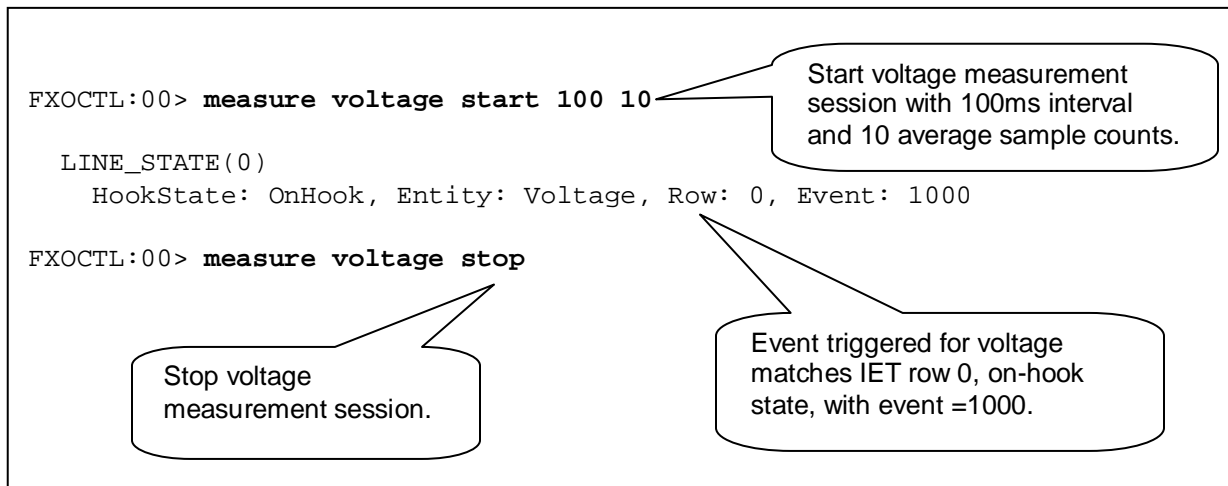


Figure 13: Measure Command Logging Session

## 2.9 GPIO Management

The FXOCTL provides three commands for managing the GPIO:

1. Config – configures the GPIO pin for operation.
2. Control – enable/disable the GPIO pin.
3. Data – accessing GPIO data.

### 2.9.1 GPIO Config Command

The GPIO pin must be configured properly before it can be used. Using this command the user can display the GPIO configuration (GET), or configure the GPIO pin for the desired operation (SET). Configuring the GPIO is simple, it requires only up to two parameters:

1. Signal direction (input or output).
2. If configured as input the GPIO will generate interrupt upon rising or falling edge signal – this parameter selects the edge transition. For output direction this parameter is not relevant.

#### Syntax (GET)

```
FXOCTL:NN> gpio config get gpioX
```

Where:            gpioX   gpio5, gpio6, or gpio7.  
                  NN       Shows the current active channel ID.

#### Syntax (SET)

```
FXOCTL:NN> gpio config set gpioX [input|output] [rising|falling]
```

Where:            gpioX   gpio5, gpio6, or gpio7.  
                  NN       Shows the current active channel ID.

The following is a log of the `gpio config` commands.

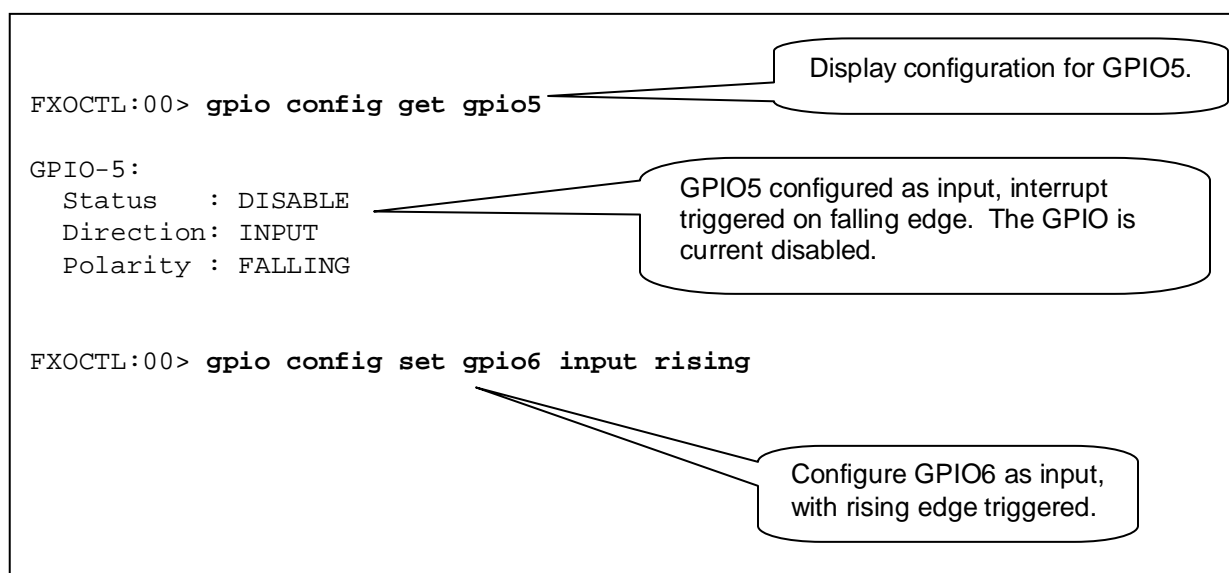


Figure 14: GPIO Config GET/SET Command Logging Session



## 2.9.2 GPIO Data Command

Using this data command the GPIO pin can be read (if configured as input) or written into (if configured as output) with signal level of high or low.

### Syntax (GET)

```
FXOCTL:NN> gpio data get gpioX
```

Where:        gpioX   gpio5, gpio6, or gpio7.  
          NN       Shows the current active channel ID.

### Syntax (SET)

```
FXOCTL:NN> gpio data set gpioX [low|high]
```

Where:        gpioX   gpio5, gpio6, or gpio7.  
          NN       Shows the current active channel ID.

The following is a log of the `gpio data` commands.

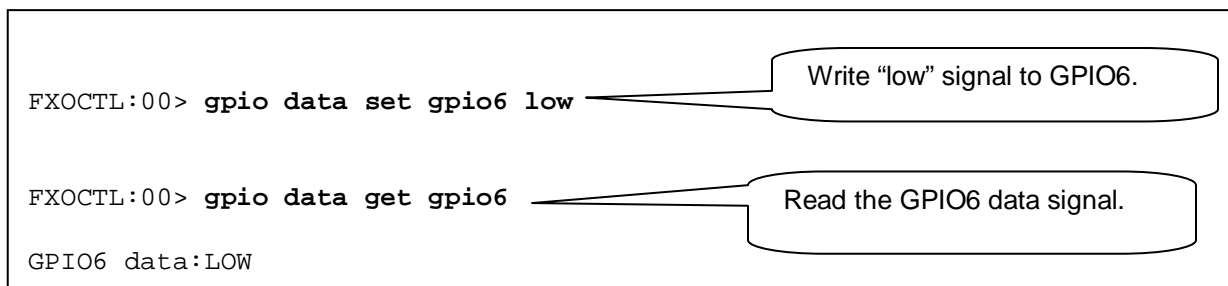


Figure 15: GPIO Data Command Logging Session

## 2.9.3 GPIO Control Command

The GPIO pin is controlled (enable/disable) using this command. Once configured properly using the config command the GPIO can be set to operational using this command.

### Syntax

```
FXOCTL:NN> gpio [enable|disable] gpioX
```

Where:        gpioX   gpio5, gpio6, or gpio7  
          NN       Shows the current active channel ID.

The following is a log of the `gpio control` commands.

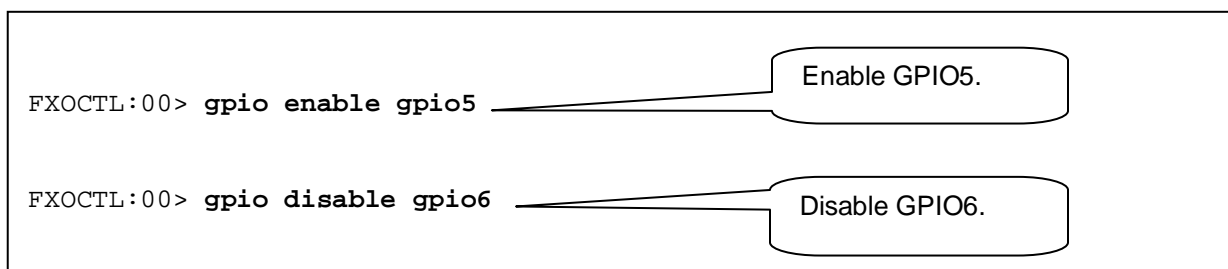


Figure 16: GPIO Control Logging Session

## 2.10 Loopback Management

There are six different loopback mode can be set internally by the driver. Using the loopback command the user can disable the loopback, query the loopback status, or enable one of the following loopback modes:

1. PCM loopback
2. Digital loopback – 1
3. Internal loopback – 1
4. Digital loopback – 2
5. Internal loopback – 2
6. Analog loopback

### 2.10.1 Loopback Set Command

This command enables one of the loopback modes.

#### Syntax

```
FXOCTL:NN> loopback set [pcm|digital1|internal1|digital2|internal2|analog]
```

Where:        NN        Shows the current active channel ID.

### 2.10.2 Loopback Clear Command

This command disables the loopback.

#### Syntax

```
FXOCTL:NN> loopback clear
```

Where:        NN        Shows the current active channel ID.

### 2.10.3 Loopback Get Command

The command displays the active loopback mode.

#### Syntax

```
FXOCTL:NN> loopback get
```

Where:        NN        Shows the current active channel ID.

The following is a log of the loopback commands.

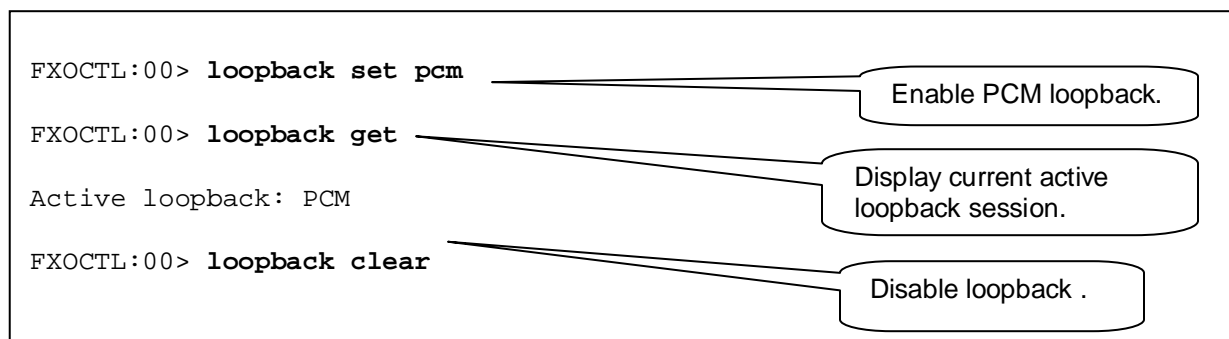


Figure 17: Loopback Command Logging Session

## 2.11 Billing Tone Filter Commands

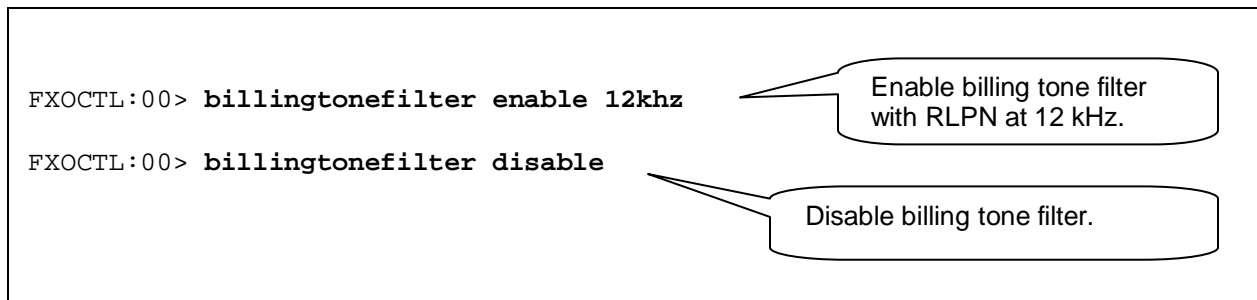
This command enables or disables the billing tone filter. If enable the user must specify the Receive Low Pass Notch (RLPN) frequency of 12 or 16 kHz.

### Syntax

```
FXOCTL:NN> billingtonefilter [enable|disable] [12khz|16khz]
```

Where:            NN        Shows the current active channel ID.

The following is a log of the billing tone filter commands:



**Figure 18: Billing Tone Filter Command Logging Session**

## 2.12 Threshold Override Commands

The FXO channel is operating with the parameter threshold configured by the channel initialization procedure. This command can be used to override the threshold value with new threshold. Three threshold parameters can be overridden:

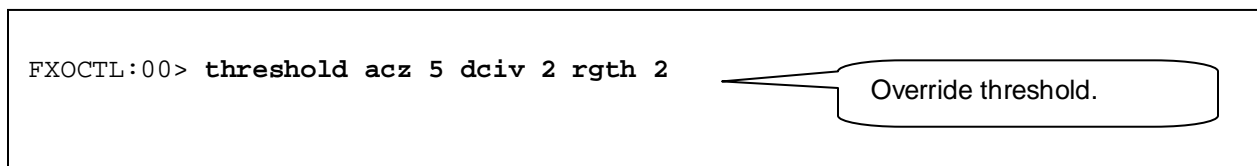
1. Active Termination Loop (ACZ)
2. DC Current Voltage Characteristic Control (DCIV)
3. Ring Detect Threshold

### Syntax

```
FXOCTL:NN> threshold acz xx dciv yy rgth zz
```

Where:            xx        0 – 15 (Active Termination Loop).  
                   yy        0 – 3 (DC Current Voltage Characteristic Control).  
                   zz        0 – 3 (Ring Detect Threshold).  
                   NN        Shows the current active channel ID.

The following is a log of the billing tone filter commands:



**Figure 19: Override Threshold Command Logging Session**

## 2.13 Sample Rate Selection Command

The 73M1x66B device can operate in one of two sample rates – 8 kHz or 16 kHz sample rate. The device defaults to 8 kHz operation upon startup and can be changed to run at 16 kHz using this command.

Notes: Changing of PCM sample rate will affect the followings:

1. Data presented in PCM timeslots - reallocation of transmit and receive timeslots may be necessary or required to properly communicate with peer interface.
2. Barrier interface operation - a momentarily lost of synchronization on the barrier interface is expected. However, the driver will automatically attempt to recover barrier synchronization. The SYNC lost event is sent and should be followed by SYNC restored event when the barrier is synced up again.

### Syntax

```
FXOCTL:NN> samplerate [8khz | 16khz]
```

Where:        NN        Shows the current active channel ID.

The following is a log of the sample rate selection commands:



**Figure 20: Sample Rate Selection Command Logging Session**

### **3 Related Documentation**

The following 73M1x66B documents are available from Teridian Semiconductor Corporation:

*73M1866B/73M1966B Data Sheet*

*73M1866B/73M1966B Reference Driver User Guide*

*73M1866B/73M1966B FXOAPI User Guide*

### **4 Contact Information**

For more information about Teridian Semiconductor products or to check the availability of the 73M1866B and 73M1966B, contact us at:

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For a complete list of worldwide sales offices, go to <http://www.teridian.com>.

## Revision History

Revision	Date	Description
1.0	3/9/2007	First publication.
1.1	9/25/2007	Reformatted to the company style. Miscellaneous editorial changes.
1.1.1	2/4/2008	Changed the document number and changed "Manual" in the title to "Guide".
2.0	11/18/2008	Changed the document title to <i>73M1866B/73M1966B FXOCTL Application User Guide</i> from <i>73M1966 Linux Application User Guide</i> . Updated document to be relevant as a user guide for the FXOCTL demo application.
3.0	6/12/2009	Documents the redesign using the FXOAPI.
4.0	10/2/2009	Rewrote <a href="#">Section 2.5, Dial Commands</a> . Added <a href="#">Section 2.9, GPIO Management</a> . Added <a href="#">Section 2.10, Loopback Management</a> . Added <a href="#">Section 2.11, Billing Tone Filter Commands</a> . Added <a href="#">Section 2.12, Threshold Override Commands</a> .
4.1	11/2/2009	Added PCM <a href="#">samplerate</a> selection command.