User Manual for YC2440&UTU2440 Linux

V5.1

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1 General

This guide applies to all product series of YC2410 and YC2440.

This guide’s description is based on open SUSE Linux 10.2 host development PC. If you are using other distributions like RedHat 9.0, Fedora Core, or Ubuntu Desktop etc, it also works although there is slightly difference. Please refer to the user manual of your particular Linux distribution when necessary.

There are some assumptions in this guide:

- The IP address of host PC is 192.168.2.3.
- The IP address of target is 192.168.2.10.
- The gateway of router is 192.168.2.1.

2 Hardware Connection

Please connect your devices as one of the figures below:

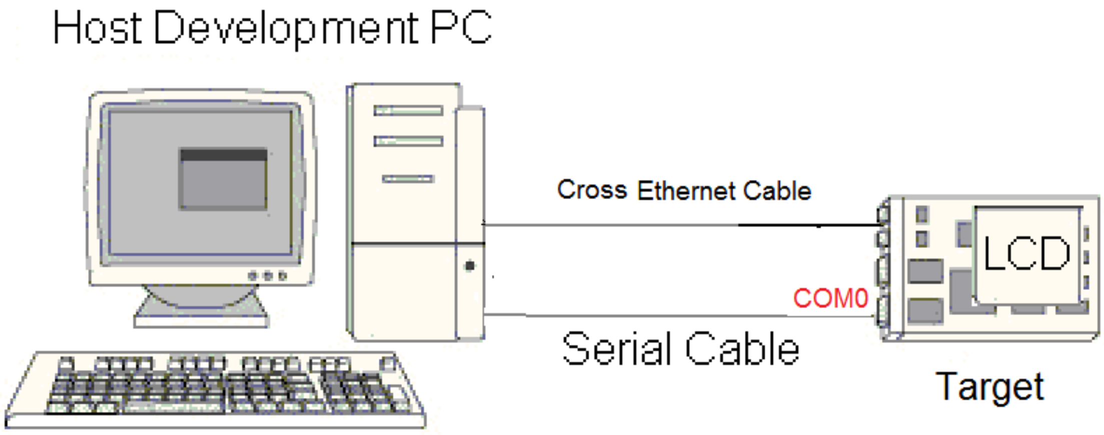


Figure 1 Use crossed Ethernet cable.

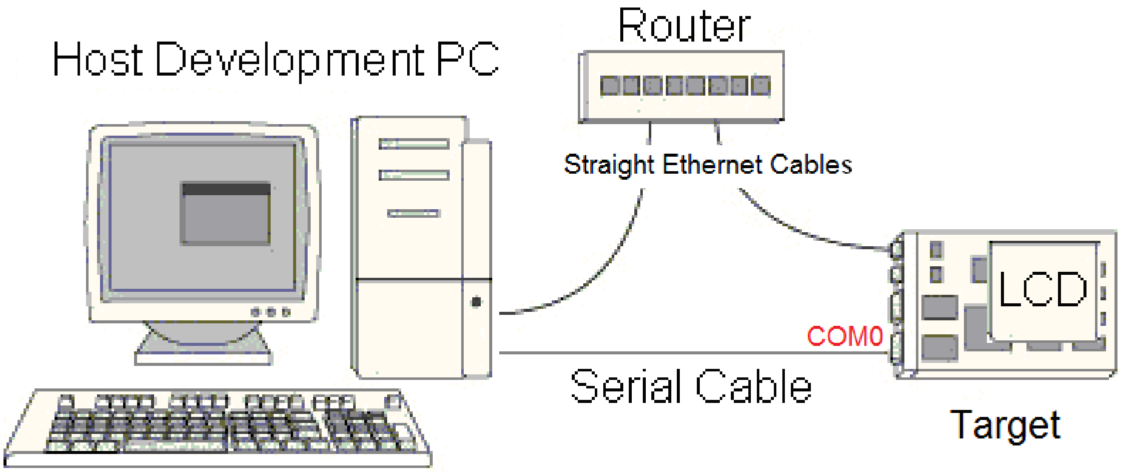


Figure 2 Use straight Ethernet cables.

3 Setup Linux Development Platform

The following programs are available for all Linux platforms. You may have to install them if they haven't been installed. Please refer to the installation procedure of your particular Linux distribution to install them. You should have root privileges.

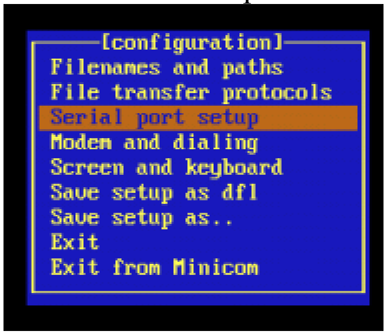
To prevent from some problems caused by firewall, please first disable the firewall of your host Linux PC.

3.1 Setup minicom

The first time Minicom is run, you will have to initialize the settings. To do this perform the following steps:

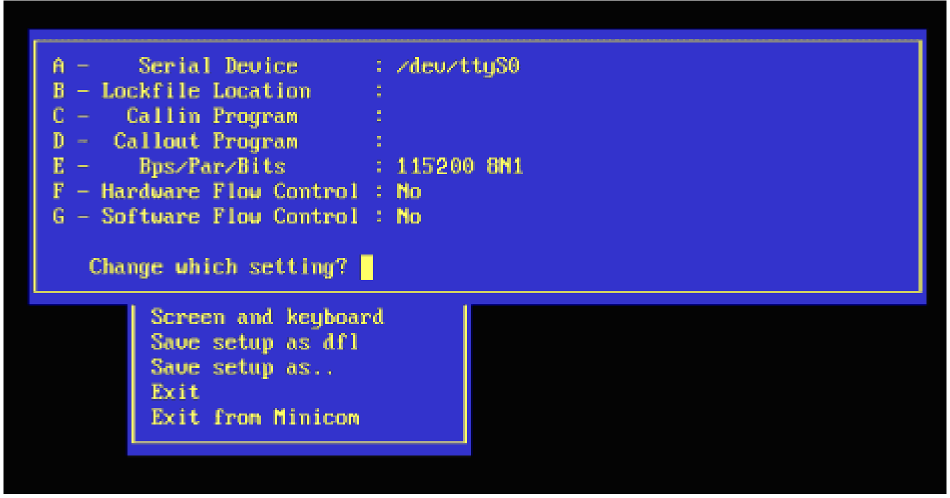
#minicom –s

The Minicom Setup screen will now appear:



Go down to Serial port setup and hit Enter.

The Serial port setup window should now appear:

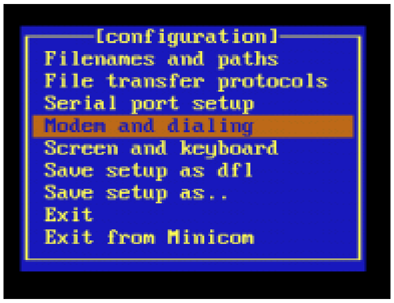


```
A -    Serial Device      : /dev/ttyS0
B - Lockfile Location     :
C -   Callin Program      :
D -  Callout Program      :
E -    Bps/Par/Bits       : 115200 8N1
F - Hardware Flow Control : No
G - Software Flow Control : No

   Change which setting?
```

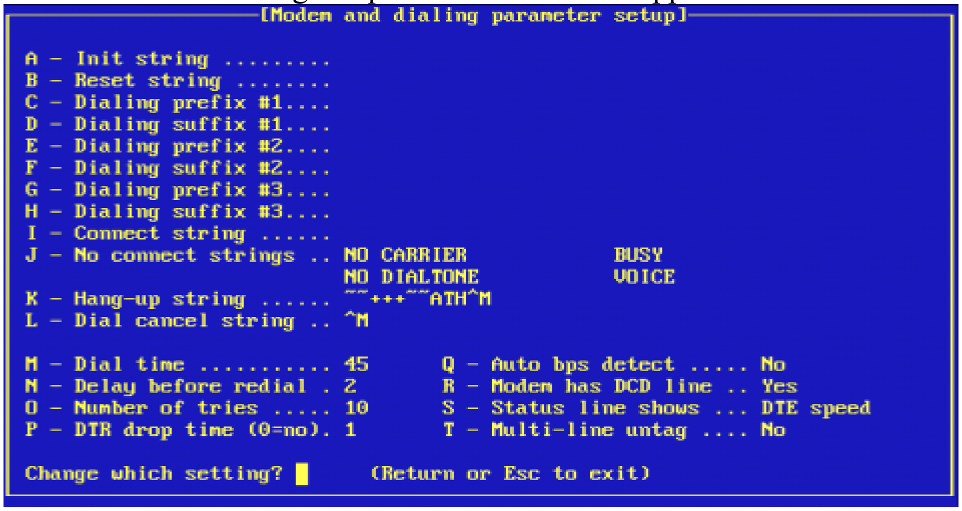
In this menu type the letter of the option you want to choose (e.g. 'A' would be Serial Device) and then edit the configuration for that option as above.

115200 baud is the default serial transfer rate for U-Boot and the linux kernel. Hit Esc to return to the main menu.

Next Go down to Modem and Dialing and hit Enter, the modem features must be disabled:



The modem and dialing setup screen should now appear:



```
[Modem and dialing parameter setup]

A - Init string .........
B - Reset string ........
C - Dialing prefix #1....
D - Dialing suffix #1....
E - Dialing prefix #2....
F - Dialing suffix #2....
G - Dialing prefix #3....
H - Dialing suffix #3....
I - Connect string ......
J - No connect strings .. NO CARRIER          BUSY
                          NO DIALTONE         VOICE
K - Hang-up string ...... ~~+++~~ATH^M
L - Dial cancel string .. ^M

M - Dial time ........... 45      Q - Auto bps detect ..... No
N - Delay before redial . 2       R - Modem has DCD line .. Yes
O - Number of tries ..... 10      S - Status line shows ... DTE speed
P - DTR drop time (0=no). 1       T - Multi-line untag .... No

Change which setting?       (Return or Esc to exit)
```

In this menu hit the letter of the option you want to choose (e.g. 'A' would be Init string) and then edit the configuration for that option as above.

Hit Esc to return to the main menu

Now that the configuration has been set, it should be saved as the default configuration so that every time Minicom starts these settings will be restored.

3.2 Setup TFTP server

The TFTP server is used by U-Boot to load image file (bootloader image, kernel image or file system image) from host PC to the target system.

Check you have TFTP package installed:

```
#/usr/sbin/in.tftpd -V
```

Create /etc/xinetd.d/tftp and put this entry:

```
service tftp
{
protocol       = udp
socket_type    = dgram
wait           = yes
user           = root
server         = /usr/sbin/in.tftpd
server_args    = -s /tftpboot
disable        = no
}
```

Create /tftpboot directory

```
#mkdir /tftpboot

#chmod -R 777 /tftpboot

#chown -R nobody /tftpboot
```

Start tftpd through xinetd

```
#/etc/init.d/xinetd restart
```

3.3 Setup NFS server

NFS is a useful tool to make the development easy. You can mount a file system on the host PC and develop your applications on the host PC before deploying them to the target. You can also transfer any files between the target and the NFS mounted directories.

Before you can configure NFS, you need to verify that the NFS server is running.

To verify that the NFS server is running, complete the following tasks:

Verify that the nfs daemon is running. Use the command:

```
#ps -aef | grep nfs
```

Messages similar to the following are displayed:

```
root 11622 1 0 Apr17 ? 00:00:00 [nfsd]
root 11623 1 0 Apr17 ? 00:00:00 [nfsd]
……
```

Verify that portmap is available.

```
#ps -aef | grep portmap
```

Message similar to the following are displayed:

```
bin 398 1 0 Apr10 ? 00:01:01 /sbin/portmap
```

Verify that the rpc.mountd mount daemon is available.

```
#ps -aef | grep mountd
```

Message similar to the following are displayed:

```
root 11614 1 0 Apr17 ? 00:00:00 /usr/sbin/rpc.mountd
```

To setup NFS server

Add the following line in /etc/exports:

```
your_dir *(rw,no_root_squash,no_all_squash)
```

(ENTER THE PRECEDING STRING AS A SINGLE LINE.)

The above directory (your_dir) could be any directories you want to export, and you can add as many lines as you want so that you can export many directories.

Restart the NFS daemon.

```
#/usr/sbin/rcnfsserver restart
```

Sync the NFS daemon.

```
#/usr/sbin/exportfs –ra
```

NFS is now set up.

3.4 Install Cross-compiling Toolchain

The toolchain packages are in arm-linux-gcc-3.4.1.tar.bz2. You can use this toolchain to compile kernel and applications, however you need arm-linux-gcc-3.3.2.tar.bz2 to compile the provided qtopia version.

3.4.1 Extract the toolchain package in to /usr/local/arm

```
#mkdir –p /usr/local/arm
```

```
#tar -xjvf arm-linux-gcc-3.4.1.tar.bz2 –C /
```

3.4.2 Set path

Add a line in /etc/profile like below:

```
...
   PATH=/usr/local/arm/3.4.1/bin:$PATH << Add this line
   export PATH
...
```

Save, and logoff and logon

If your Linux is not Suse Linux, the PATH setup may be different.

3.4.3 Verify the toolchain has been installed

```
#arm-linux-gcc –version
```

Message similar to the following are displayed:

```
arm-linux-gcc (GCC) 3.4.1
```

4 Experience Linux

The following software applications are stored in the 64Mbytes NAND flash memory. You don't need to do programming at this time. You can always restore them using the pre-built images of bootloader, kernel, and file system in the supplied CD.

During booting, you might see some messages on the Minicom console as below:

```
Block XXXX is marked bad
Block XXXX is bad
```

That is all right. It is very common that NAND flash has bad blocks. Your Linux file system is smart enough to detect and mark those blocks. Those bad blocks will not be used when running.

4.1 Mount a USB drive

Insert a USB drive into USB host, you will see some messages on your minicom terminal.

```
#mount /dev/sda1 /mnt
```

```
#ls /mnt
```

```
#umount /mnt
```

4.2 Mount a SD/MMC card

Insert a SD card into SD slot, you will see some messages on your minicom terminal.

```
#mount /dev/mmcblk0p1 /mnt
```

```
#ls /mnt
```

```
#umount /mnt
```

4.3 Play a mp3 music using madplay

madplay is a command line mp3 player.

To see how to use it:

```
#madplay –h
```

To play a mp3 music

```
#madplay music.mp3
```

4.4 Check your target's IP address

```
#ifconfig –a
```

4.5 Check the network.

```
#ping 192.168.2.1
```

4.6 Using telnet to logon the target

```
#telnet 192.168.2.10
```

4.7 Set, save and read the real-time clock

To set the current system clock:

```
#date -s 112717122006
Mon Nov 27 17:12:00 UTC 2006
```

To save current system time into the hardware clock, afterwards the real-time clock will be maintained by the battery on the board:

```
#hwclock –w
```

To read the system time from the hardware clock after the system boots up:

```
#hwclock –s
```

4.8 Test buttons

```
#buttons
```

Press each button, you will see some messages on the minicom terminal.

4.9 Test LEDs

```
#led [0-3] [1|0]
```

4.10 Test blacklight

This is supported only on some LCDs.

```
#lcdbacklight on
```

```
#lcdbacklight off
```

4.11 Using USB camera

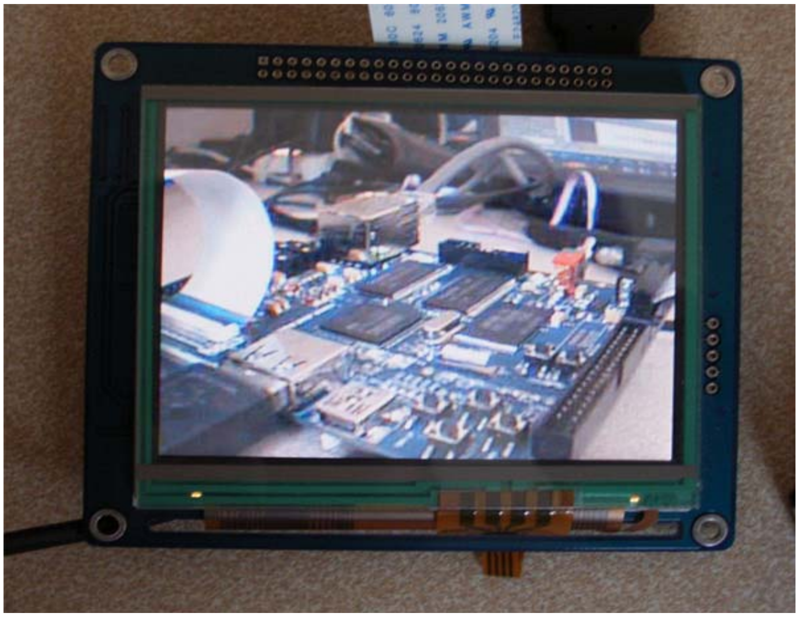
Many USB cameras are supported. Plug in your USB camera into USB host connecter, you will probably see some messages on your minicom terminal like below:

```
#usb 1-1: new full speed USB device using s3c2410-ohci and address 2
drivers/usb/media/gspca/gspca_core.c: USB SPCA5XX camera found.(ZC3XX)
```

4.11.1 To display video on LCD

```
#servfox –g –L
```

```
servfox version: 1.1.2 date: 07:10:2005 (C) mxhaard@magic.fr
frame buffer: 320x240, 16bpp, 0x25800byte
Ctrl + C to STOP!
```



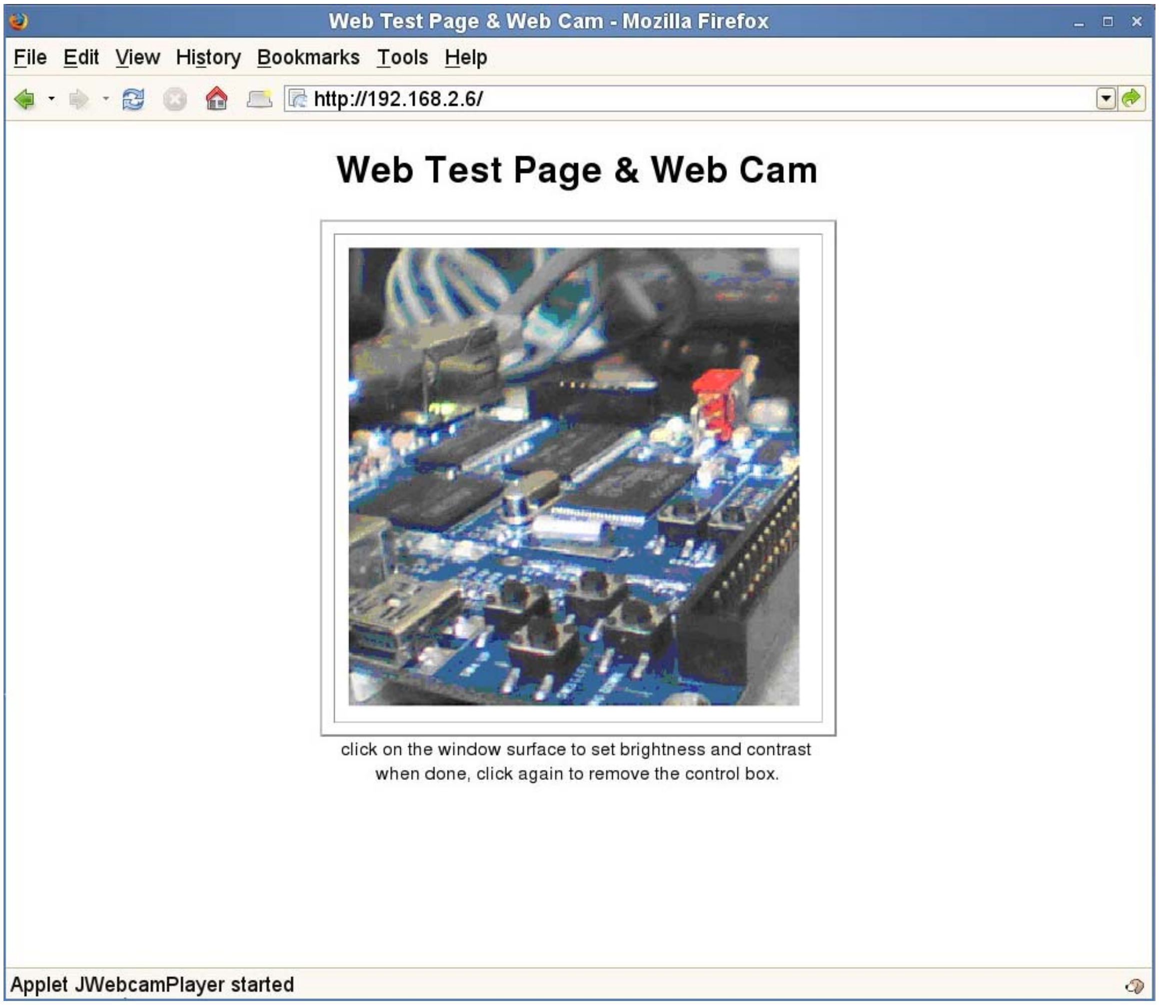
4.11.2 To display on the web browser of host PC

```
#servfox -d /dev/video0 -g 640 480 -w 7070
```

```
servfox version: 1.1.2 date: 07:10:2005 (C) mxhaard@magic.fr
VIDIOCSWIN failed
: Invalid argument
Waiting .... for connection. CTrl_c to stop !!!!
```

Open the web browser of your host PC.

Type 192.168.2.10 on the address field and press Enter, and install SUN JRE if prompted.


Web Test Page & Web Cam - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://192.168.2.6/

Web Test Page & Web Cam

click on the window surface to set brightness and contrast
when done, click again to remove the control box.

Applet JWebcamPlayer started

4.12 Surf the internet

Connect your systems as **Figure 2**.

```
#udhcpc &

 udhcpc (v1.3.2) started
Sending discover...
Sending select for 192.168.2.10...
Lease of 192.168.2.10 obtained, lease time 7172
deleting routers
route: SIOC[ADD|DEL]RT: No such process
adding dns 202.106.46.151
adding dns 202.106.195.68
```

```
[1] + Done udhcpc
```

For some routers, this command may not work. If it does not work, edit /etc/init.d/rcS as below to set static ip address and gateway address:

```
…
#config network by manual work
/sbin/ifconfig eth0 192.168.2.10
/sbin/route add default gw 192.168.2.1
#config network by udhcpc
#/sbin/udhcpc &
…
```

Now you can surf the internet using Qtopia. If your Qtopia doesn’t display your language, you can click the **Setting Tab**, and then change the default language.

5 Update bootloader, kernel or file system images

You may accidentally damage the bootloader image, kernel image or file system image when you do your development, or you may update those images with your own customized images. We have 3 developed commands of u-boot to make it easier – install-bootloader, install-kernel and install-filesystem. We also provide you with 3 ready-to-use images in case you need to restore your flash memory:

Bootloader image – u-boot.bin
Kernel image – uImage
File system image – filesystem.yaffs

Before you start to update, make sure the following have been done:

- TFTP server has been setup correctly on host PC as **3.2**.
- Host PC's IP address is the same as u-boot's TFTP server address. To set host PC's IP address, use "ifconfig" command. To set u-boot's TFTP server address, use "setenv serverip" command of u-boot.
- Copy bootloader image (u-boot.bin), kernel image (uImage), or file system image (filesystem.yaffs) to /tftpboot of host PC. If your images are not the same as the above, please rename them. In the provided CD, "***800x480" is for 7 inch LCD, "***480x272" is for 4.3 inch LCD.

5.1 Update bootloader

Power-on the target and some startup messages show up on the minicom terminal, press space key to enter u-boot command entry line.

```
#run install-bootloader
```

After it is finished, power-off the target.

5.2 Update kernel

Power-on the target and some startup messages show up on the minicom terminal, press space key to enter u-boot command entry line.

```
#run install-kernel
```

After it is finished, power-off the target.

5.3 Update file system

Power-on the target and some startup messages show up on the minicom terminal, press space key to enter u-boot command entry line.

#run install-filesystem

After it is finished, power-off the target.

5.4 How to make your own file system image

#cp mkyaffsimage to /usr/bin (mkyaffsimage is a Linux utility provided in CD)
#chmod 755 /usr/bin/mkyaffsimage

Assume rootfs is the directory of your root file system on host PC
#mkyaffsimage rootfs filesystem.yaffs

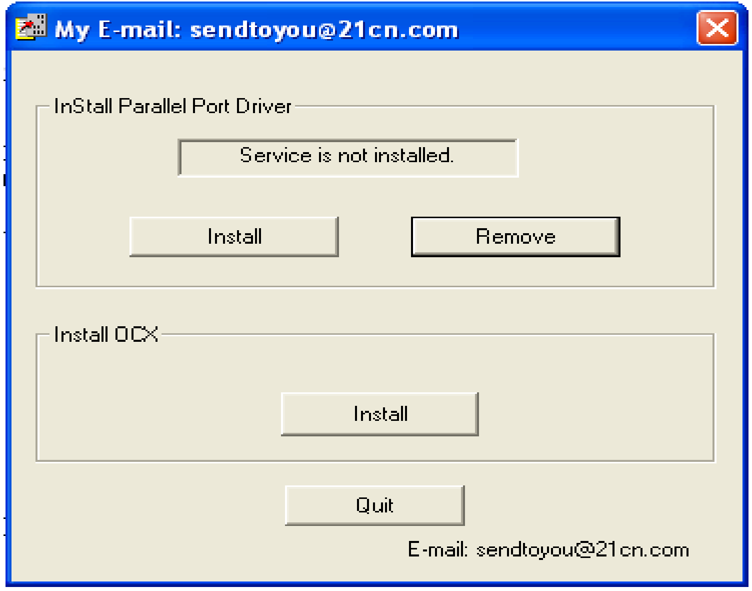
5.5 What to do if u-boot is corrupt or does not exist

If your u-boot is somehow corrupt or your nand flash is blank, you can use the provided Windows utility to load u-boot into the nand flash.

The following steps are done on Windows PC.

5.5.1 Install GIVEIO driver

Find **Windows Utilities\GIVEIO driver** directory on the provided CD, double click **install.exe** to get to this window.

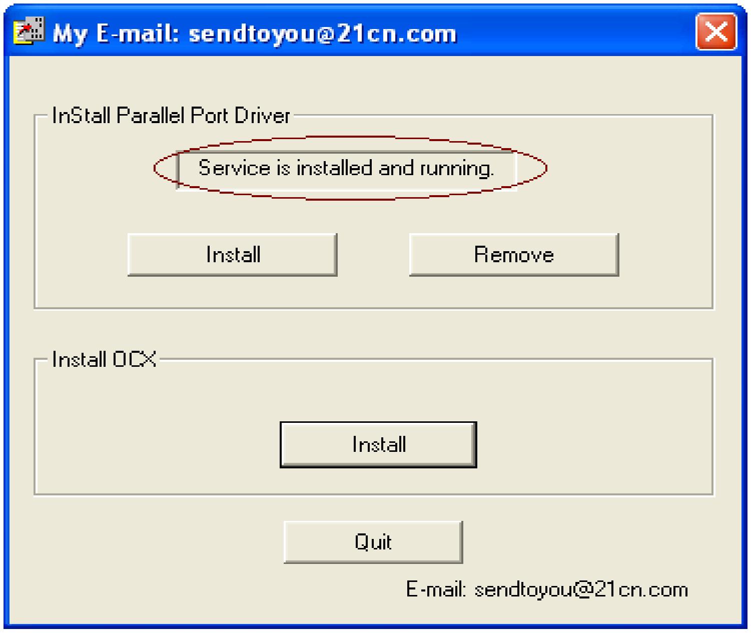


My E-mail: sendtoyou@21cn.com

Service is not installed.

E-mail: sendtoyou@21cn.com

Click those 2 **Install** buttons, and you will see the driver installed.


My E-mail: sendtoyou@21cn.com
InStall Parallel Port Driver
Install
Remove
Install OCX
Install
Quit
E-mail: sendtoyou@21cn.com

Service is installed and running.

Click **Quit** button to close the window. Now GIVEIO driver is installed.

5.5.2 Make hardware connection

PC parallel port <-> Provided Parrallel Cable <-> Wiggler Board <-> 20 Lines JTAG Cable <-> JTAG connector of 2410(or 2440) board.

Power-on the board. It does not matter if the board is now running WinCE/Linux or not.

5.5.3 Load bootloader image into nand flash

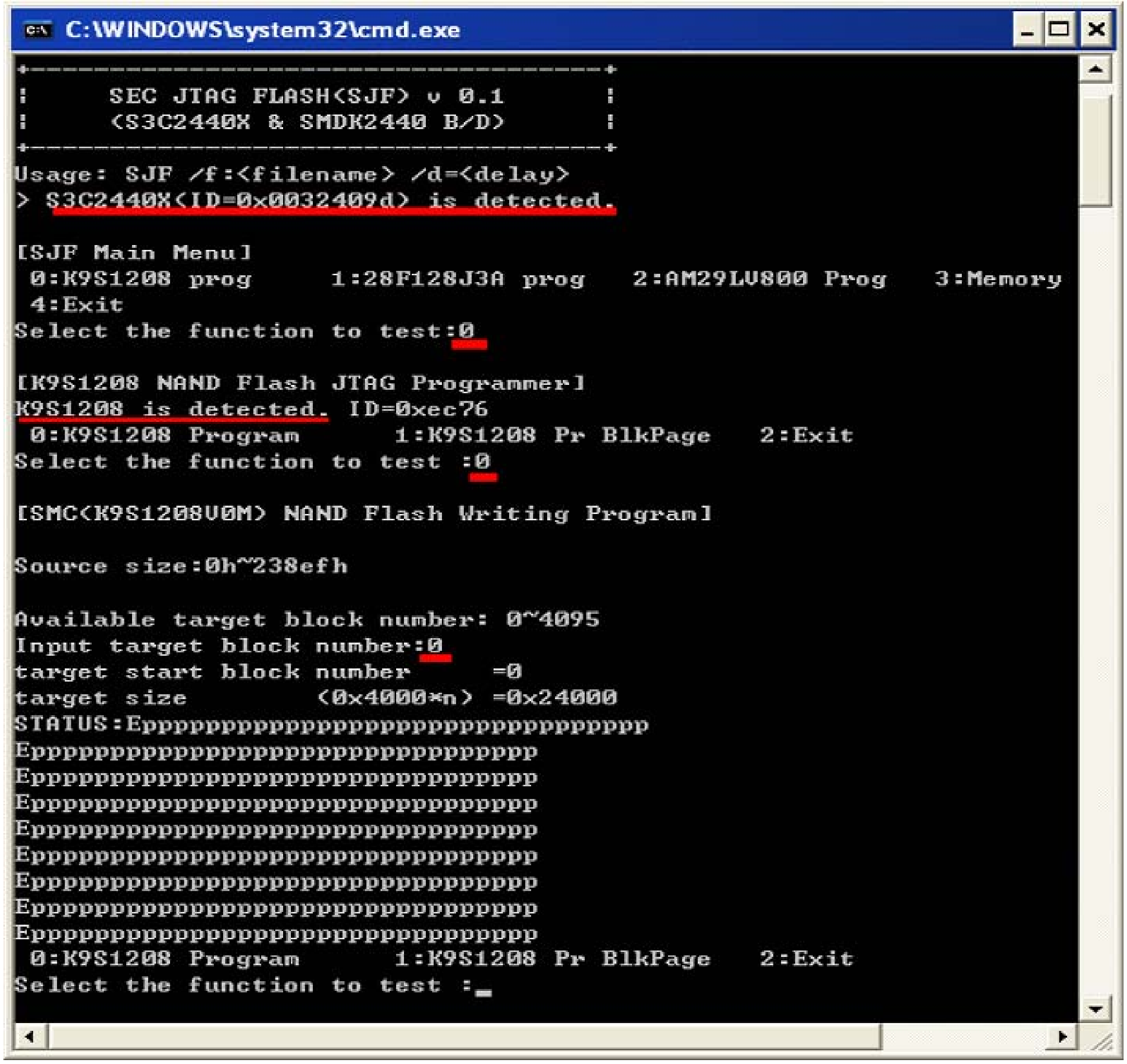
Copy **Windows Utilities\sjf2440.exe** on the provided CD to **C:\.**

Copy u-boot image, for example, u-boot.bin, to **C:\.**

Open **Command Prompt** by click **Start**->**Programs**->**Accessories**->**Command Prompt**, and then go to C:\ by typing: **cd **

```
C:\>sjf2440.exe /f:u-boot.bin
```

Here comes the following window. You need to type “0” 3 times to complete the loading process. Normally it will take a few minutes.



```
+-------------------------------------+
|     SEC JTAG FLASH(SJF) v 0.1       |
|     (S3C2440X & SMDK2440 B/D)       |
+-------------------------------------+
Usage: SJF /f:<filename> /d=<delay>
> S3C2440X(ID=0x0032409d) is detected.

[SJF Main Menu]
 0:K9S1208 prog     1:28F128J3A prog   2:AM29LV800 Prog   3:Memory
 4:Exit
Select the function to test:0

[K9S1208 NAND Flash JTAG Programmer]
K9S1208 is detected. ID=0xec76
 0:K9S1208 Program       1:K9S1208 Pr BlkPage   2:Exit
Select the function to test :0

[SMC(K9S1208V0M) NAND Flash Writing Program]

Source size:0h~238efh

Available target block number: 0~4095
Input target block number:0
target start block number     =0
target size        (0x4000*n) =0x24000
STATUS:Eppppppppppppppppppppppppppppppppp
Eppppppppppppppppppppppppppppppppp
Eppppppppppppppppppppppppppppppppp
Eppppppppppppppppppppppppppppppppp
Eppppppppppppppppppppppppppppppppp
Eppppppppppppppppppppppppppppppppp
Eppppppppppppppppppppppppppppppppp
Eppppppppppppppppppppppppppppppppp
Eppppppppppppppppppppppppppppppppp
 0:K9S1208 Program       1:K9S1208 Pr BlkPage   2:Exit
Select the function to test :_
```

After it is complete, power-off the board, unplug the JTAG cable, power-on it, and you will see the new bootloader is running. Now you can continue to upload the kernel and file system images as **5.2** and **5.3.**

5.6 A TFTP server on Windows XP – tftpd.exe

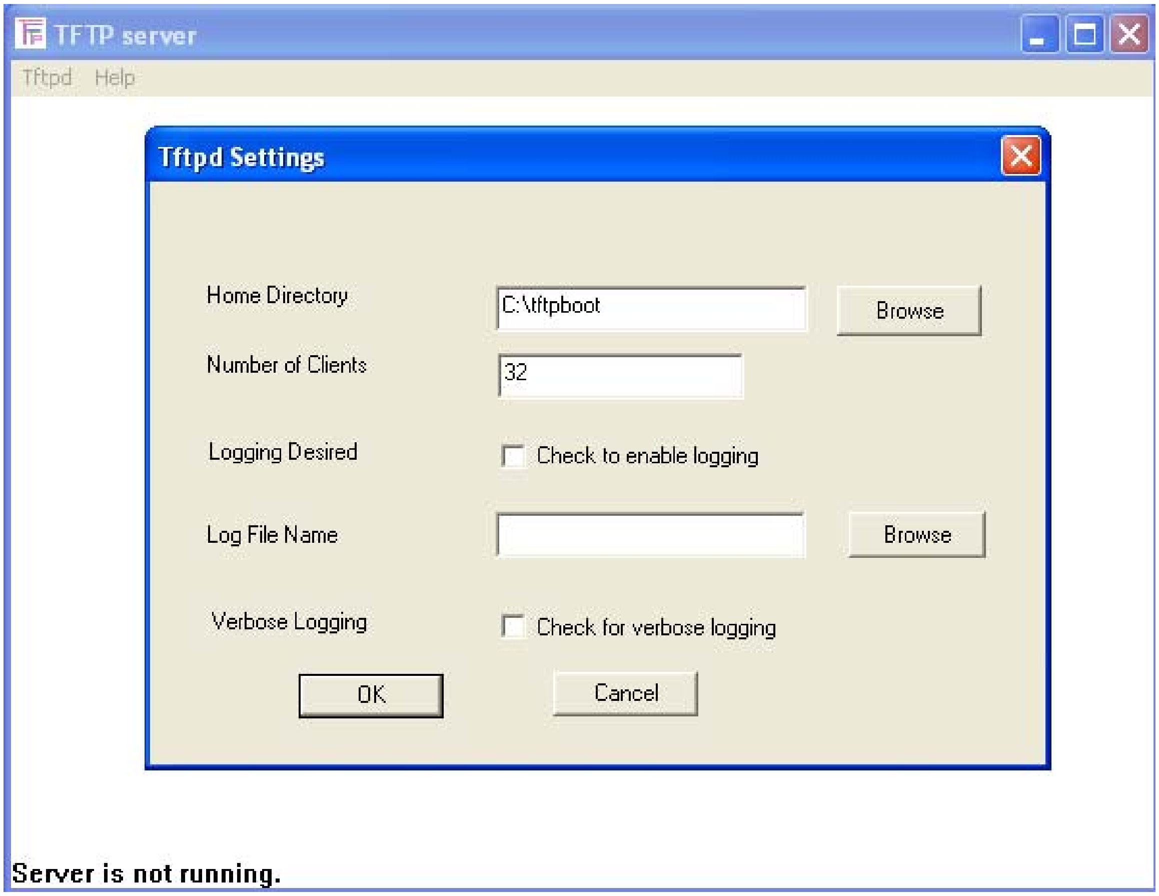
There is a TFTP server utility that can be running on Windows XP – tftpd.exe. It can also be used to update the kernel and file system. The steps are as below.

Make a directory folder, C:\tftpboot.

Copy “uImage” and “filesystem.yaffs” into C:\tftpboot.

Double-click “tftpd.exe” to start the application.

Click “Tftpd” -> “Configure’. Click “Browse” and select “C:\tftpboot” to be “Home Directory”. Click “OK” to finish “Tftpd Settings”.



Tftpd Settings

Home Directory C:\tftpboot

Number of Clients 32

Logging Desired □ Check to enable logging

Log File Name

Verbose Logging □ Check for verbose logging

Server is not running.

Click “Tftpd” -> “Start” to start the TFTP server.

6 Develop your own application

This section tells you how to cross-compile the application – buttons on the host PC, transfer the application executable file to the target, and then run it.

6.1 Cross-compile application

On the host PC, create a directory – buttons that contains your application "buttons" source code – buttons.c.

```
#arm-linux-gcc -o buttons buttons.c
```

6.2 Copy your application to target by NFS

Assume that /your_dir is a directory exported by NFS. Please refer 3.3 for NFS server set-up.

On the host PC:

```
#cp buttons /your_dir
```

On the target minicom terminal:

```
#mount –t nfs -o nolock 192.168.2.3:/your_dir /mnt
#cp /mnt/buttons .
#umount /mnt
```

Now the application, buttons, is in your current directory of the target.

6.3 Copy your application to target by TFTP

Assume that /tftpboot is a directory exported by TFTP. Please refer 3.2 for TFTP server set-up.

On the host PC:

```
#cp buttons /tftpboot
```

On the target minicom terminal:

```
#tftp –g -r buttons 192.168.2.3
```

Now the application, buttons, is in your current directory of the target.

6.4 Run application

On the target minicom terminal:

```
#./buttons
```

7 Mount a root file system on host PC

It is very useful during development stage if we are able to let booting kernel mount a root file system on host PC. We do not have to copy the intermit applications to nand flash for testing every time after they are cross-compiled on host PC. The cross-compiled applications only need to be copied to an exported directory, and the target kernel can mount it as if it is its own root directory.

The steps are detailed as below.

7.1 Create NFS mountable root file system on host PC

Create a directory on host PC, for example, /opt/rootfs.

Export the above directory as described in **3.3 Setup NFS server.**

Unzip nfs-filesystem.tar.gz to /opt/rootfs:

```
#tar –zxvf  nfs-filesystem.tar.gz –C /opt/rootfs.
```

Edit /opt/rootfs/etc/init.d/rcS as below to set static ip address and gateway address:

```
…
#config network by manual work
/sbin/ifconfig eth0 192.168.2.10
/sbin/route add default gw 192.168.2.1
#config network by udhcpc
#/sbin/udhcpc &
…
```

Logoff and logon host PC

7.2 Edit u-boot environment variable – bootargs

Power on the target, and enter u-boot command line.

```
#setenv bootargs 'console=ttySAC0 root=/dev/nfs nfsroot=192.168.2.3:/opt/rootfs
ip=192.168.2.10'
```

```
#saveenv
```

Reboot the target, and you will see some messages as:

```
...
Kernel command line: console=ttySAC0 root=/dev/nfs nfsroot=192.168.2.3:/opt/roo0
```

```
irq: clearing pending ext status 00000300
irq: clearing subpending status 00000002
...
IP-Config: Guessing netmask 255.255.255.0
IP-Config: Complete:
      device=eth0, addr=192.168.2.10, mask=255.255.255.0, gw=255.255.255.255,
     host=192.168.2.10, domain=, nis-domain=(none),
     bootserver=255.255.255.255, rootserver=192.168.2.3, rootpath=
Looking up port of RPC 100003/2 on 192.168.2.3
Looking up port of RPC 100005/1 on 192.168.2.3
VFS: Mounted root (nfs filesystem).
Freeing init memory: 176K
...
```

Now /opt/rootfs directory on host PC is your target’s root file system.

8 Build kernel

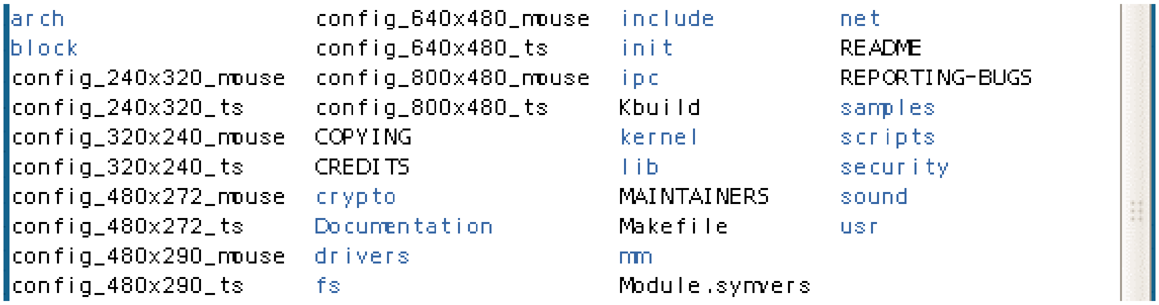
The following steps are done at host PC.

“mkimage” is a utility to convert “zImage” to “uImage”. “uImage” is a kernel image we need to write to NAND flash so that u-boot can load it and boot it.
#cp mkimage to /usr/bin
#chmod 755 /usr/bin/mkinage

Unzip the kernel source tree to a directory such as /opt:
#tar –xjvf utu-linux2.6.***.tar.bz2 –C /opt
#cd /opt/utu-linux2.6.***

To build your own kernel, you need to do kernel configuration. The kernel configuration file is “.config”, a hidden file. To see this file, type console command “ls –a” instead of “ls”.

To configure the kernel correctly, you need to have substantial knowledge of Linux and the architecture of your board, however, we provide some templates of configuration file “.config” as shown below. Please use one of them as your starting point.



```
arch                  config_640x480_mouse  include          net
block                 config_640x480_ts     init             README
config_240x320_mouse  config_800x480_mouse  ipc              REPORTING-BUGS
config_240x320_ts     config_800x480_ts     Kbuild           samples
config_320x240_mouse  COPYING               kernel           scripts
config_320x240_ts     CREDITS               lib              security
config_480x272_mouse  crypto                MAINTAINERS      sound
config_480x272_ts     Documentation         Makefile         usr
config_480x290_mouse  drivers               mm
config_480x290_ts     fs                    Module.symvers
```

If your LCD is 4.3 inch (480x272) and touch screen, config_480x272_ts is your template of “.config”. Replace the hidden configuration file (.config) by config_480x272_ts:
#cp config_480x272_ts .config

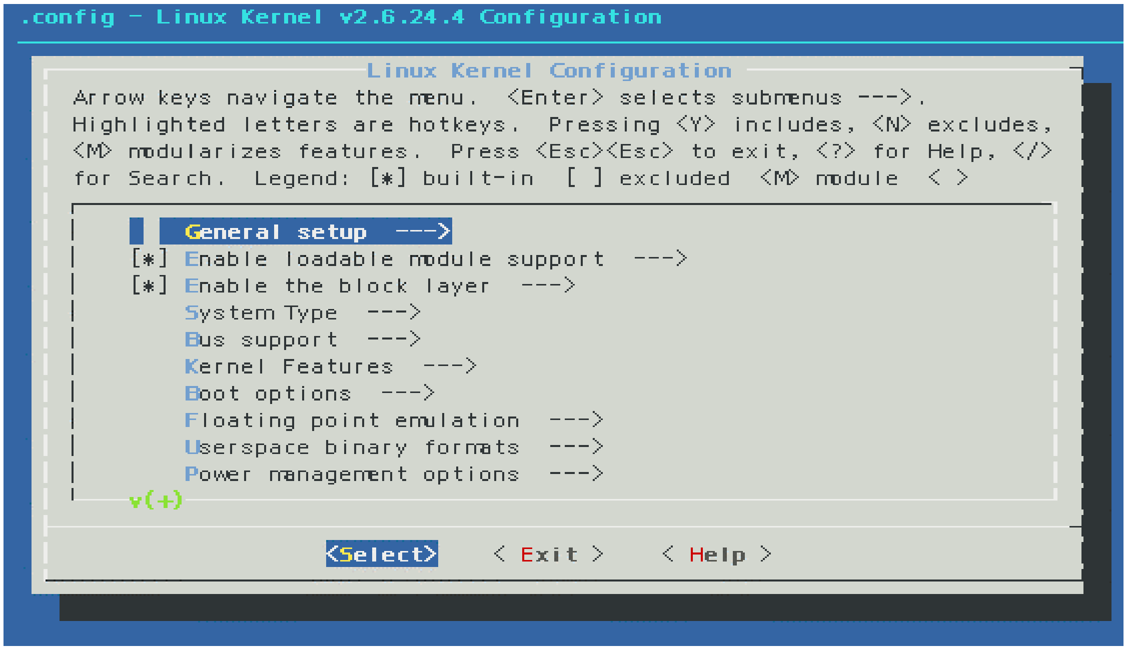
To compile kernel:
#make uImage

If compiling succeeds, you will find “uImage” in directory /opt/ utu-linux2.6.***/arch/arm/boot.

The folllowing are some detailed configuration selections.

8.1 Configure the kernel

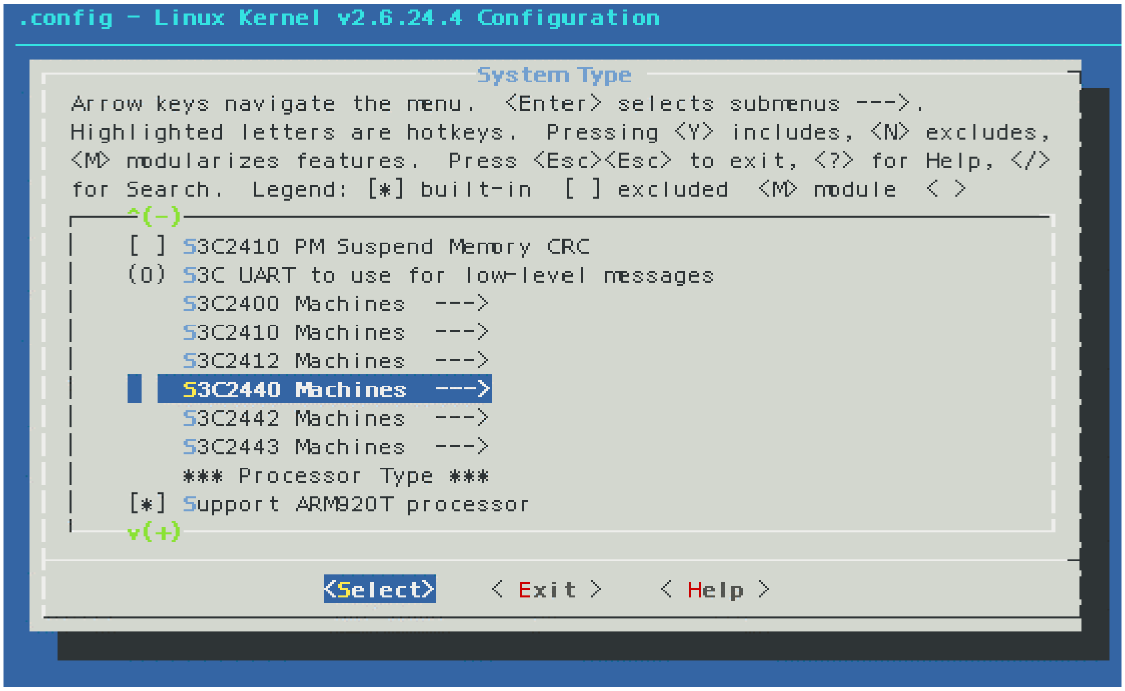
#make menuconfig



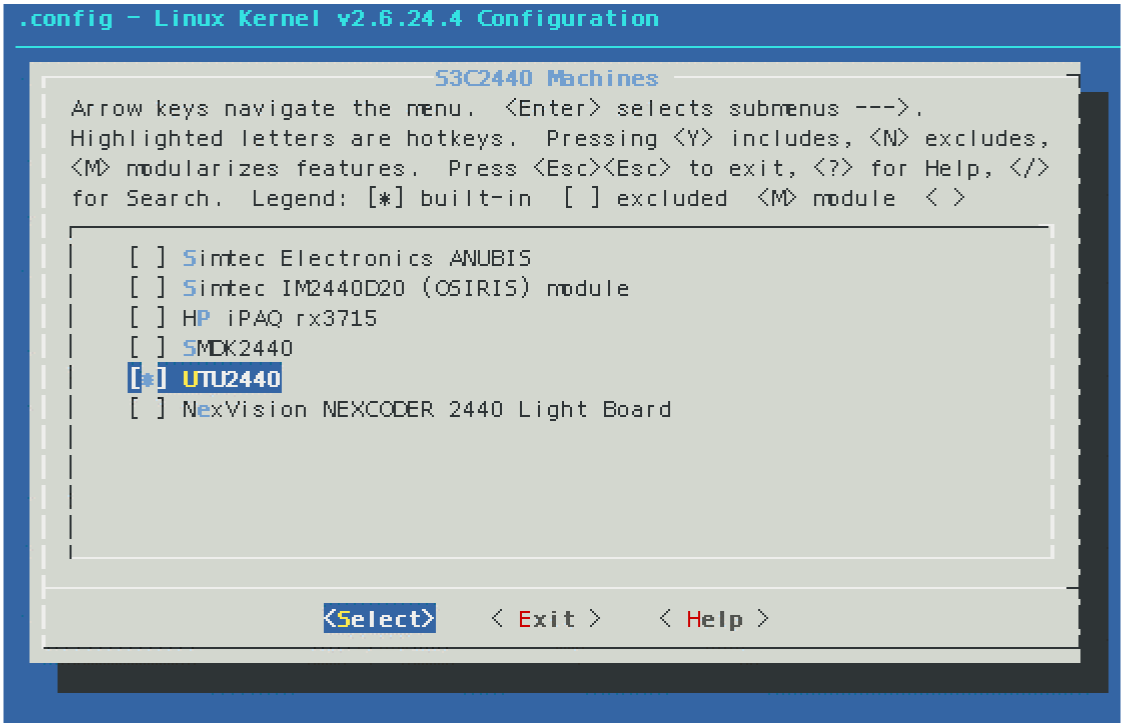
```
.config - Linux Kernel v2.6.24.4 Configuration
                       Linux Kernel Configuration
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

          General setup  --->
      [*] Enable loadable module support  --->
      [*] Enable the block layer  --->
          System Type  --->
          Bus support  --->
          Kernel Features  --->
          Boot options  --->
          Floating point emulation  --->
          Userspace binary formats  --->
          Power management options  --->
      v(+)

                 <Select>    < Exit >    < Help >
```

8.2 Configure CPU

At main menu, select **System Type**.



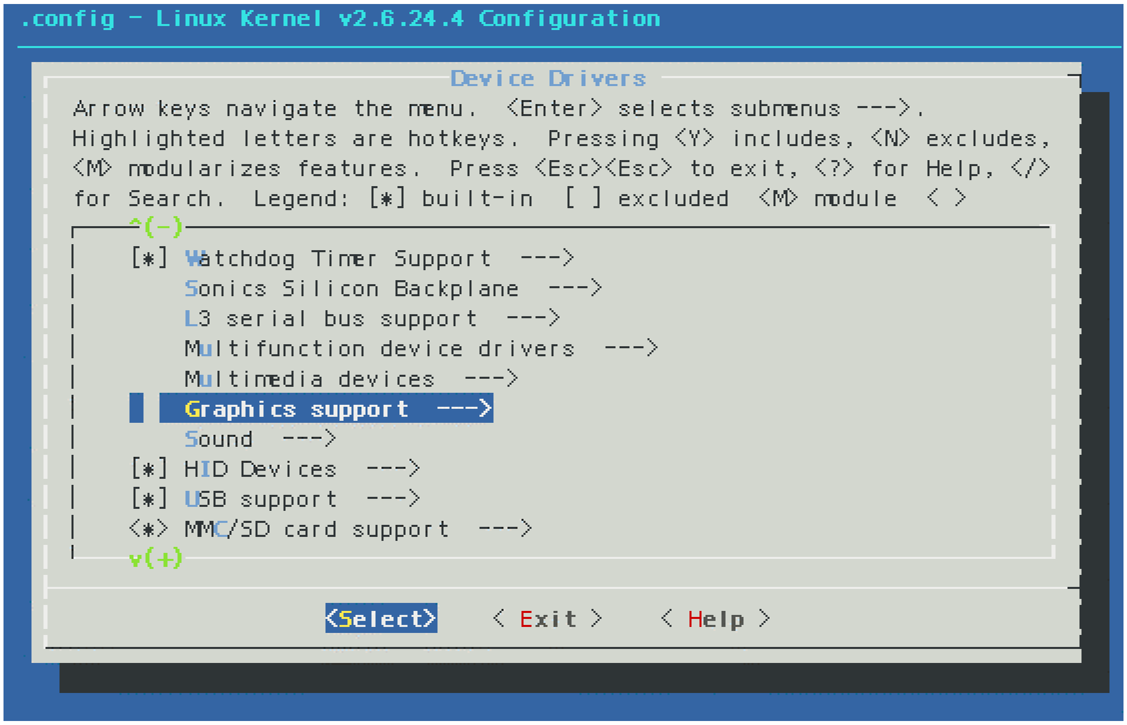
```
.config - Linux Kernel v2.6.24.4 Configuration
                             System Type
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
      [ ] S3C2410 PM Suspend Memory CRC
      (0) S3C UART to use for low-level messages
          S3C2400 Machines  --->
          S3C2410 Machines  --->
          S3C2412 Machines  --->
          S3C2440 Machines  --->
          S3C2442 Machines  --->
          S3C2443 Machines  --->
          *** Processor Type ***
      [*] Support ARM920T processor
      v(+)

                 <Select>    < Exit >    < Help >
```



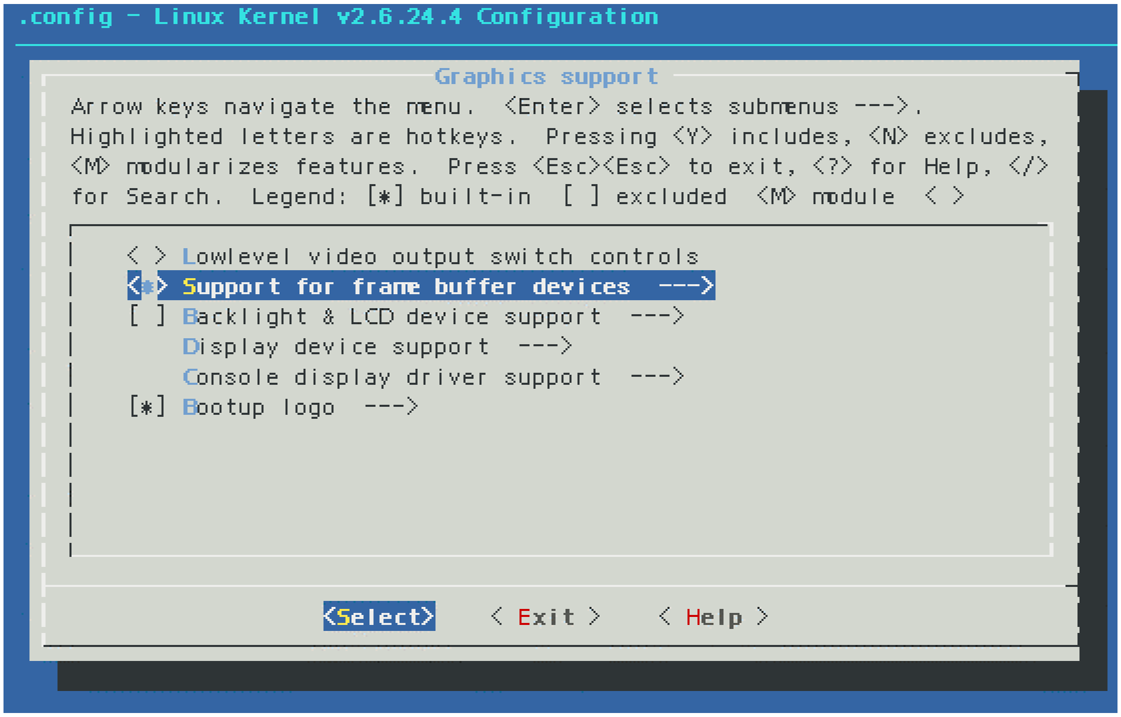
```
.config - Linux Kernel v2.6.24.4 Configuration

                     S3C2440 Machines
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

     [ ] Simtec Electronics ANUBIS
     [ ] Simtec IM2440D20 (OSIRIS) module
     [ ] HP iPAQ rx3715
     [ ] SMDK2440
     [*] UTU2440
     [ ] NexVision NEXCODER 2440 Light Board

              <Select>    < Exit >    < Help >
```

8.3 Configure LCD

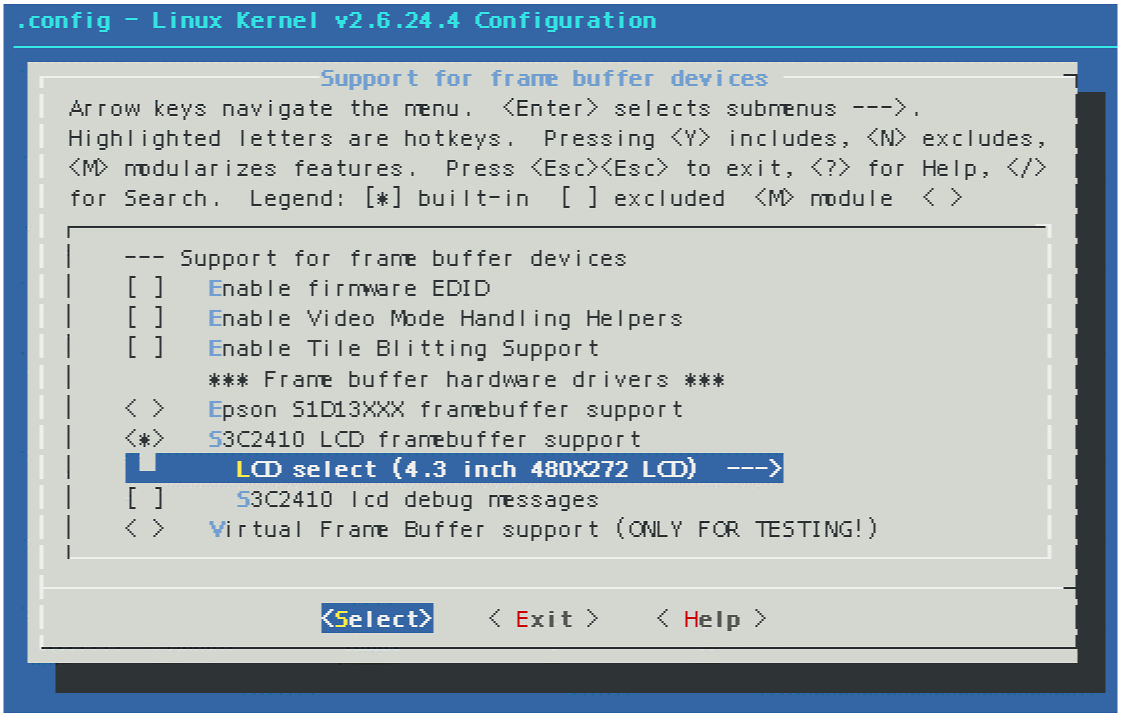
At main menu, select **Device Drivers**.



```
.config - Linux Kernel v2.6.24.4 Configuration

                     Device Drivers
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
     ^(-)
     [*] Watchdog Timer Support  --->
         Sonics Silicon Backplane  --->
         L3 serial bus support  --->
         Multifunction device drivers  --->
         Multimedia devices  --->
         Graphics support  --->
         Sound  --->
     [*] HID Devices  --->
     [*] USB support  --->
     <*> MMC/SD card support  --->
     v(+)

              <Select>    < Exit >    < Help >
```



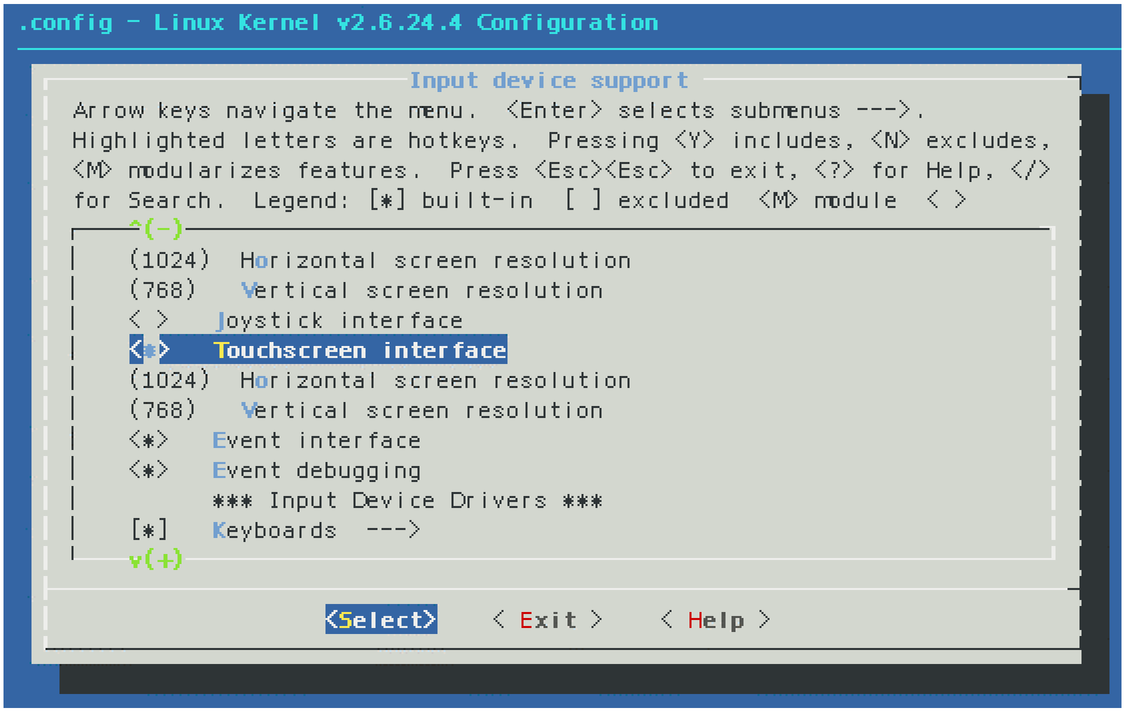
```
.config - Linux Kernel v2.6.24.4 Configuration

                          Graphics support
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      < > Lowlevel video output switch controls
      <*> Support for frame buffer devices  --->
      [ ] Backlight & LCD device support  --->
          Display device support  --->
          Console display driver support  --->
      [*] Bootup logo  --->

                  <Select>    < Exit >    < Help >
```



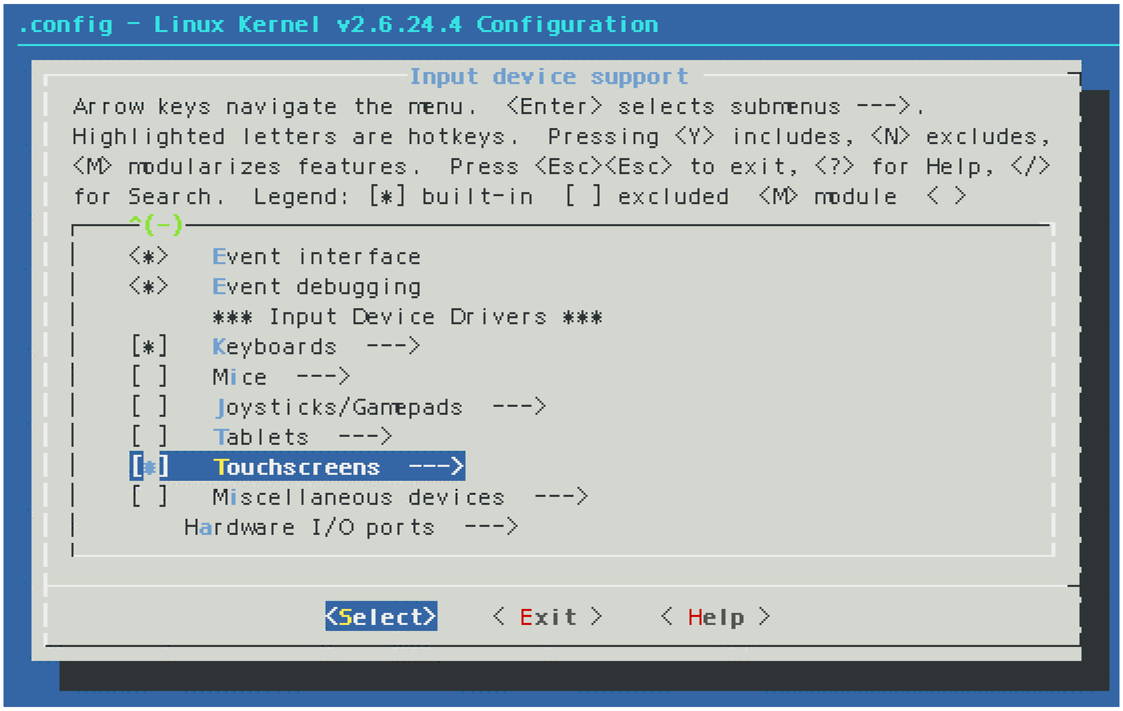
```
.config - Linux Kernel v2.6.24.4 Configuration

                  Support for frame buffer devices
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      --- Support for frame buffer devices
      [ ]   Enable firmware EDID
      [ ]   Enable Video Mode Handling Helpers
      [ ]   Enable Tile Blitting Support
            *** Frame buffer hardware drivers ***
      < >   Epson S1D13XXX framebuffer support
      <*>   S3C2410 LCD framebuffer support
              LCD select (4.3 inch 480X272 LCD)  --->
      [ ]     S3C2410 lcd debug messages
      < >   Virtual Frame Buffer support (ONLY FOR TESTING!)

                  <Select>    < Exit >    < Help >
```

8.4 Configure touch screen

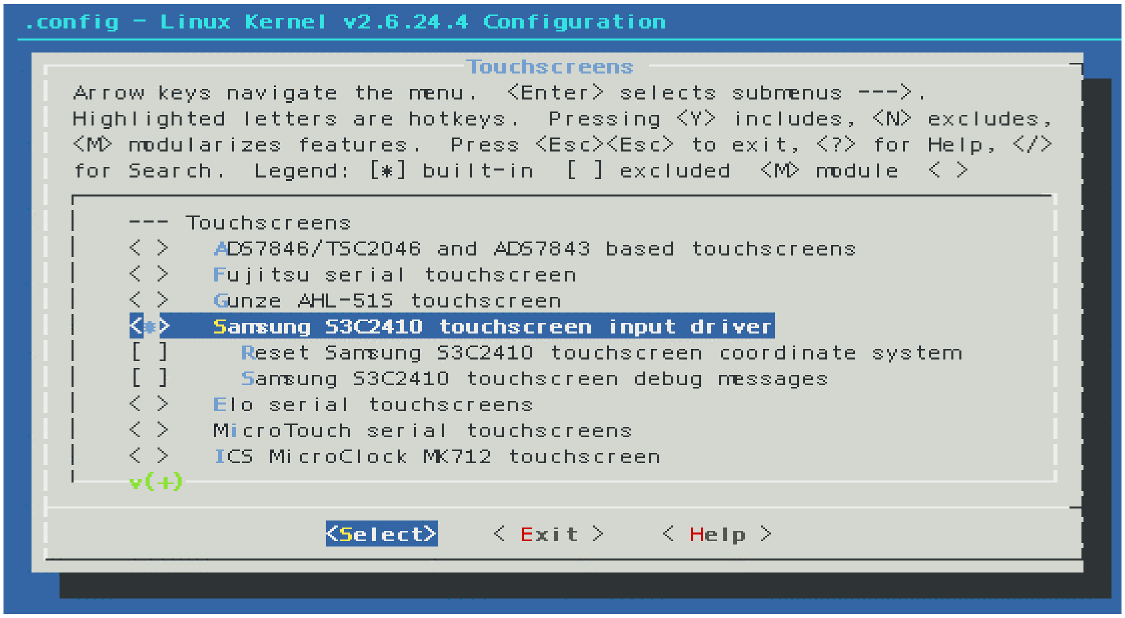
At main menu, select **Device Drivers -> Input device support**.



```
.config - Linux Kernel v2.6.24.4 Configuration

                         Input device support
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
          (1024)  Horizontal screen resolution
          (768)    Vertical screen resolution
          < >    Joystick interface
          <*>    Touchscreen interface
          (1024)  Horizontal screen resolution
          (768)    Vertical screen resolution
          <*>    Event interface
          <*>    Event debugging
                 *** Input Device Drivers ***
          [*]    Keyboards  --->
      v(+)

              <Select>    < Exit >    < Help >
```



```
.config - Linux Kernel v2.6.24.4 Configuration

                         Input device support
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
          <*>    Event interface
          <*>    Event debugging
                 *** Input Device Drivers ***
          [*]    Keyboards  --->
          [ ]    Mice  --->
          [ ]    Joysticks/Gamepads  --->
          [ ]    Tablets  --->
          [*]    Touchscreens  --->
          [ ]    Miscellaneous devices  --->
               Hardware I/O ports  --->

              <Select>    < Exit >    < Help >
```



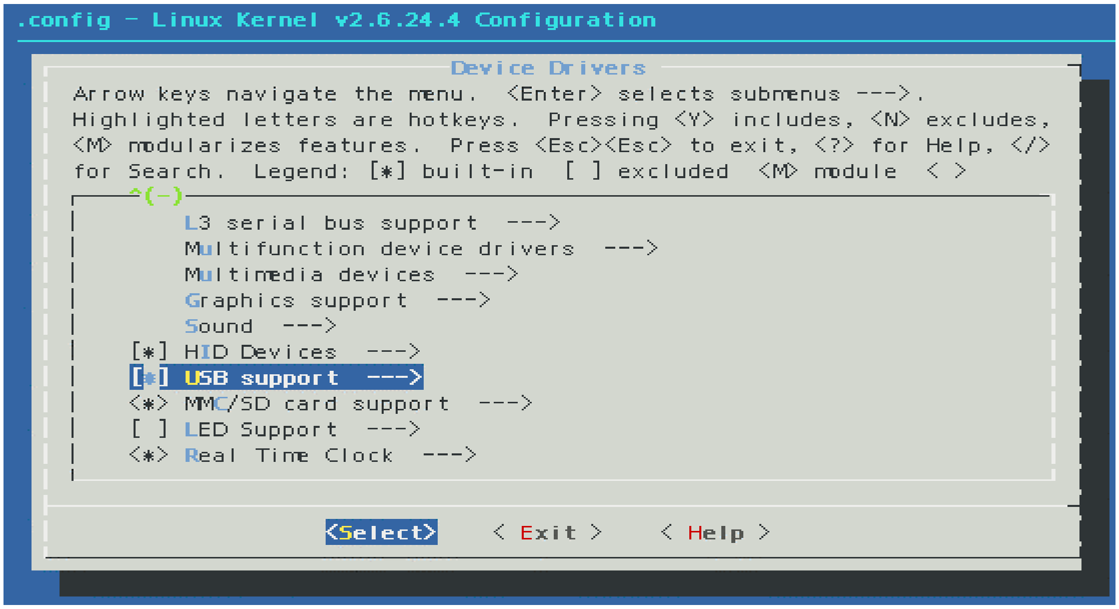
```
.config - Linux Kernel v2.6.24.4 Configuration
                              Touchscreens
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      --- Touchscreens
      < >   ADS7846/TSC2046 and ADS7843 based touchscreens
      < >   Fujitsu serial touchscreen
      < >   Gunze AHL-51S touchscreen
      <*>   Samsung S3C2410 touchscreen input driver
      [ ]     Reset Samsung S3C2410 touchscreen coordinate system
      [ ]     Samsung S3C2410 touchscreen debug messages
      < >   Elo serial touchscreens
      < >   MicroTouch serial touchscreens
      < >   ICS MicroClock MK712 touchscreen
      v(+)

                  <Select>    < Exit >    < Help >
```

"**Reset Samsung S3C2410 touchscreen coordinate system**" can set the coordinate up and down. If your touch screen is responded, but the calibration never succeeds, select it.

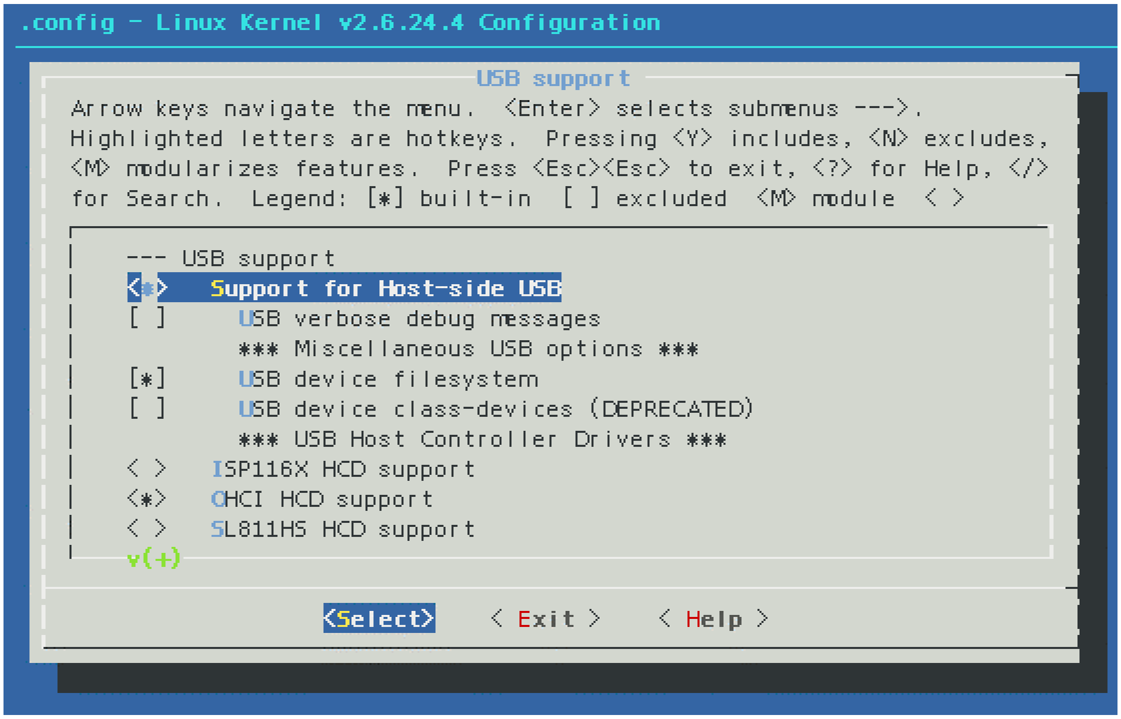
8.5 Configure USB mouse

Right now, USB mouse can't work with touch screen at the same time, and the USB mouse hotplug does not work, that means USB mouse needs to be connected before the system boots up.

At main menu, select **Device Drivers -> USB support**.

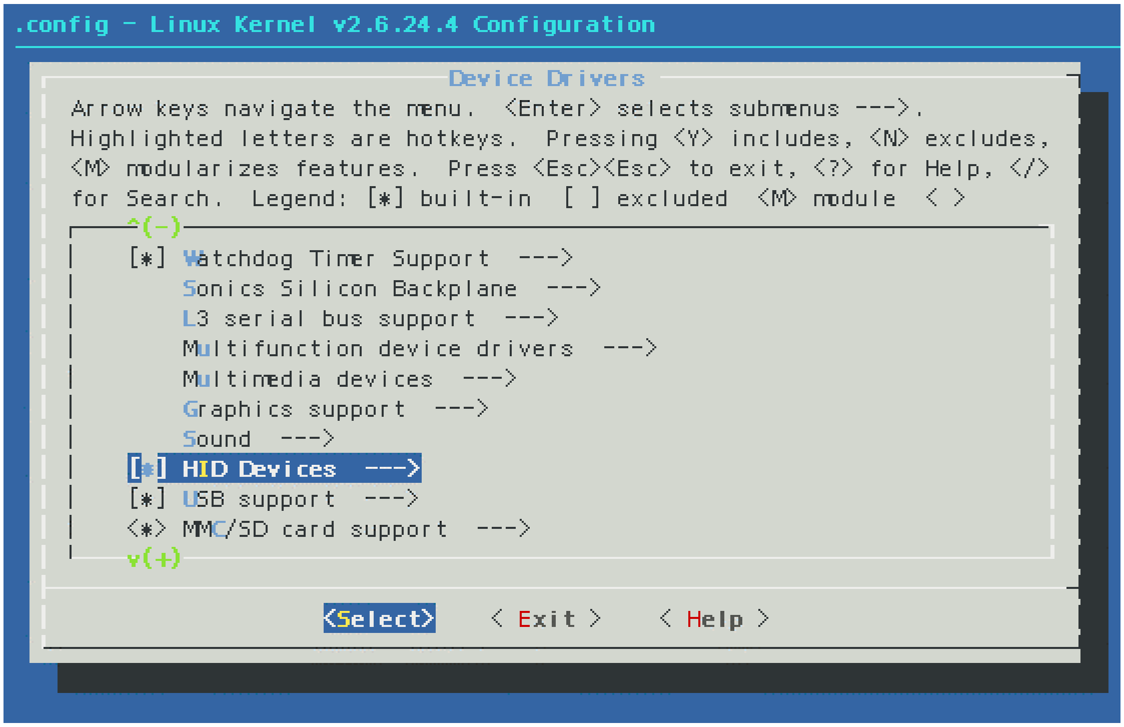


```
.config - Linux Kernel v2.6.24.4 Configuration
                             Device Drivers
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
          L3 serial bus support  --->
          Multifunction device drivers  --->
          Multimedia devices  --->
          Graphics support  --->
          Sound  --->
      [*] HID Devices  --->
      [*] USB support  --->
      <*> MMC/SD card support  --->
      [ ] LED Support  --->
      <*> Real Time Clock  --->

                  <Select>    < Exit >    < Help >
```

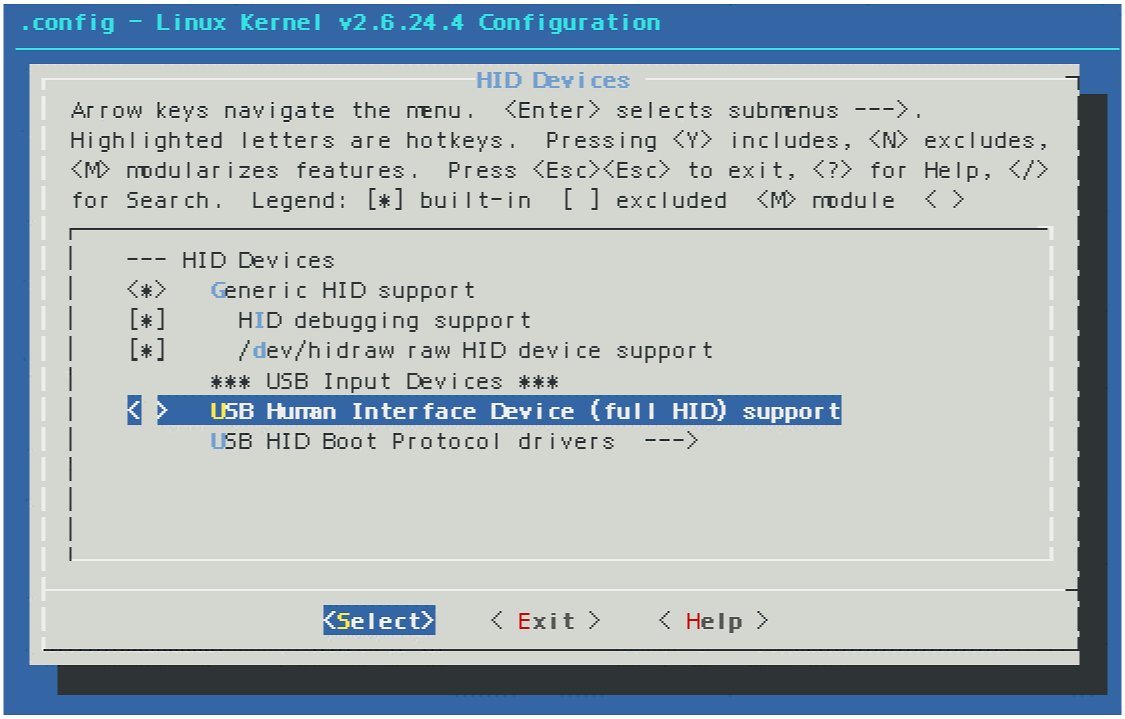


```
.config - Linux Kernel v2.6.24.4 Configuration
                          USB support
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      --- USB support
      <*>   Support for Host-side USB
      [ ]     USB verbose debug messages
              *** Miscellaneous USB options ***
      [*]     USB device filesystem
      [ ]     USB device class-devices (DEPRECATED)
              *** USB Host Controller Drivers ***
      < >   ISP116X HCD support
      <*>   OHCI HCD support
      < >   SL811HS HCD support
      v(+)

                  <Select>    < Exit >    < Help >
```

At main menu, select **Device Drivers -> HID Devices**.



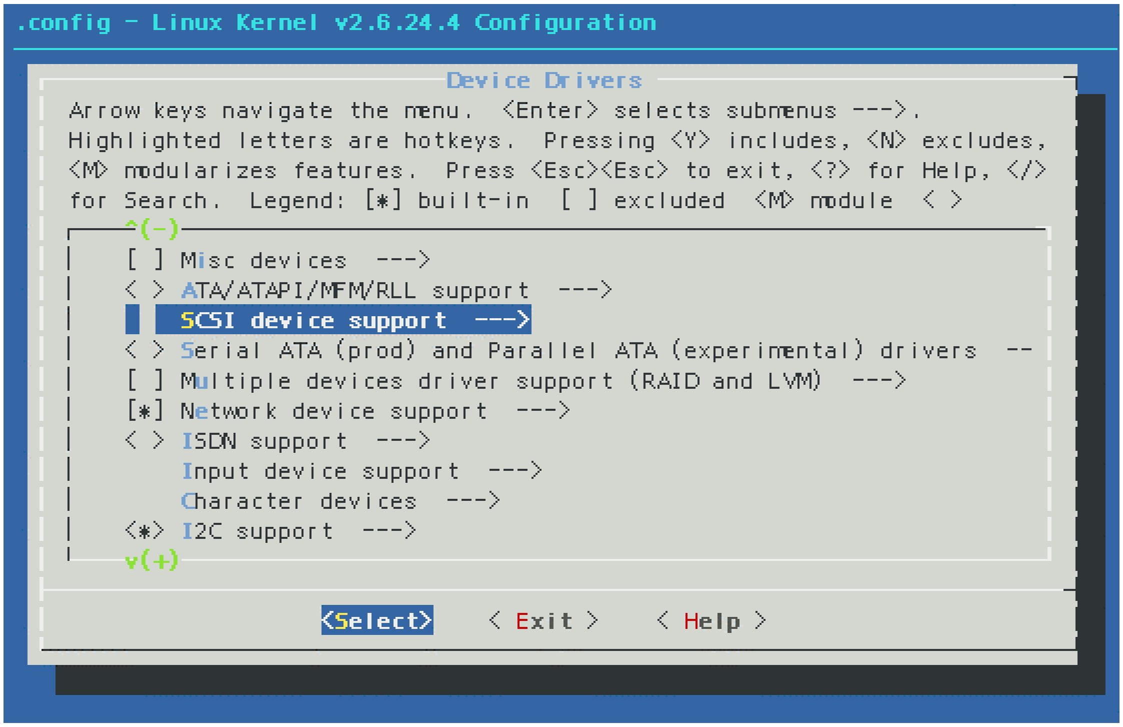
```
.config - Linux Kernel v2.6.24.4 Configuration
                         Device Drivers
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
      [*] Watchdog Timer Support  --->
          Sonics Silicon Backplane  --->
          L3 serial bus support  --->
          Multifunction device drivers  --->
          Multimedia devices  --->
          Graphics support  --->
          Sound  --->
      [*] HID Devices  --->
      [*] USB support  --->
      <*> MMC/SD card support  --->
      v(+)

                  <Select>    < Exit >    < Help >
```



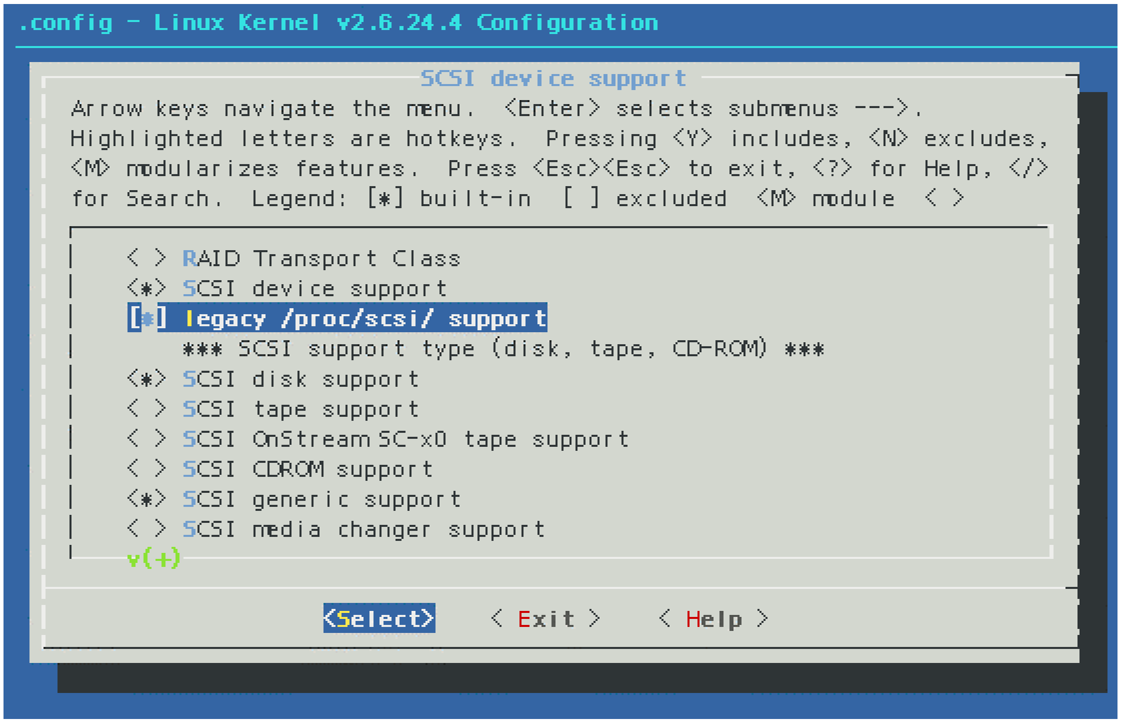
```
.config - Linux Kernel v2.6.24.4 Configuration
                              HID Devices
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      --- HID Devices
      <*>   Generic HID support
      [*]     HID debugging support
      [*]     /dev/hidraw raw HID device support
            *** USB Input Devices ***
      < >   USB Human Interface Device (full HID) support
            USB HID Boot Protocol drivers  --->

                  <Select>    < Exit >    < Help >
```

8.6 Configure USB drive support

At main menu, select **Device Drivers -> SCSI device support.**

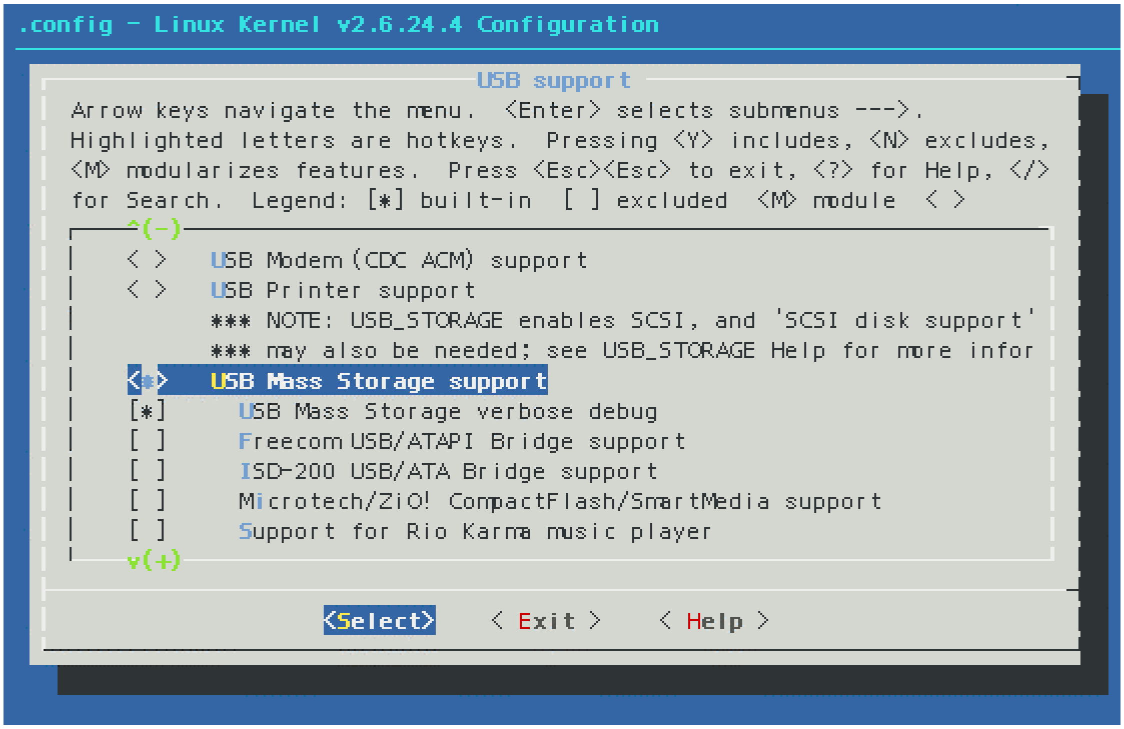


```
.config - Linux Kernel v2.6.24.4 Configuration
                            Device Drivers
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
  ---^(-)--------------------------------------------------------------
      [ ] Misc devices  --->
      < > ATA/ATAPI/MFM/RLL support  --->
          SCSI device support  --->
      < > Serial ATA (prod) and Parallel ATA (experimental) drivers  --
      [ ] Multiple devices driver support (RAID and LVM)  --->
      [*] Network device support  --->
      < > ISDN support  --->
          Input device support  --->
          Character devices  --->
      <*> I2C support  --->
      v(+)

                  <Select>    < Exit >    < Help >
```



```
.config - Linux Kernel v2.6.24.4 Configuration
                         SCSI device support
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

     < > RAID Transport Class
     <*> SCSI device support
     [*] legacy /proc/scsi/ support
         *** SCSI support type (disk, tape, CD-ROM) ***
     <*> SCSI disk support
     < > SCSI tape support
     < > SCSI OnStream SC-x0 tape support
     < > SCSI CDROM support
     <*> SCSI generic support
     < > SCSI media changer support
     v(+)

              <Select>    < Exit >    < Help >
```

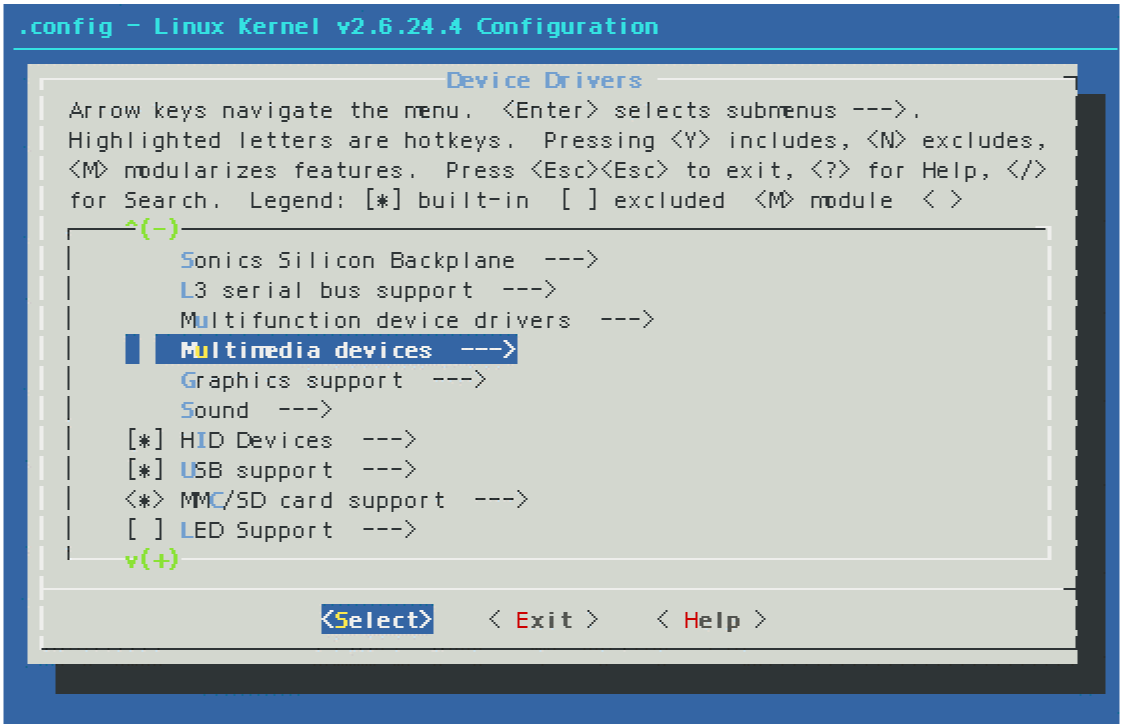
At main menu, select **Device Drivers -> USB support.**



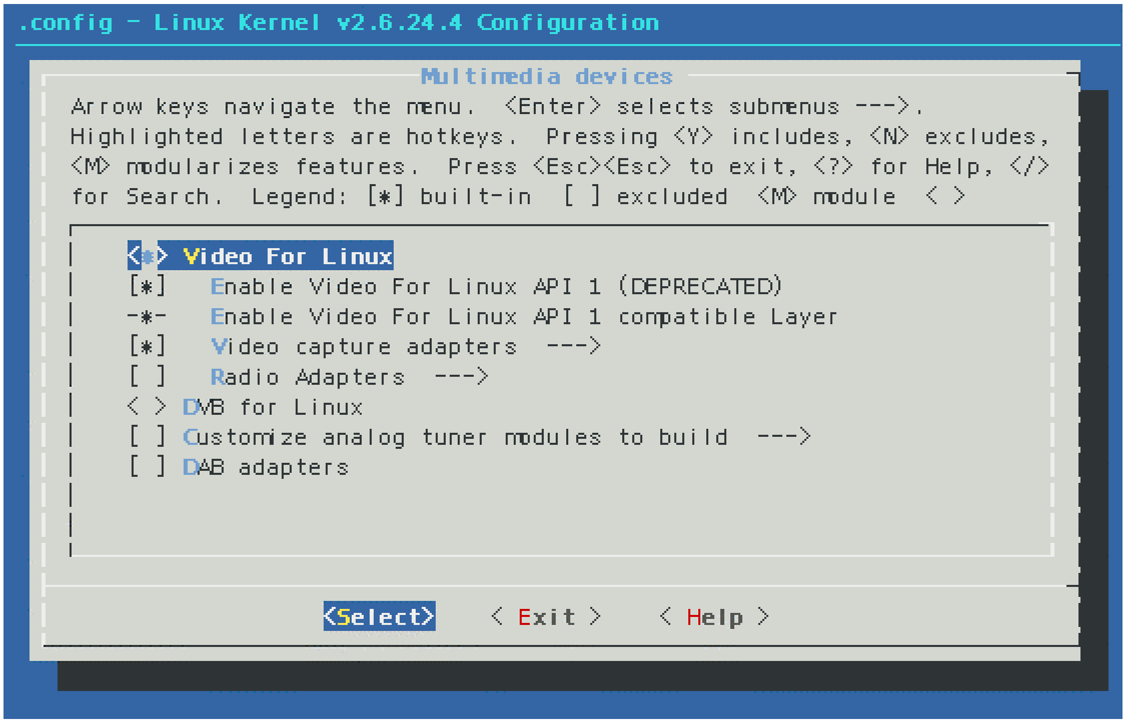
```
.config - Linux Kernel v2.6.24.4 Configuration
                              USB support
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
     ^(-)
     < >   USB Modem (CDC ACM) support
     < >   USB Printer support
           *** NOTE: USB_STORAGE enables SCSI, and 'SCSI disk support'
           *** may also be needed; see USB_STORAGE Help for more infor
     <*>   USB Mass Storage support
     [*]     USB Mass Storage verbose debug
     [ ]     Freecom USB/ATAPI Bridge support
     [ ]     ISD-200 USB/ATA Bridge support
     [ ]     Microtech/ZiO! CompactFlash/SmartMedia support
     [ ]     Support for Rio Karma music player
     v(+)

              <Select>    < Exit >    < Help >
```

8.7 Configure USB camera

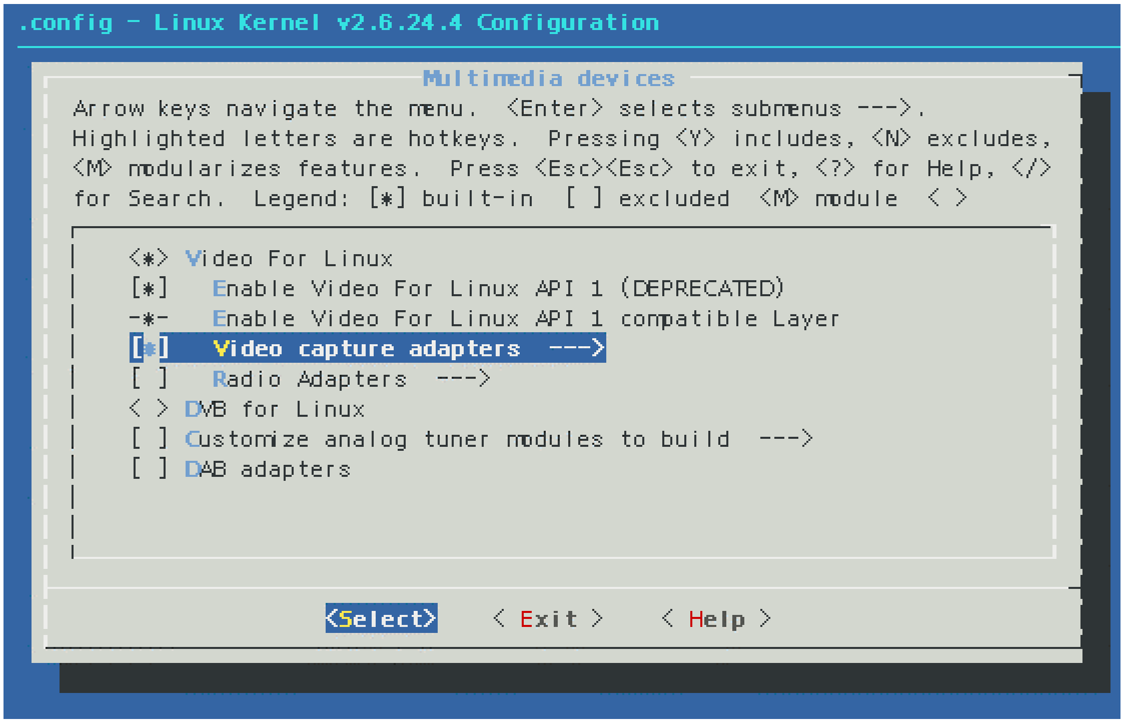
At main menu, select **Device Drivers-> Multimedia devices.**



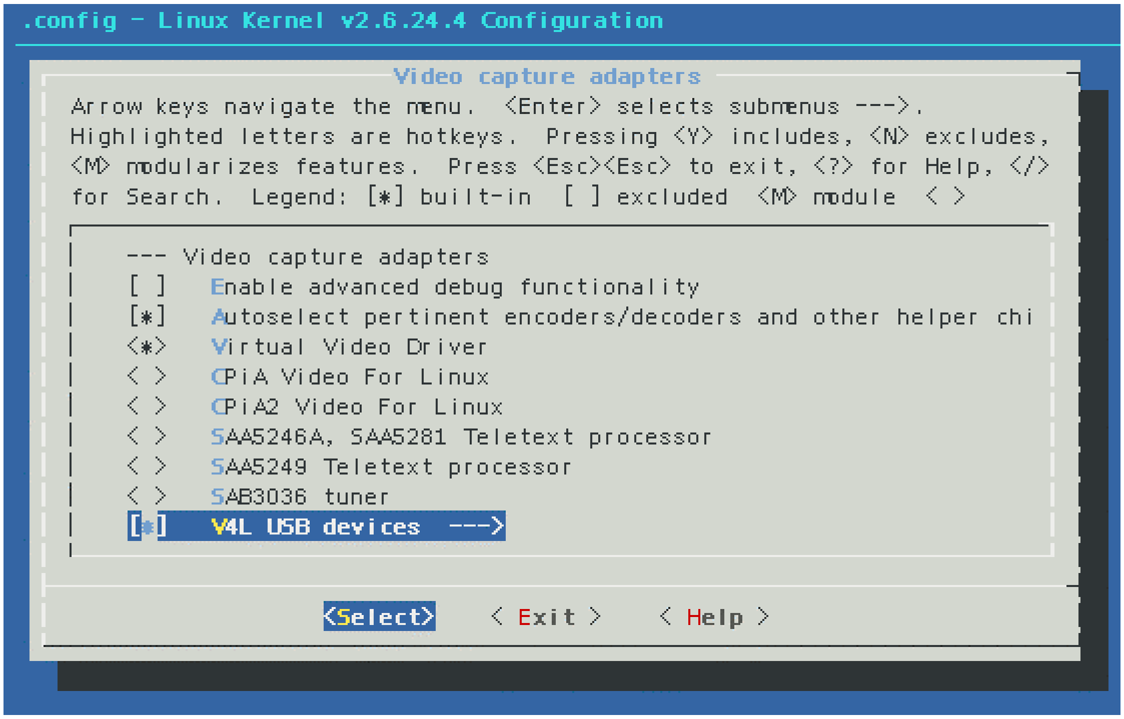
```
.config - Linux Kernel v2.6.24.4 Configuration
                         Device Drivers
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
          Sonics Silicon Backplane  --->
          L3 serial bus support  --->
          Multifunction device drivers  --->
          Multimedia devices  --->
          Graphics support  --->
          Sound  --->
      [*] HID Devices  --->
      [*] USB support  --->
      <*> MMC/SD card support  --->
      [ ] LED Support  --->
      v(+)

              <Select>    < Exit >    < Help >
```



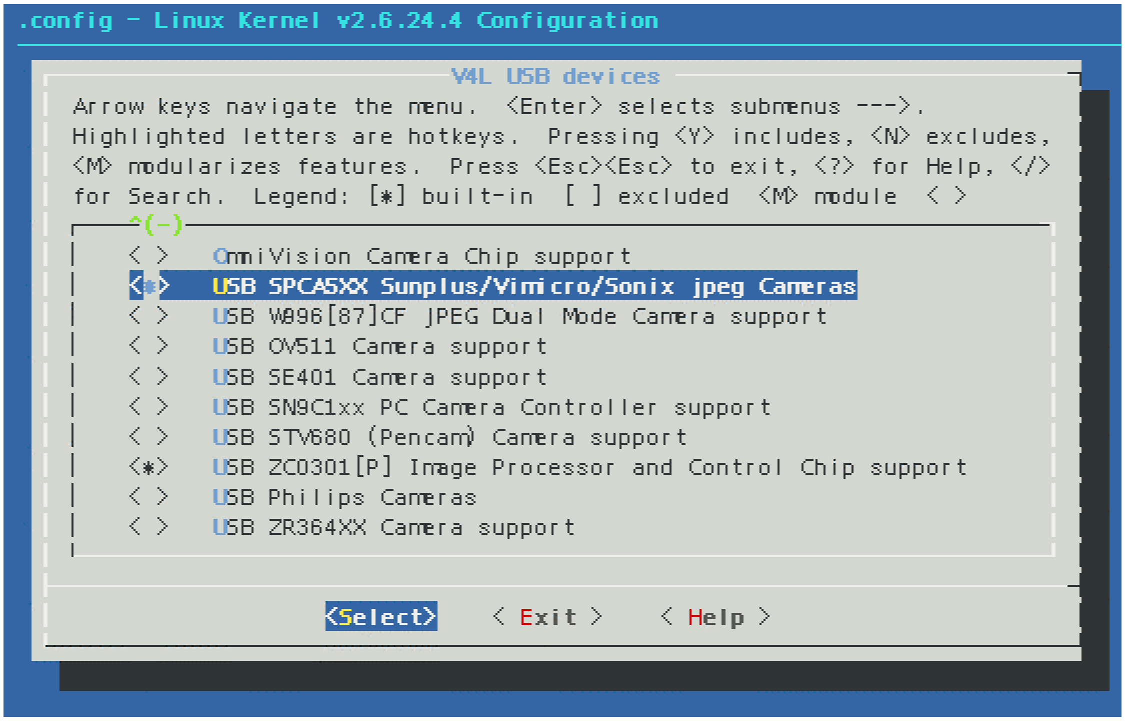
```
.config - Linux Kernel v2.6.24.4 Configuration
                       Multimedia devices
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      <*> Video For Linux
      [*]   Enable Video For Linux API 1 (DEPRECATED)
      -*-   Enable Video For Linux API 1 compatible Layer
      [*]   Video capture adapters  --->
      [ ]   Radio Adapters  --->
      < > DVB for Linux
      [ ] Customize analog tuner modules to build  --->
      [ ] DAB adapters



              <Select>    < Exit >    < Help >
```



```
.config - Linux Kernel v2.6.24.4 Configuration
                           Multimedia devices
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      <*> Video For Linux
      [*]   Enable Video For Linux API 1 (DEPRECATED)
      -*-   Enable Video For Linux API 1 compatible Layer
      [*]   Video capture adapters  --->
      [ ]   Radio Adapters  --->
      < > DVB for Linux
      [ ] Customize analog tuner modules to build  --->
      [ ] DAB adapters

                    <Select>    < Exit >    < Help >
```



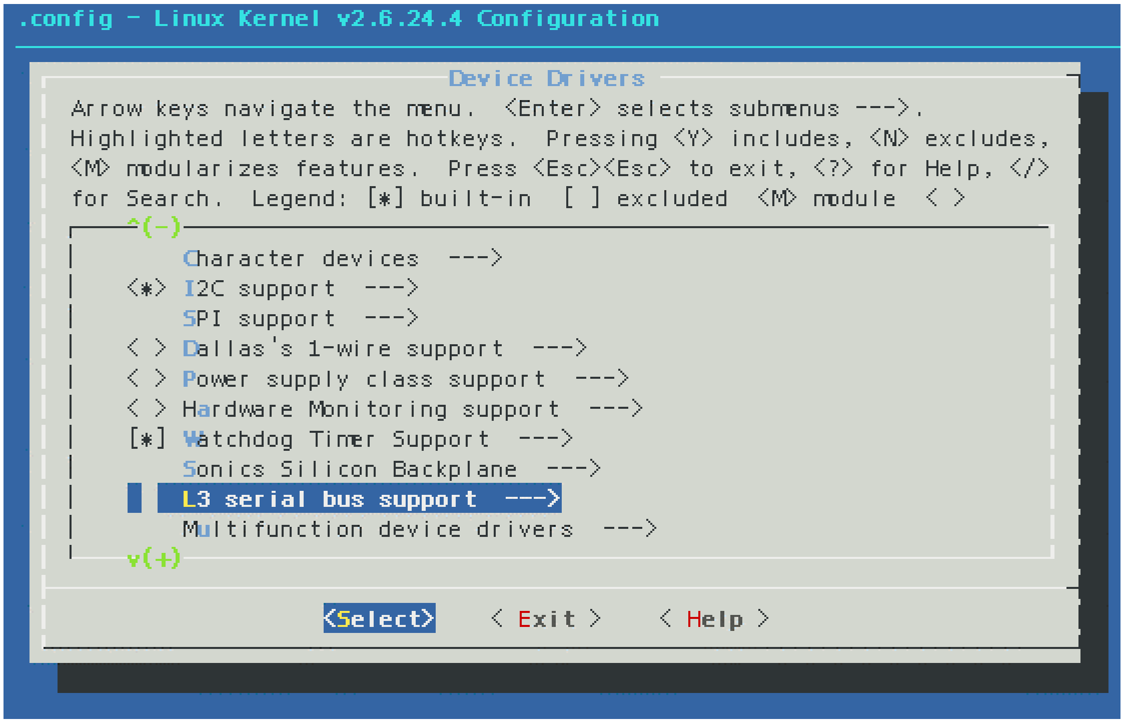
```
.config - Linux Kernel v2.6.24.4 Configuration
                         Video capture adapters
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      --- Video capture adapters
      [ ]   Enable advanced debug functionality
      [*]   Autoselect pertinent encoders/decoders and other helper chi
      <*>   Virtual Video Driver
      < >   CPiA Video For Linux
      < >   CPiA2 Video For Linux
      < >   SAA5246A, SAA5281 Teletext processor
      < >   SAA5249 Teletext processor
      < >   SAB3036 tuner
      [*]   V4L USB devices  --->

                    <Select>    < Exit >    < Help >
```



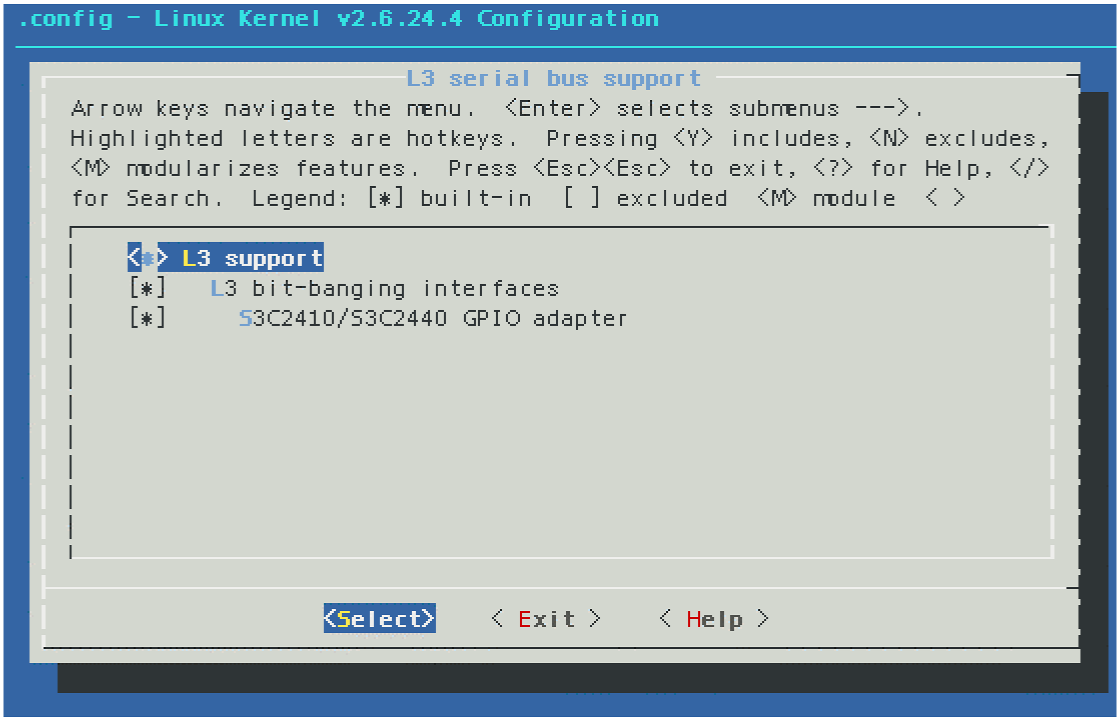
```
.config - Linux Kernel v2.6.24.4 Configuration
                              V4L USB devices
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
     ^(-)
      < >   OmniVision Camera Chip support
      <*>   USB SPCA5XX Sunplus/Vimicro/Sonix jpeg Cameras
      < >   USB W996[87]CF JPEG Dual Mode Camera support
      < >   USB OV511 Camera support
      < >   USB SE401 Camera support
      < >   USB SN9C1xx PC Camera Controller support
      < >   USB STV680 (Pencam) Camera support
      <*>   USB ZC0301[P] Image Processor and Control Chip support
      < >   USB Philips Cameras
      < >   USB ZR364XX Camera support

                   <Select>    < Exit >    < Help >
```

8.8 Configure sound

At main menu, select **Device Drivers-> L3 serial bus support.**

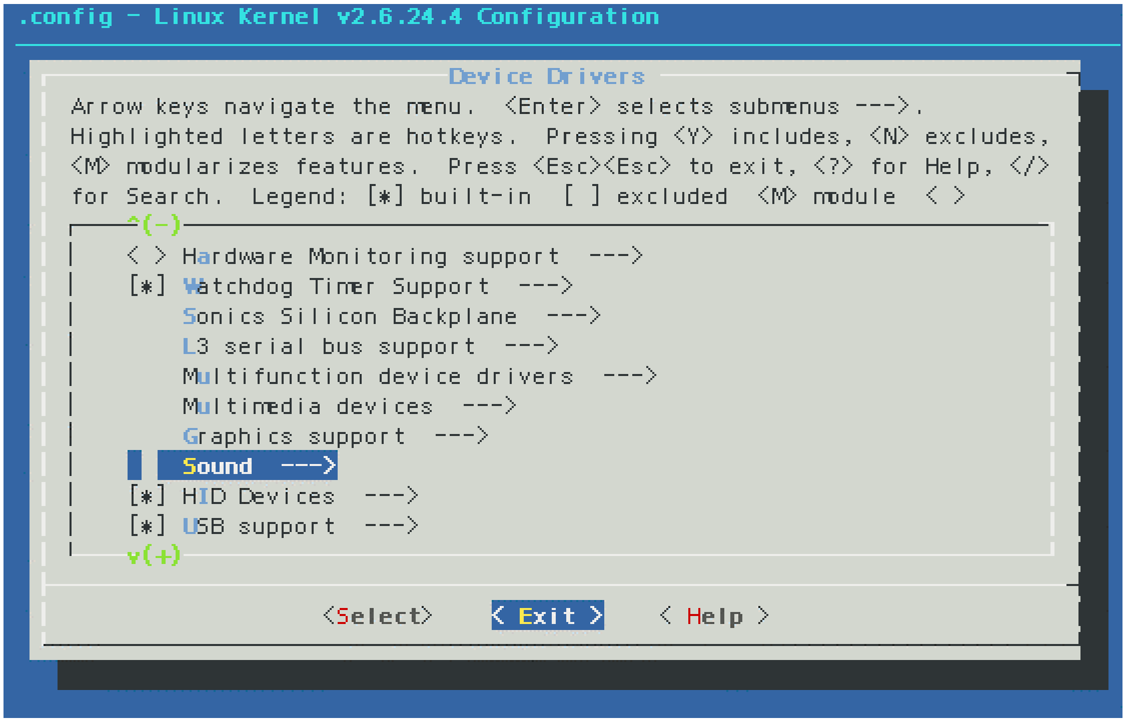


```
.config - Linux Kernel v2.6.24.4 Configuration
                              Device Drivers
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
     ^(-)
          Character devices  --->
      <*> I2C support  --->
          SPI support  --->
      < > Dallas's 1-wire support  --->
      < > Power supply class support  --->
      < > Hardware Monitoring support  --->
      [*] Watchdog Timer Support  --->
          Sonics Silicon Backplane  --->
          L3 serial bus support  --->
          Multifunction device drivers  --->
     v(+)

                   <Select>    < Exit >    < Help >
```

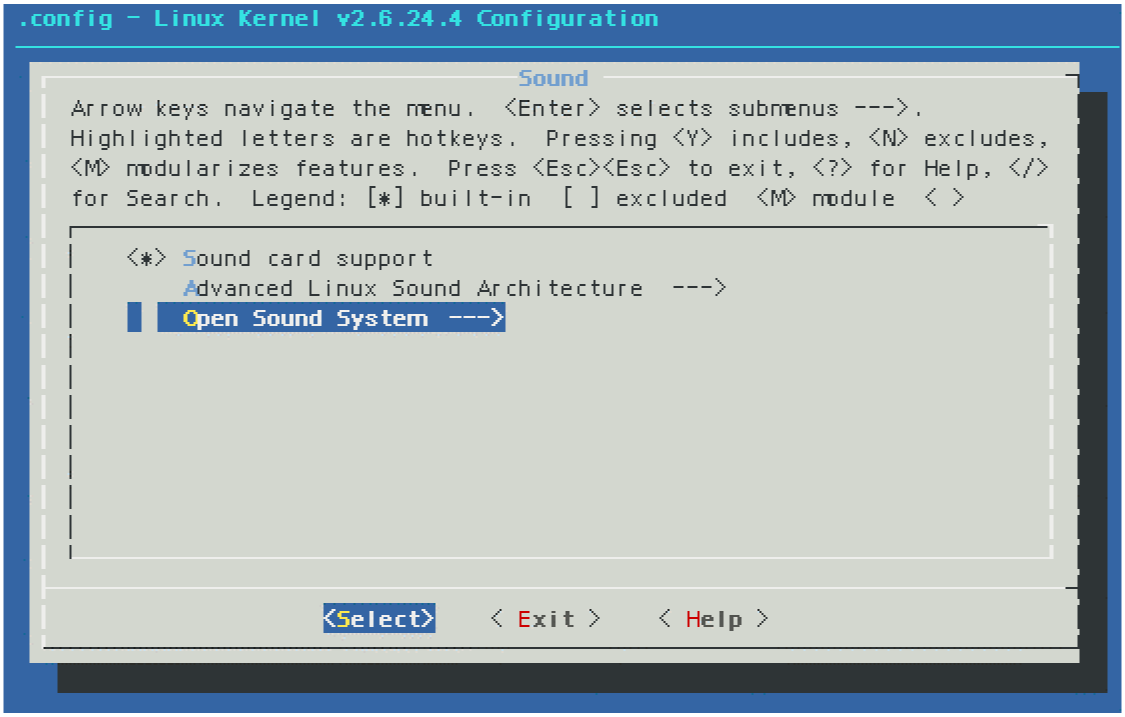


```
.config - Linux Kernel v2.6.24.4 Configuration
                         L3 serial bus support
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      <*> L3 support
      [*]   L3 bit-banging interfaces
      [*]     S3C2410/S3C2440 GPIO adapter

                   <Select>    < Exit >    < Help >
```

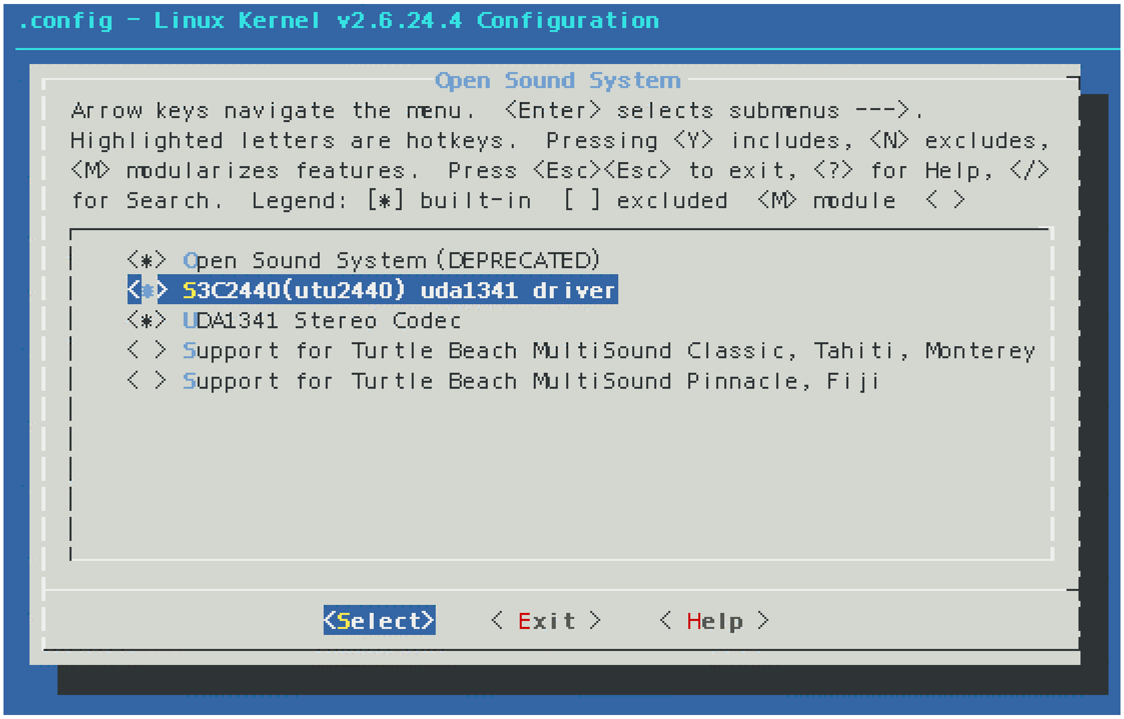
At main menu, select **Device Drivers-> Sound.**



```
.config - Linux Kernel v2.6.24.4 Configuration
                           Device Drivers
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
      < > Hardware Monitoring support  --->
      [*] Watchdog Timer Support  --->
          Sonics Silicon Backplane  --->
          L3 serial bus support  --->
          Multifunction device drivers  --->
          Multimedia devices  --->
          Graphics support  --->
          Sound  --->
      [*] HID Devices  --->
      [*] USB support  --->
      v(+)

                   <Select>    < Exit >    < Help >
```



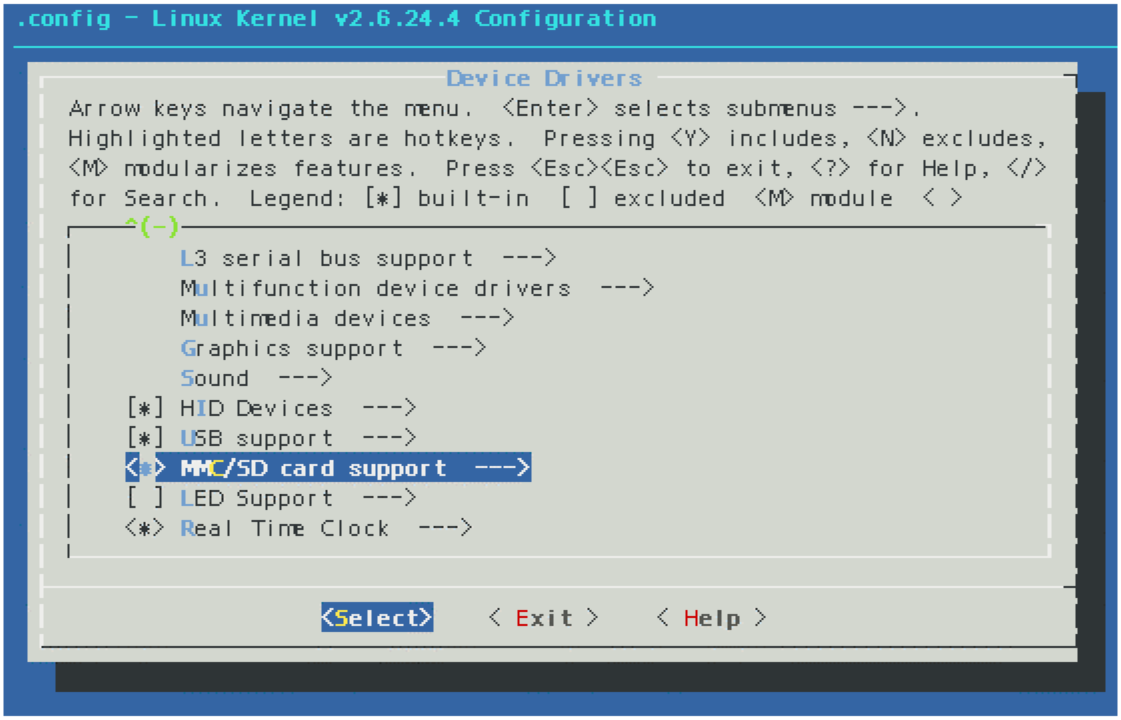
```
.config - Linux Kernel v2.6.24.4 Configuration
                              Sound
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

     <*> Sound card support
         Advanced Linux Sound Architecture  --->
         Open Sound System  --->

               <Select>    < Exit >    < Help >
```



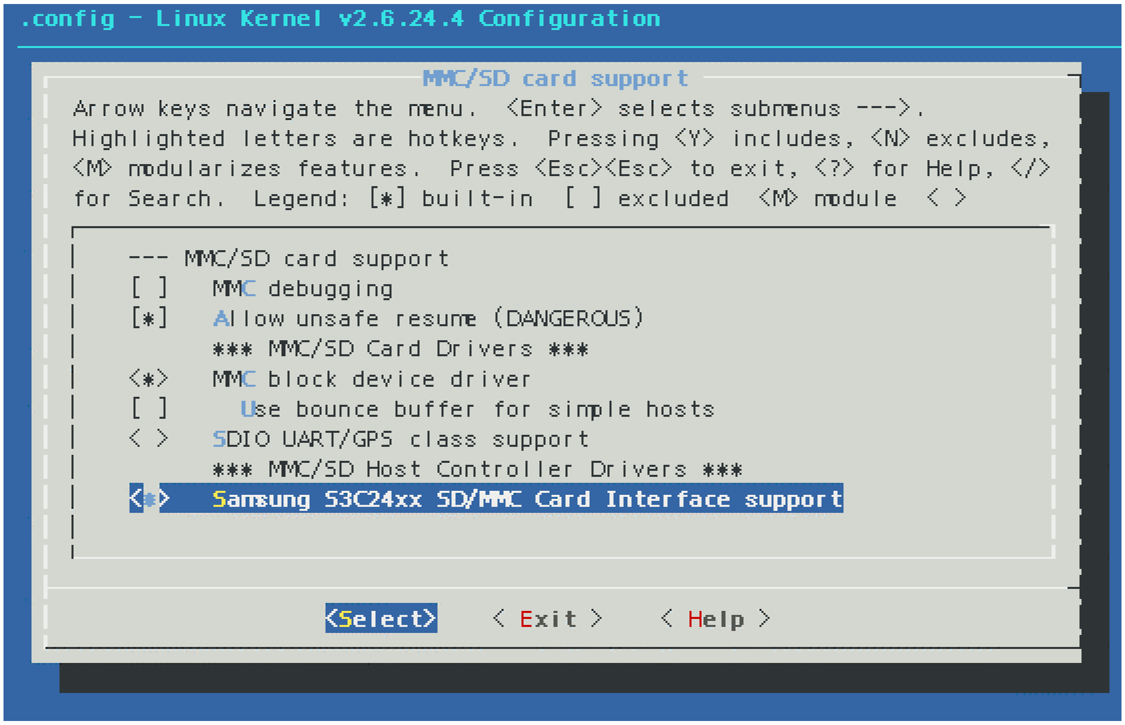
```
.config - Linux Kernel v2.6.24.4 Configuration
                         Open Sound System
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

     <*> Open Sound System (DEPRECATED)
     <*> S3C2440(utu2440) uda1341 driver
     <*> UDA1341 Stereo Codec
     < > Support for Turtle Beach MultiSound Classic, Tahiti, Monterey
     < > Support for Turtle Beach MultiSound Pinnacle, Fiji

               <Select>    < Exit >    < Help >
```

8.9 Configure SD/MMC

At main menu, select **Device Drivers-> MMC/SD Card support.**



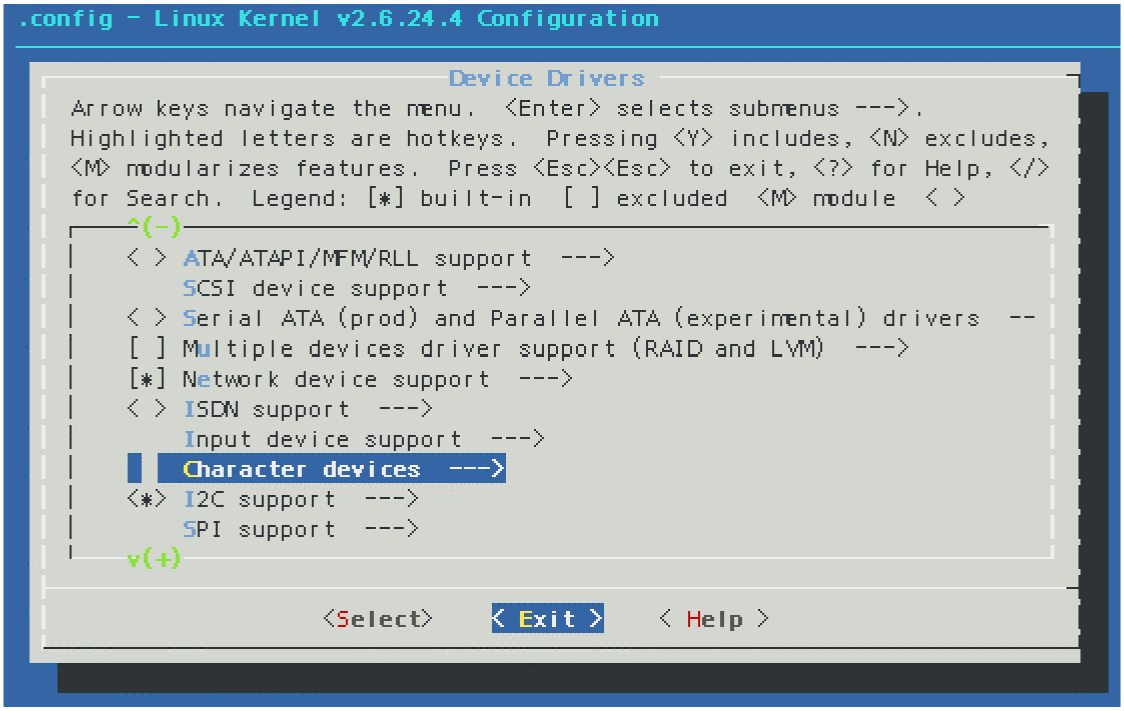
```
.config - Linux Kernel v2.6.24.4 Configuration

                          Device Drivers
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
 ┌───^(-)──────────────────────────────────────────────────────────────┐
 │        L3 serial bus support  --->
 │        Multifunction device drivers  --->
 │        Multimedia devices  --->
 │        Graphics support  --->
 │        Sound  --->
 │    [*] HID Devices  --->
 │    [*] USB support  --->
 │    <*> MMC/SD card support  --->
 │    [ ] LED Support  --->
 │    <*> Real Time Clock  --->

                 <Select>    < Exit >    < Help >
```



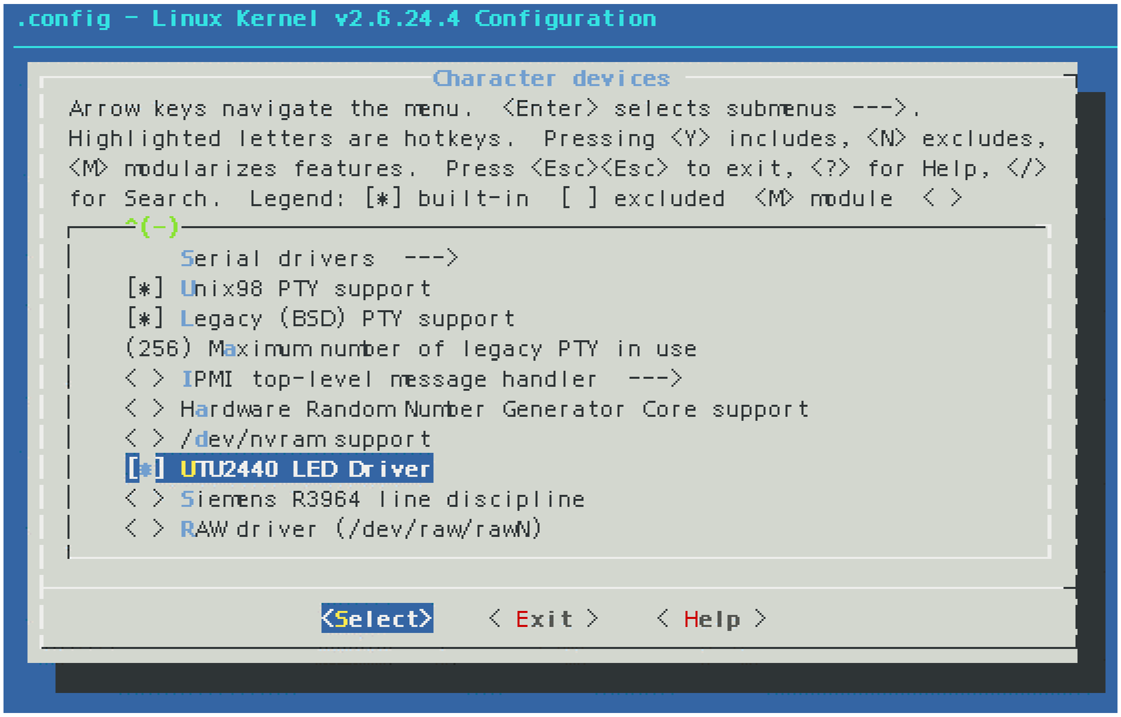
```
.config - Linux Kernel v2.6.24.4 Configuration

                        MMC/SD card support
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
 ┌─────────────────────────────────────────────────────────────────────┐
 │    --- MMC/SD card support
 │    [ ]   MMC debugging
 │    [*]   Allow unsafe resume (DANGEROUS)
 │          *** MMC/SD Card Drivers ***
 │    <*>   MMC block device driver
 │    [ ]     Use bounce buffer for simple hosts
 │    < >   SDIO UART/GPS class support
 │          *** MMC/SD Host Controller Drivers ***
 │    <*>   Samsung S3C24xx SD/MMC Card Interface support

                 <Select>    < Exit >    < Help >
```

8.10 Configure LED

At main menu, select **Device Drivers->Character devices.**



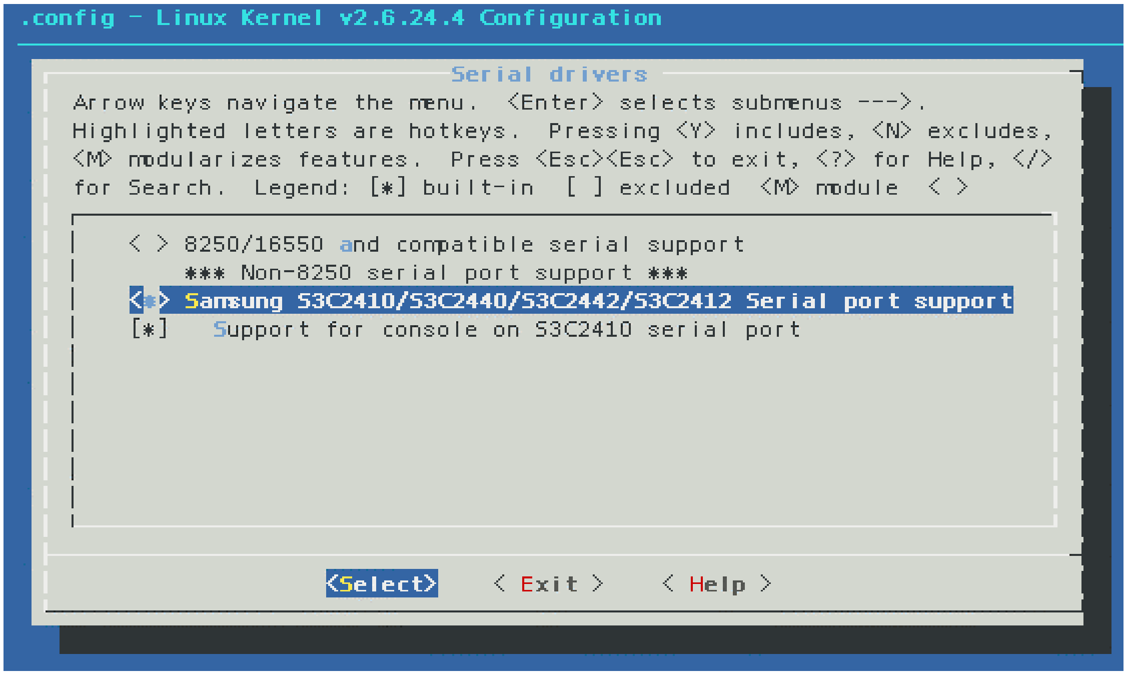
```
.config - Linux Kernel v2.6.24.4 Configuration
                       Device Drivers
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
  ┌───^(-)──────────────────────────────────────────────────────────
  │    < > ATA/ATAPI/MFM/RLL support  --->
  │        SCSI device support  --->
  │    < > Serial ATA (prod) and Parallel ATA (experimental) drivers  --
  │    [ ] Multiple devices driver support (RAID and LVM)  --->
  │    [*] Network device support  --->
  │    < > ISDN support  --->
  │        Input device support  --->
  │        Character devices  --->
  │    <*> I2C support  --->
  │        SPI support  --->
  └───v(+)──────────────────────────────────────────────────────────
              <Select>    < Exit >    < Help >
```



```
.config - Linux Kernel v2.6.24.4 Configuration
                     Character devices
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
  ┌───^(-)──────────────────────────────────────────────────────────
  │        Serial drivers  --->
  │    [*] Unix98 PTY support
  │    [*] Legacy (BSD) PTY support
  │    (256) Maximum number of legacy PTY in use
  │    < > IPMI top-level message handler  --->
  │    < > Hardware Random Number Generator Core support
  │    < > /dev/nvram support
  │    [*] UTU2440 LED Driver
  │    < > Siemens R3964 line discipline
  │    < > RAW driver (/dev/raw/rawN)
  └─────────────────────────────────────────────────────────────────
              <Select>    < Exit >    < Help >
```

8.11 Configure serial ports

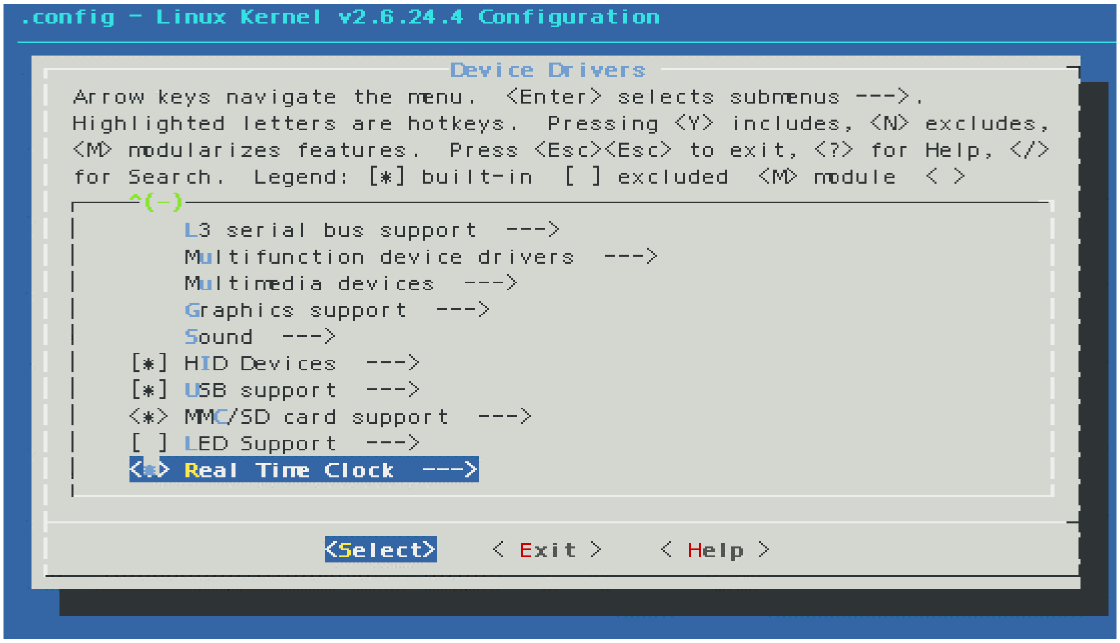
At main menu, select **Device Drivers -> Character devices -> Serial drivers.**



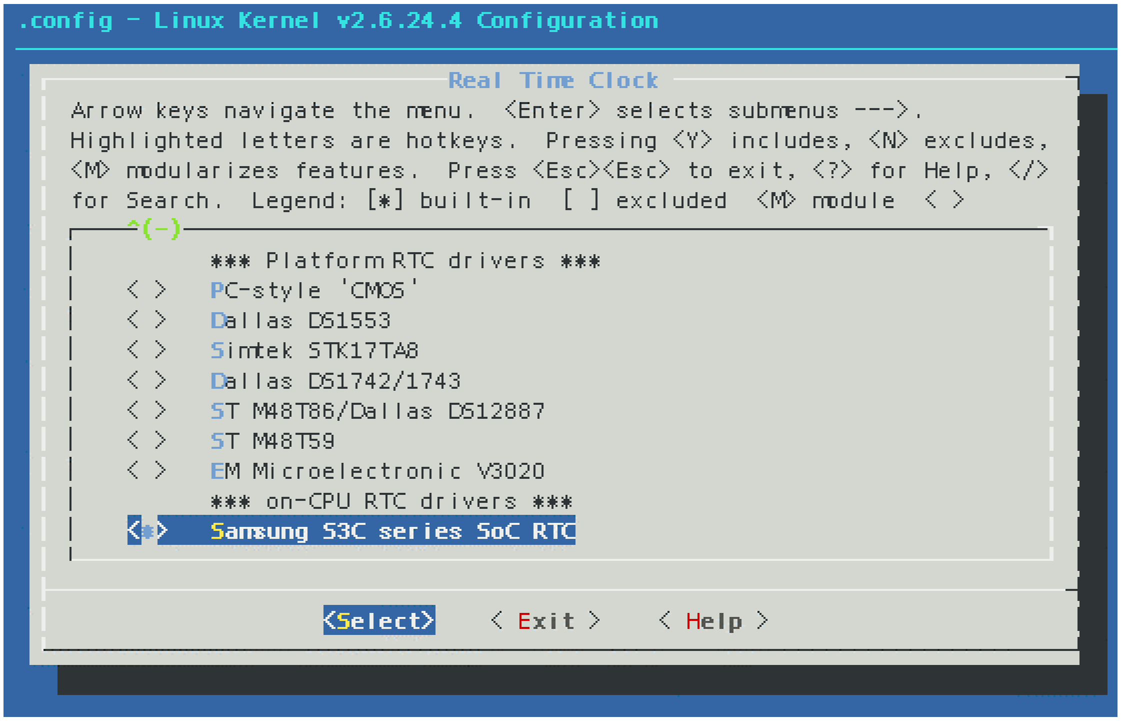
```
.config - Linux Kernel v2.6.24.4 Configuration
                          Serial drivers
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      < > 8250/16550 and compatible serial support
          *** Non-8250 serial port support ***
      <*> Samsung S3C2410/S3C2440/S3C2442/S3C2412 Serial port support
      [*]   Support for console on S3C2410 serial port

                 <Select>    < Exit >    < Help >
```

8.12 Configure RTC

At main menu, select **Device Drivers->Real Time Clock.**



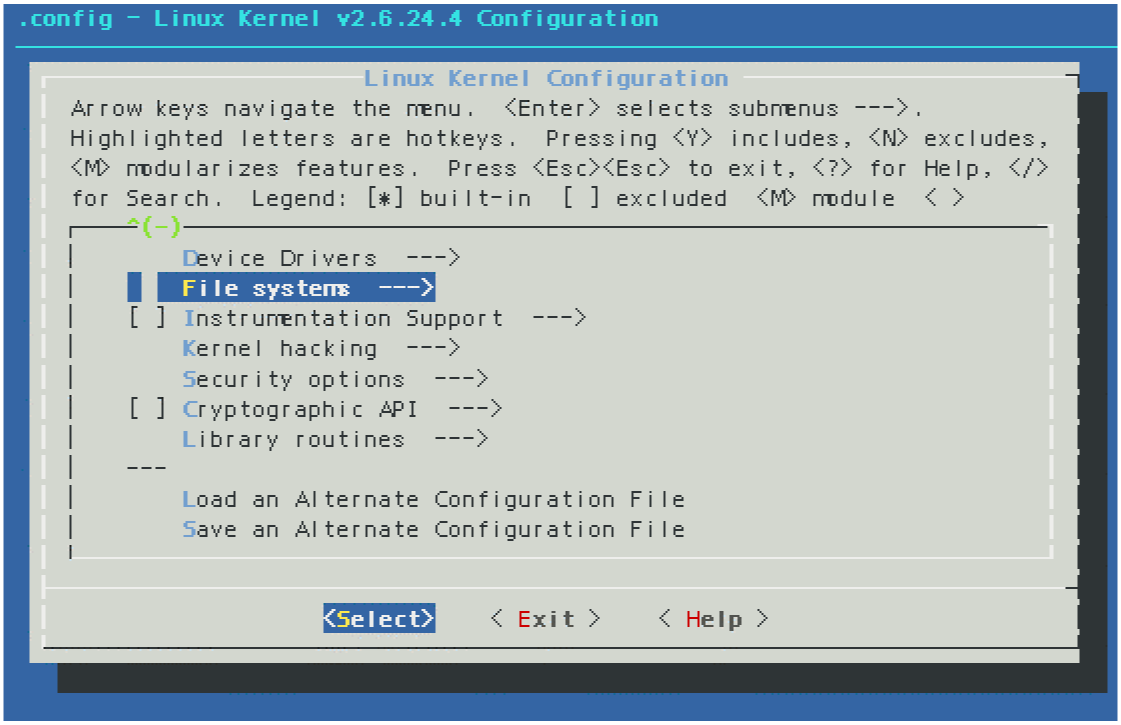
```
.config - Linux Kernel v2.6.24.4 Configuration
                          Device Drivers
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
          L3 serial bus support  --->
          Multifunction device drivers  --->
          Multimedia devices  --->
          Graphics support  --->
          Sound  --->
      [*] HID Devices  --->
      [*] USB support  --->
      <*> MMC/SD card support  --->
      [ ] LED Support  --->
      <*> Real Time Clock  --->

                 <Select>    < Exit >    < Help >
```



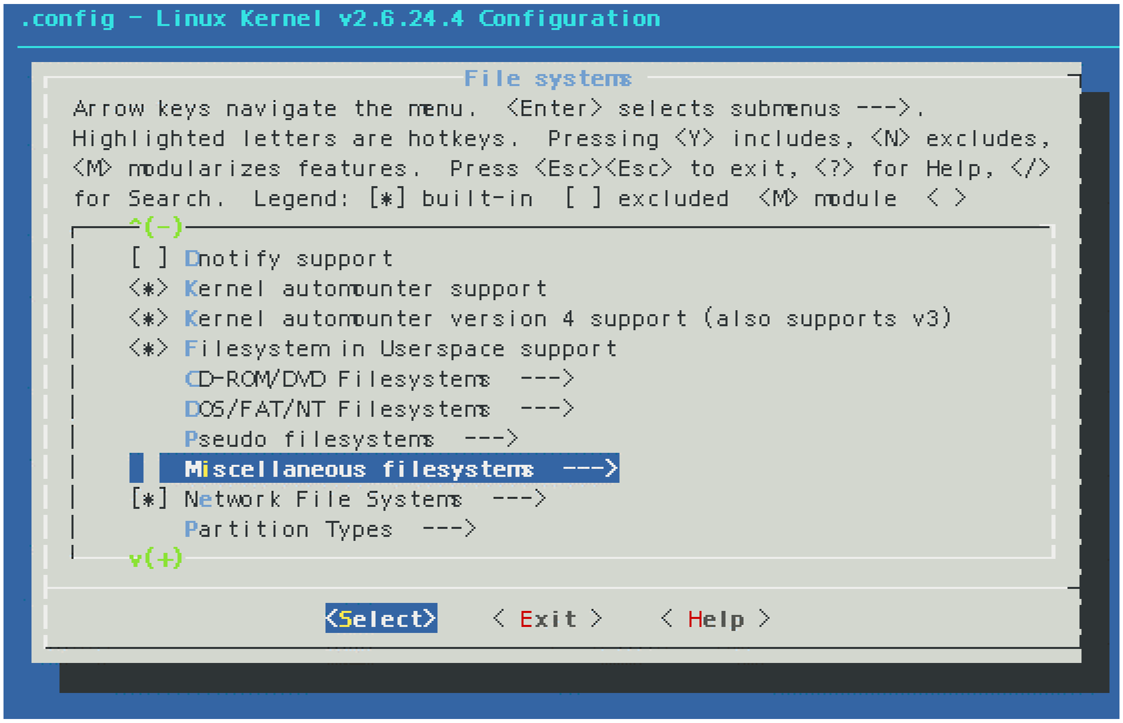
```
.config - Linux Kernel v2.6.24.4 Configuration
                          Real Time Clock
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
    ^(-)
          *** Platform RTC drivers ***
      < >  PC-style 'CMOS'
      < >  Dallas DS1553
      < >  Simtek STK17TA8
      < >  Dallas DS1742/1743
      < >  ST M48T86/Dallas DS12887
      < >  ST M48T59
      < >  EM Microelectronic V3020
          *** on-CPU RTC drivers ***
      <*>  Samsung S3C series SoC RTC

                 <Select>    < Exit >    < Help >
```

8.13 Configure yaffs file system support

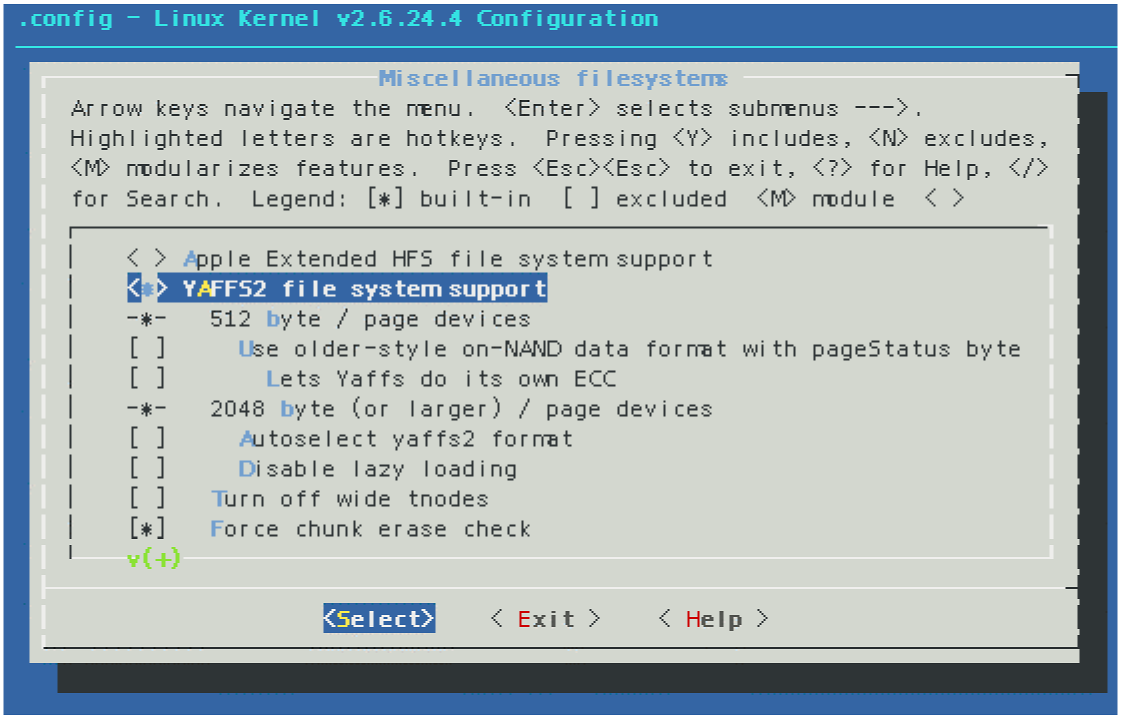
At main menu, select **File Systems ->Miscellaneous filesystems.**



```
.config - Linux Kernel v2.6.24.4 Configuration
                     Linux Kernel Configuration
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
    ^(-)
          Device Drivers  --->
          File systems  --->
      [ ] Instrumentation Support  --->
          Kernel hacking  --->
          Security options  --->
      [ ] Cryptographic API  --->
          Library routines  --->
      ---
          Load an Alternate Configuration File
          Save an Alternate Configuration File

                 <Select>    < Exit >    < Help >
```

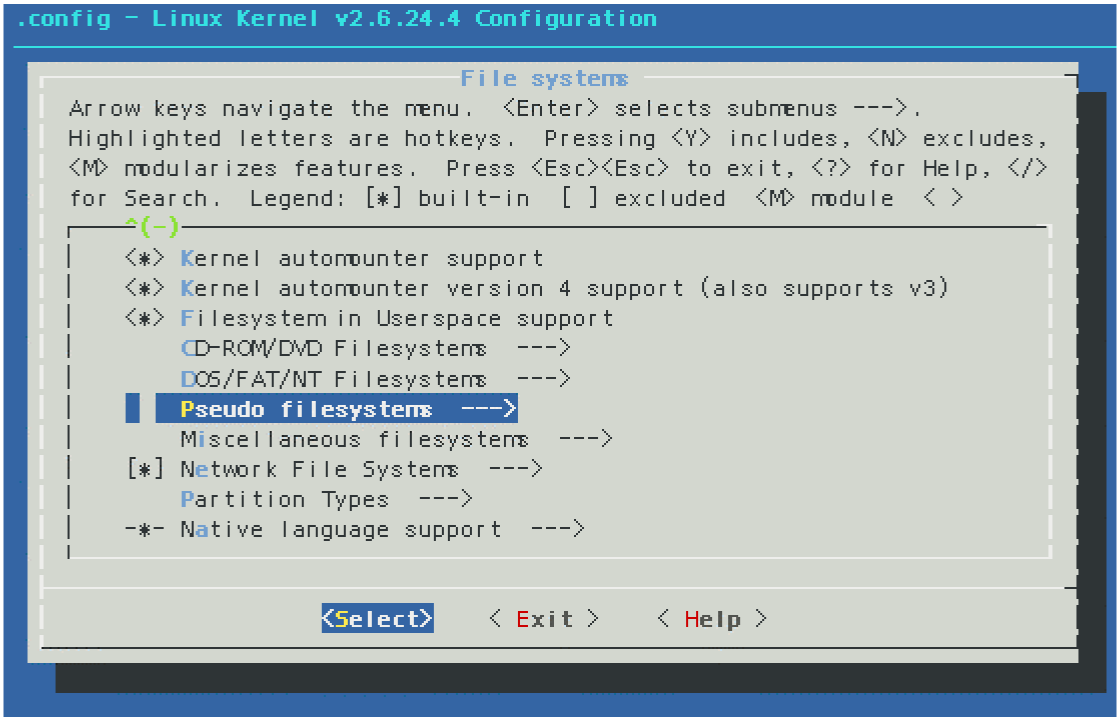


```
.config - Linux Kernel v2.6.24.4 Configuration
                          File systems
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
 ┌───^(-)──────────────────────────────────────────────────────────┐
 │    [ ] Dnotify support
 │    <*> Kernel automounter support
 │    <*> Kernel automounter version 4 support (also supports v3)
 │    <*> Filesystem in Userspace support
 │        CD-ROM/DVD Filesystems  --->
 │        DOS/FAT/NT Filesystems  --->
 │        Pseudo filesystems  --->
 │        Miscellaneous filesystems  --->
 │    [*] Network File Systems  --->
 │        Partition Types  --->
 └───v(+)──────────────────────────────────────────────────────────┘

              <Select>    < Exit >    < Help >
```

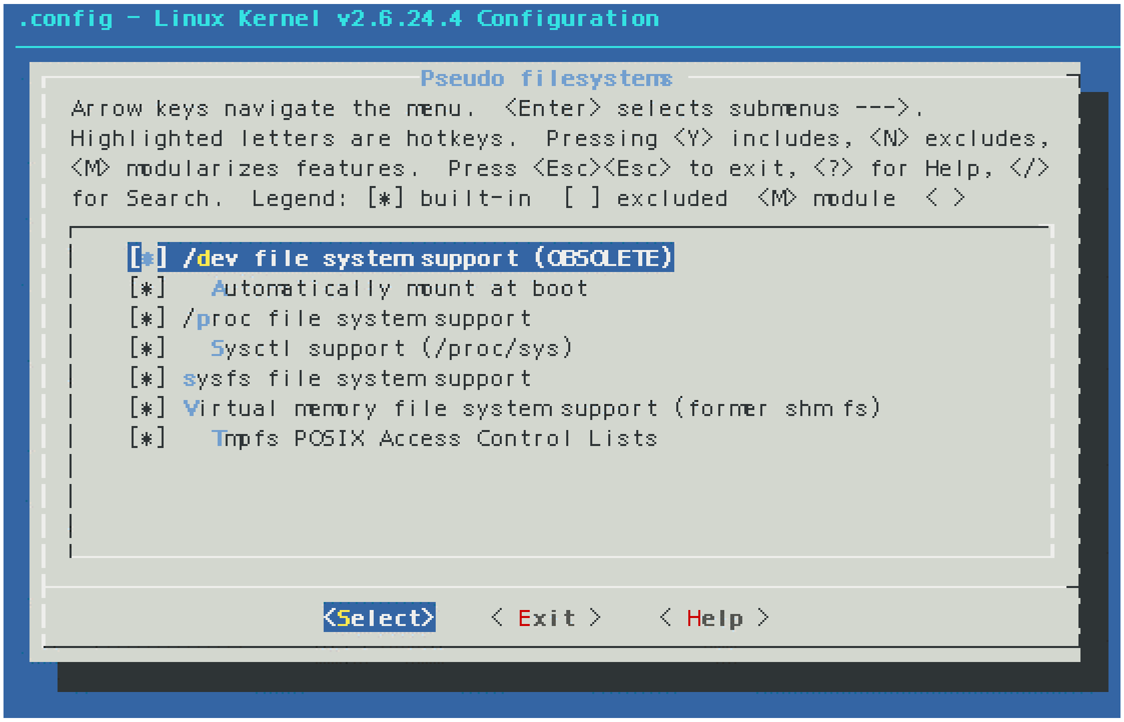


```
.config - Linux Kernel v2.6.24.4 Configuration
                   Miscellaneous filesystems
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
 ┌─────────────────────────────────────────────────────────────────┐
 │    < > Apple Extended HFS file system support
 │    <*> YAFFS2 file system support
 │    -*-   512 byte / page devices
 │    [ ]     Use older-style on-NAND data format with pageStatus byte
 │    [ ]       Lets Yaffs do its own ECC
 │    -*-   2048 byte (or larger) / page devices
 │    [ ]     Autoselect yaffs2 format
 │    [ ]     Disable lazy loading
 │    [ ]   Turn off wide tnodes
 │    [*]   Force chunk erase check
 └───v(+)──────────────────────────────────────────────────────────┘

              <Select>    < Exit >    < Help >
```

At main menu, select **File Systems -> Pseudo filesystems.**



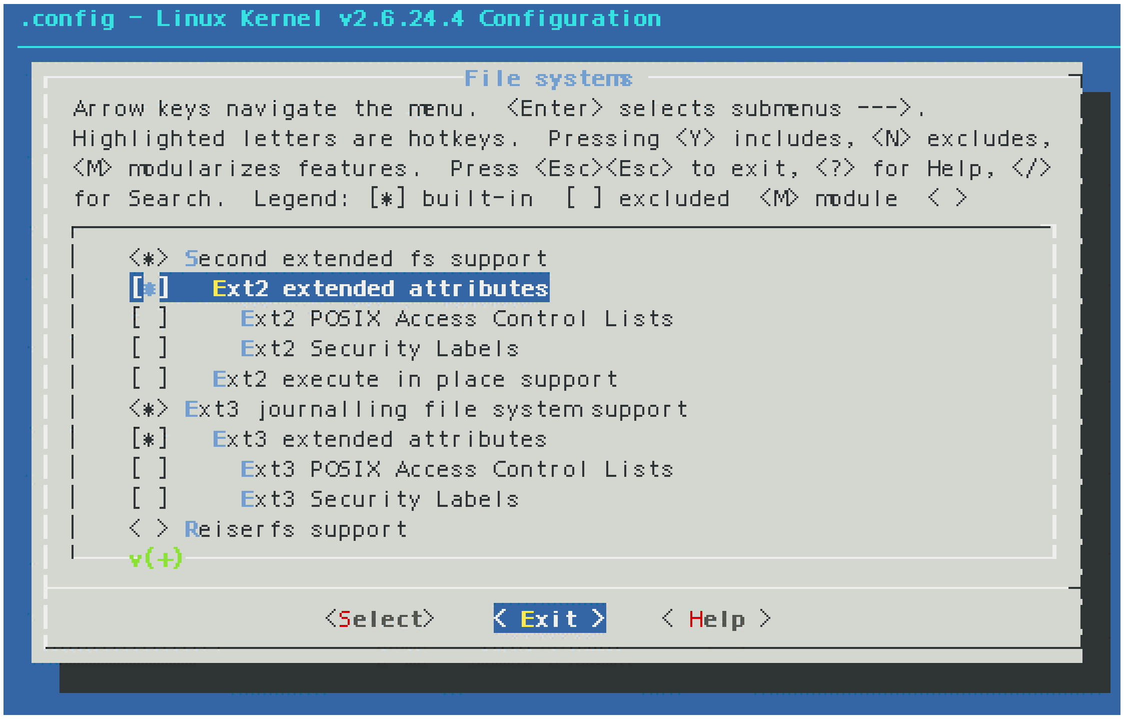
```
.config - Linux Kernel v2.6.24.4 Configuration

                         File systems
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
      <*> Kernel automounter support
      <*> Kernel automounter version 4 support (also supports v3)
      <*> Filesystem in Userspace support
          CD-ROM/DVD Filesystems  --->
          DOS/FAT/NT Filesystems  --->
          Pseudo filesystems  --->
          Miscellaneous filesystems  --->
      [*] Network File Systems  --->
          Partition Types  --->
      -*- Native language support  --->

                <Select>    < Exit >    < Help >
```



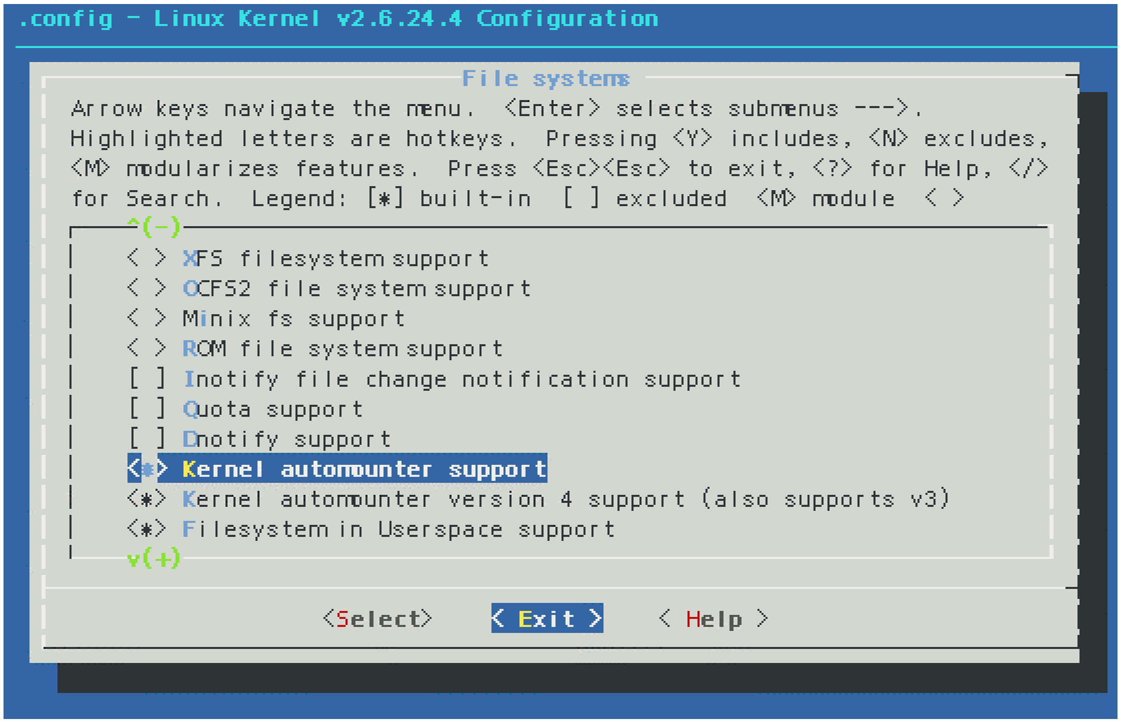
```
.config - Linux Kernel v2.6.24.4 Configuration

                      Pseudo filesystems
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      [*] /dev file system support (OBSOLETE)
      [*]   Automatically mount at boot
      [*] /proc file system support
      [*]   Sysctl support (/proc/sys)
      [*] sysfs file system support
      [*] Virtual memory file system support (former shm fs)
      [*]   Tmpfs POSIX Access Control Lists

                <Select>    < Exit >    < Help >
```

8.14 Configure EXT2/VFAT/ NFS file system support

At main menu, select **File Systems.**

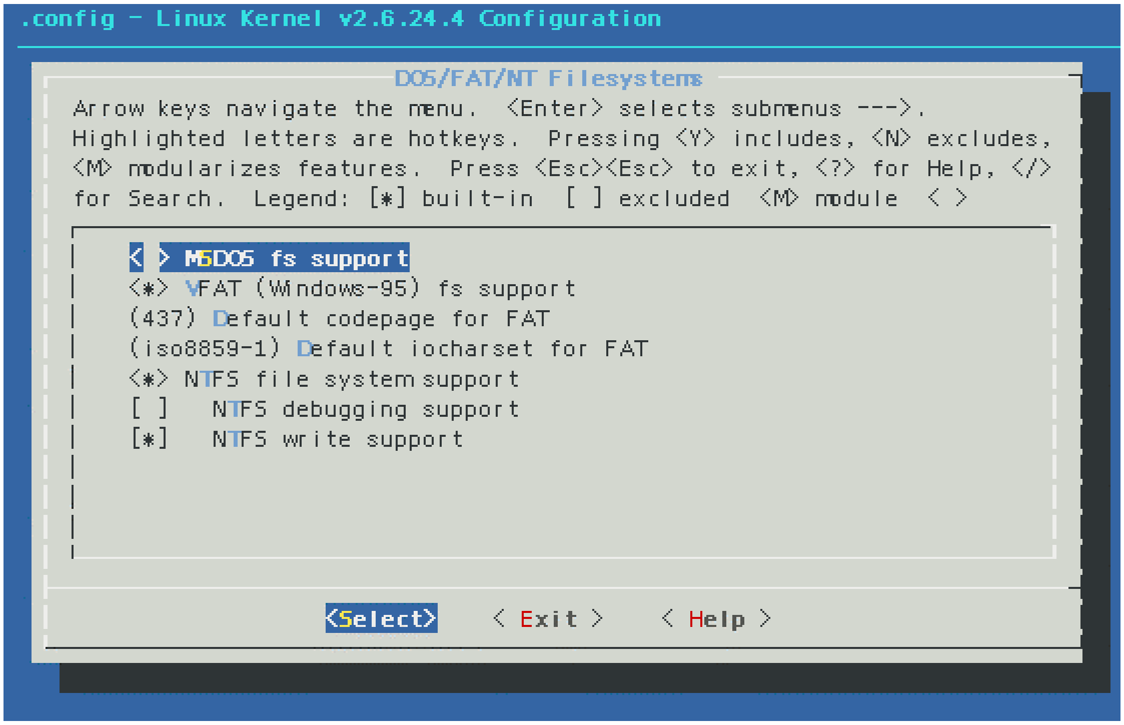


```
.config - Linux Kernel v2.6.24.4 Configuration
                          File systems
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

    <*> Second extended fs support
    [*]   Ext2 extended attributes
    [ ]     Ext2 POSIX Access Control Lists
    [ ]     Ext2 Security Labels
    [ ]   Ext2 execute in place support
    <*> Ext3 journalling file system support
    [*]   Ext3 extended attributes
    [ ]     Ext3 POSIX Access Control Lists
    [ ]     Ext3 Security Labels
    < > Reiserfs support
    v(+)

              <Select>    < Exit >    < Help >
```



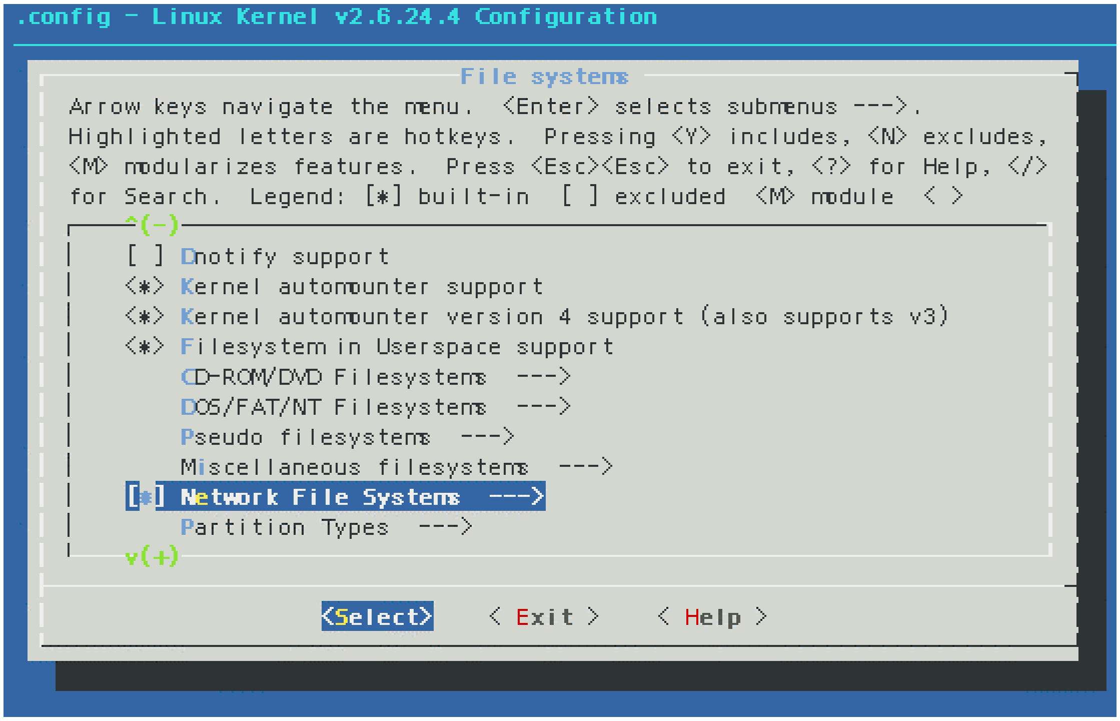
```
.config - Linux Kernel v2.6.24.4 Configuration
                          File systems
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
    ^(-)
    < > XFS filesystem support
    < > OCFS2 file system support
    < > Minix fs support
    < > ROM file system support
    [ ] Inotify file change notification support
    [ ] Quota support
    [ ] Dnotify support
    <*> Kernel automounter support
    <*> Kernel automounter version 4 support (also supports v3)
    <*> Filesystem in Userspace support
    v(+)

              <Select>    < Exit >    < Help >
```

Select **File Systems -> DOS/FAT/NT Filesystems.**

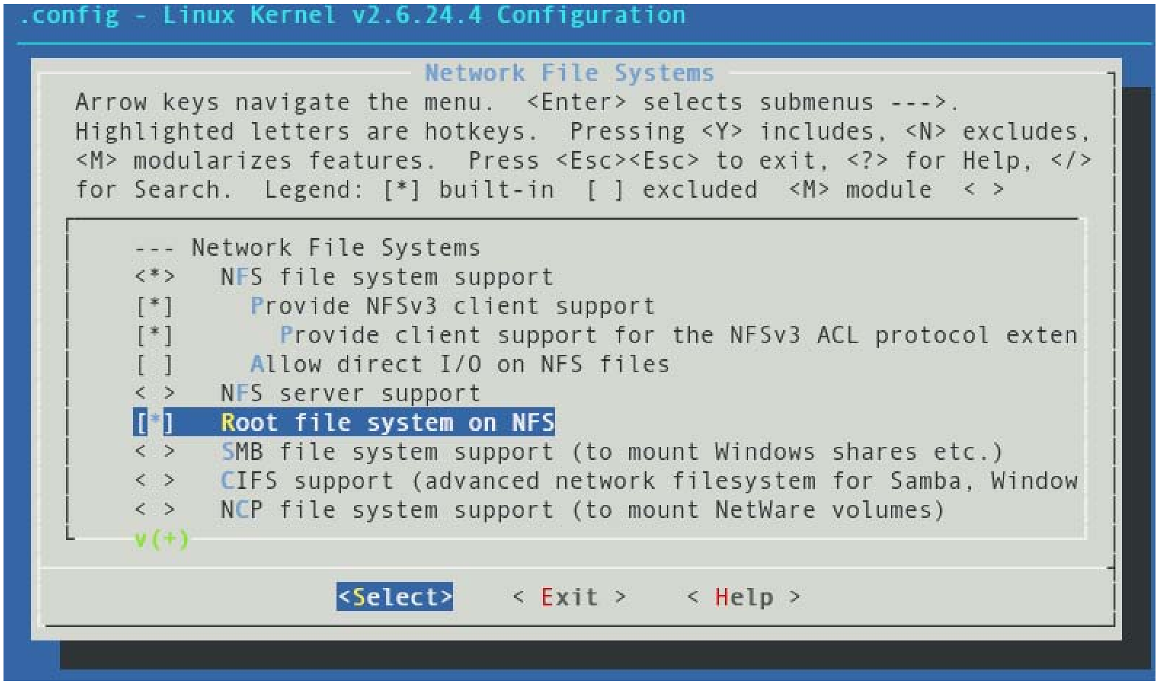


```
.config - Linux Kernel v2.6.24.4 Configuration

                         DOS/FAT/NT Filesystems
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      < > MSDOS fs support
      <*> VFAT (Windows-95) fs support
      (437) Default codepage for FAT
      (iso8859-1) Default iocharset for FAT
      <*> NTFS file system support
      [ ]   NTFS debugging support
      [*]   NTFS write support

                 <Select>    < Exit >    < Help >
```

Select **File Systems -> Network File Systems.**



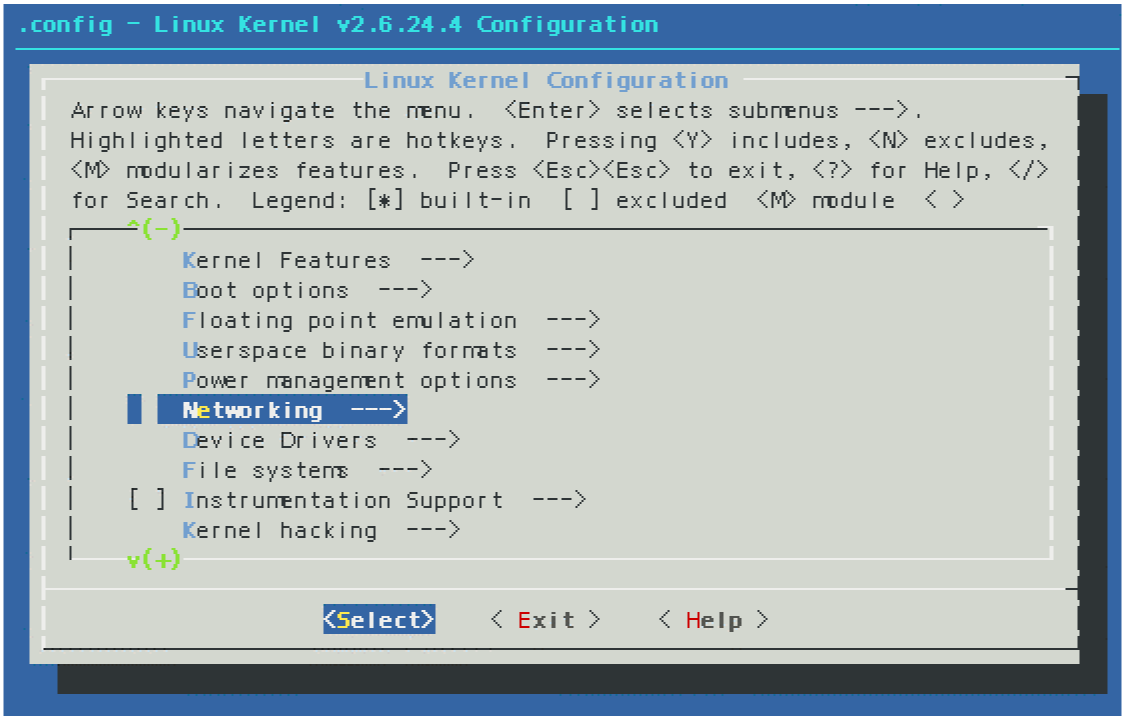
```
.config - Linux Kernel v2.6.24.4 Configuration

                              File systems
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
      [ ] Dnotify support
      <*> Kernel automounter support
      <*> Kernel automounter version 4 support (also supports v3)
      <*> Filesystem in Userspace support
          CD-ROM/DVD Filesystems  --->
          DOS/FAT/NT Filesystems  --->
          Pseudo filesystems  --->
          Miscellaneous filesystems  --->
      [*] Network File Systems  --->
          Partition Types  --->
      v(+)

                 <Select>    < Exit >    < Help >
```



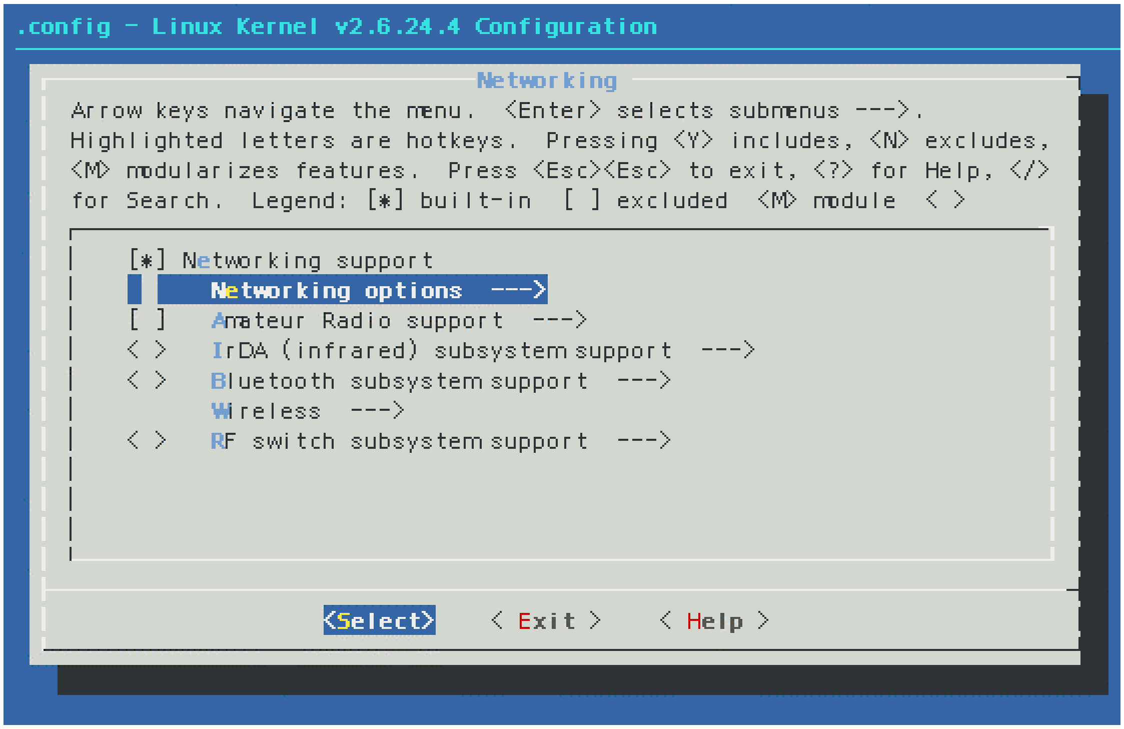
```
.config - Linux Kernel v2.6.24.4 Configuration
                         Network File Systems
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      --- Network File Systems
      <*>   NFS file system support
      [*]     Provide NFSv3 client support
      [*]       Provide client support for the NFSv3 ACL protocol exten
      [ ]     Allow direct I/O on NFS files
      < >   NFS server support
      [*]   Root file system on NFS
      < >   SMB file system support (to mount Windows shares etc.)
      < >   CIFS support (advanced network filesystem for Samba, Window
      < >   NCP file system support (to mount NetWare volumes)
      v(+)

                   <Select>    < Exit >    < Help >
```

8.15 Configure network

At main menu, select **Networking -> Networking support.**

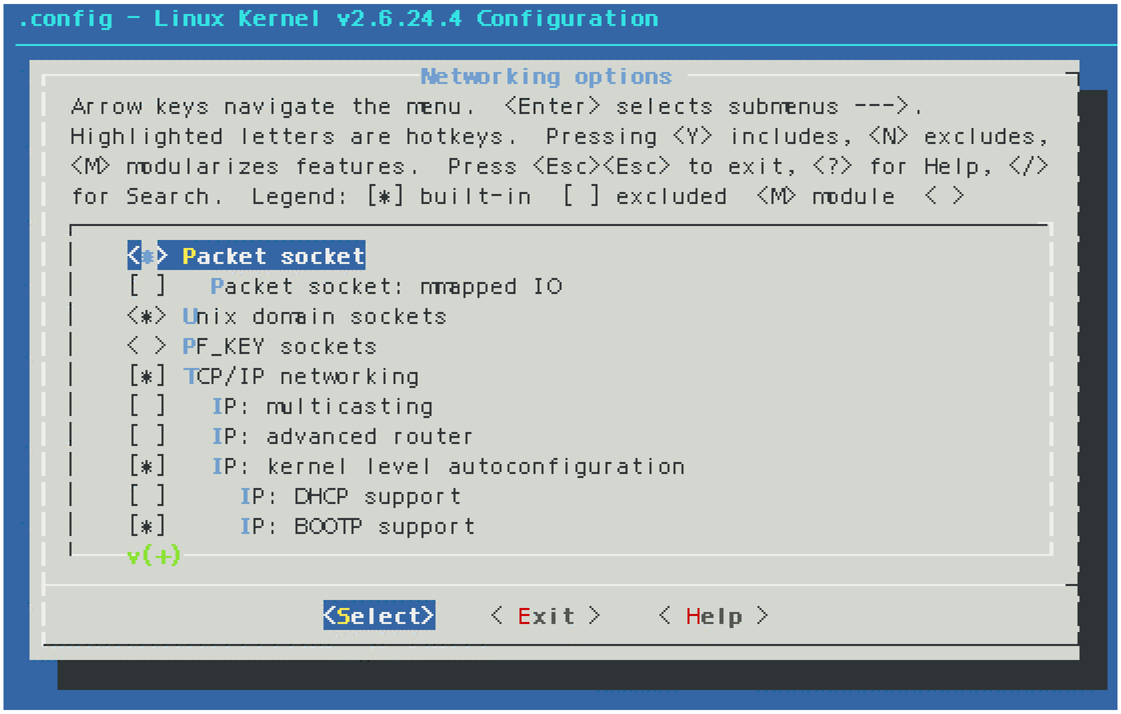


```
.config - Linux Kernel v2.6.24.4 Configuration
                        Linux Kernel Configuration
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
            Kernel Features  --->
            Boot options  --->
            Floating point emulation  --->
            Userspace binary formats  --->
            Power management options  --->
            Networking  --->
            Device Drivers  --->
            File systems  --->
        [ ] Instrumentation Support  --->
            Kernel hacking  --->
      v(+)

                  <Select>    < Exit >    < Help >
```



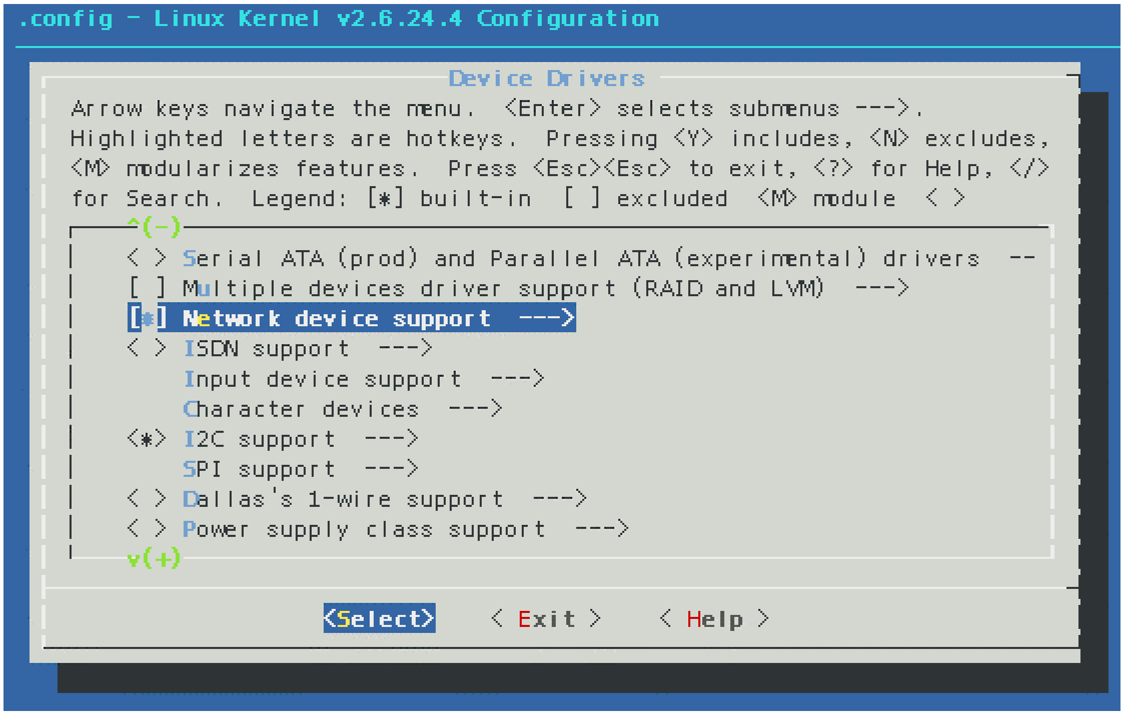
```
.config - Linux Kernel v2.6.24.4 Configuration
                              Networking
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      [*] Networking support
              Networking options  --->
      [ ]     Amateur Radio support  --->
      < >     IrDA (infrared) subsystem support  --->
      < >     Bluetooth subsystem support  --->
              Wireless  --->
      < >     RF switch subsystem support  --->

                   <Select>    < Exit >    < Help >
```

Select **Networking options,** and press **Enter**. Select some as below.



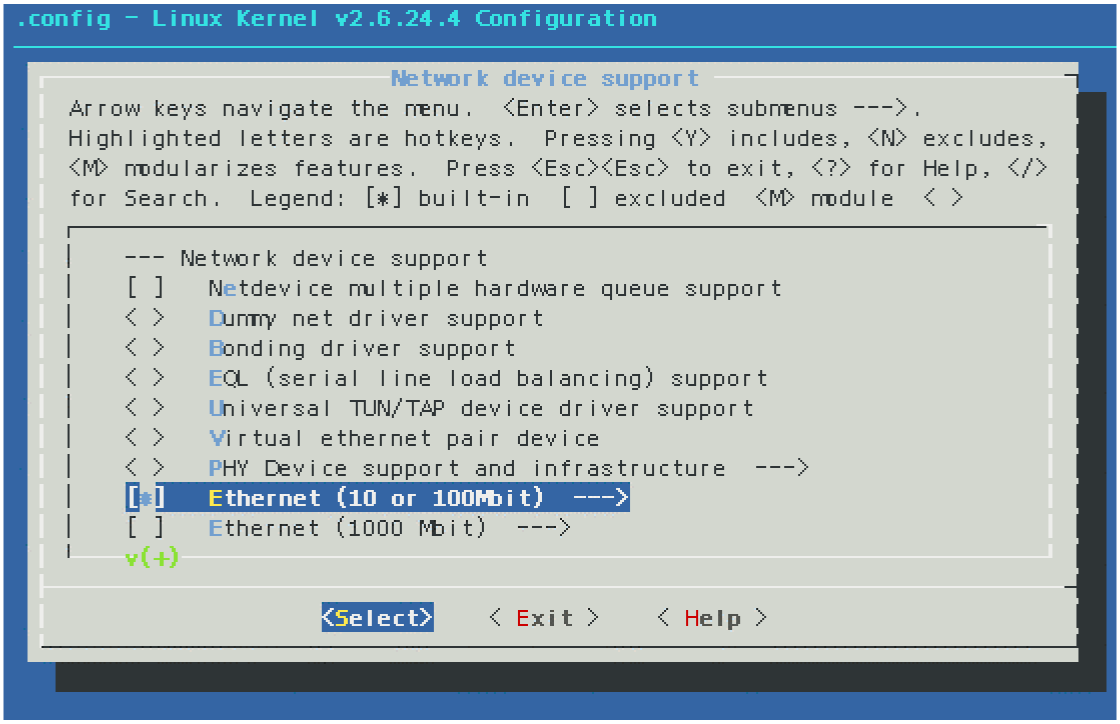
```
.config - Linux Kernel v2.6.24.4 Configuration
                          Networking options
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      <*> Packet socket
      [ ]   Packet socket: mmapped IO
      <*> Unix domain sockets
      < > PF_KEY sockets
      [*] TCP/IP networking
      [ ]   IP: multicasting
      [ ]   IP: advanced router
      [*]   IP: kernel level autoconfiguration
      [ ]     IP: DHCP support
      [*]     IP: BOOTP support
      v(+)

                   <Select>    < Exit >    < Help >
```

At main menu, select **Device Drivers -> Network device support.**



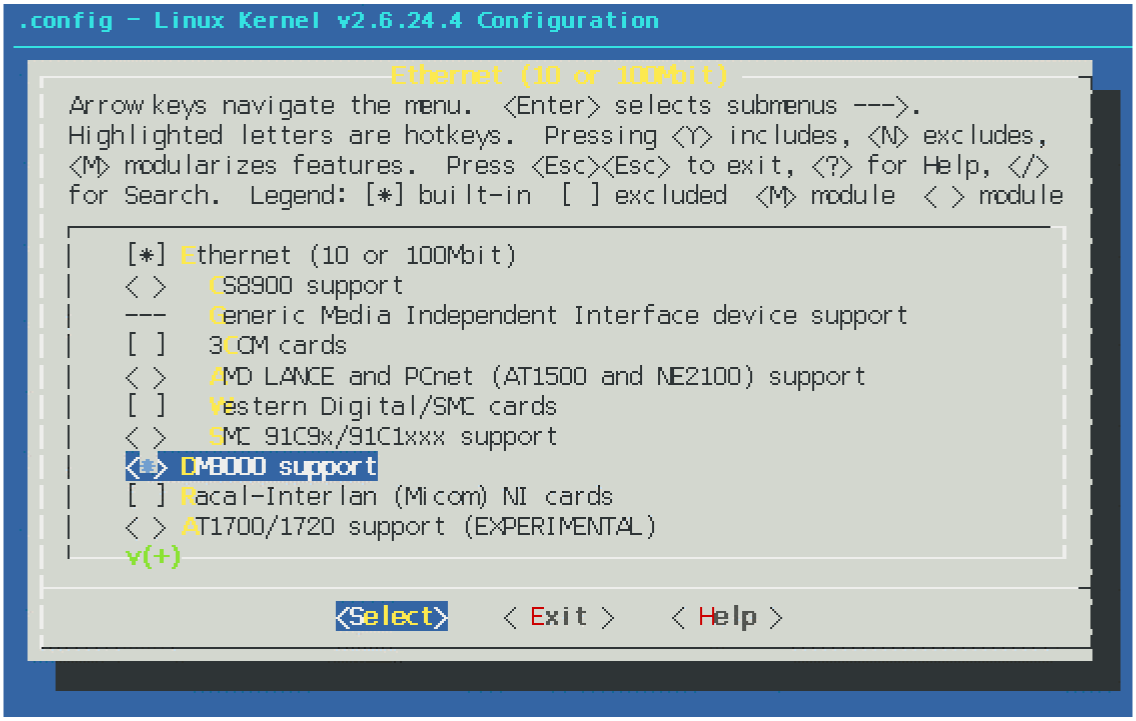
```
.config - Linux Kernel v2.6.24.4 Configuration
                          Device Drivers
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
     ^(-)
     < > Serial ATA (prod) and Parallel ATA (experimental) drivers  --
     [ ] Multiple devices driver support (RAID and LVM)  --->
     [*] Network device support  --->
     < > ISDN support  --->
         Input device support  --->
         Character devices  --->
     <*> I2C support  --->
         SPI support  --->
     < > Dallas's 1-wire support  --->
     < > Power supply class support  --->
     v(+)

              <Select>    < Exit >    < Help >
```

Select **Ethernet (10 or 100Mbit),** and press **Enter**.



```
.config - Linux Kernel v2.6.24.4 Configuration
                       Network device support
 Arrow keys navigate the menu.  <Enter> selects submenus --->.
 Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
 <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
 for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

     --- Network device support
     [ ]   Netdevice multiple hardware queue support
     < >   Dummy net driver support
     < >   Bonding driver support
     < >   EQL (serial line load balancing) support
     < >   Universal TUN/TAP device driver support
     < >   Virtual ethernet pair device
     < >   PHY Device support and infrastructure  --->
     [*]   Ethernet (10 or 100Mbit)  --->
     [ ]   Ethernet (1000 Mbit)  --->
     v(+)

              <Select>    < Exit >    < Help >
```

Select **DM9000 support** if your main board is V4.1 or later whose network IC is DM9000.



```
.config - Linux Kernel v2.6.24.4 Configuration

                          Ethernet (10 or 100Mbit)
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module

      [*] Ethernet (10 or 100Mbit)
      < >   CS8900 support
      ---   Generic Media Independent Interface device support
      [ ]   3COM cards
      < >   AMD LANCE and PCnet (AT1500 and NE2100) support
      [ ]   Western Digital/SMC cards
      < >   SMC 91C9x/91C1xxx support
      <*> DM9000 support
      [ ] Racal-Interlan (Micom) NI cards
      < > AT1700/1720 support (EXPERIMENTAL)
      v(+)

                    <Select>    < Exit >    < Help >
```

9 Common u-boot Commands

Display commands’ usage

```
#help
```

Display environment variables

```
#printenv
```

Set IP address

```
#setenv ipaddr XXX.XXX.XXX.XXX
```

Set CMD_LINE (mount a nand flash root file system)

```
#setenv bootargs 'noinitrd root=/dev/mtdblock2 init=/linuxrc console=ttySAC0,115200'
```

Set IP address of TFTP server

```
#setenv serverip 192.168.2.3
```

Save enviroment variables

```
#saveenv
```

Restore the default enviroment variables

```
#run erase-env
```

Check bad block

```
#nand bad
```

Erase nand flash

```
#nand scrub
```

10 Change logo

Assume you have a picture file - logo.png. (Use GIMP to convert it to png format first)

```
#pngtopnm logo.png > 1.pnm

#pnmquant 224   l.pnm > 2.pnm

#pnmtoplainpnm 2.pnm > 3.ppm
```

If your LCD size is **320*240**, replace /drivers/video/logo/logo_linux_**320240**_clut224.ppm with 3.ppm, re-compile the kernel, and copy the kernel image “uImage” to flash as described in **5.2**. You will see your new logo the next time you boot the target.

11 Build Qtopia Core Opensource

Qtopia is a product of Trolltech, having rich toolkit, intuitive API and comprehensive documentation. It shares the same API as Qt. You can use Qt designder to design your GUI at your Linux desktop (like VB) and then cross-compile the same codes for running on the embedded Linux system. The Trolltech website is http://trolltech.com/. Qtopia is free for open source projects. If you want to use it to develop a commercial product and keep your application source codes private, you have to purchase some sort of licenses.

This board is pre-loaded with a Qtopia PDA edition, and its open source codes are provided in the CD. It is ready to use, and you will experience how powerful it is. However this version is old and will be replaced by Qtopia Phone edition.

Qtopia Core Open Source Edition 4.3.2 is a subset of the latest Qt. From the views of the developers, it is much simpler to configure, compile and program compared to the previous Qt embedded versions. If you have experiences of Qt embedded, now you will notice how simpler it is to get it run on the embedded Linux target. It is freely download at http://trolltech.com/developer/downloads/, and its detailed documentation is at http://doc.trolltech.com/4.3/index.html.

11.1 Download

Download qtopia-core-opensource-src-4.3.2.tar.gz from the above website to host PC directory such as /opt

```
#cd /opt
```

```
#tar zxvf qtopia-core-opensource-src-4.3.2.tar.gz
```

11.2 Configure

Assume you have installed cross-compiler as said in **3.4**.

```
#cd qtopia-core-opensource-src-4.3.2
```

```
#echo "yes"|./configure -embedded arm -no-stl -no-qt3support -no-nis -no-cups -no-iconv -no-qdbus -no-freetype -depths 4,8,16,32 -qt-mouse-linuxtp -little-endian
```

```
#gmake
```

```
#gmake install
```

Now the compiled results are in /usr/local/Trolltech/QtopiaCore-4.3.2-arm/. The size of this directory is about 120 MB, however you don't have to copy all of them to target. The required directory is /usr/local/Trolltech/QtopiaCore-4.3.2-arm/lib. You **must** copy them to the **same** location of the target for use.

To trim down the size of Qtopia, please refer to Qtopia's documentation.

11.3 Copy to a root file system

Assume that you have a root file system /opt/rootfs on your host PC that is NFS exported.

```
#cd /opt

#rm  -r rootfs/opt/*   (delete old Qtopia if any)

#rm rootfs/bin/qtopia   (delete old Qtopia if any)

#mkdir -p rootfs/usr/local/Trolltech/QtopiaCore-4.3.2-arm/lib

#cp -a /usr/local/Trolltech/QtopiaCore-4.3.2-arm/lib/*
rootfs/usr/local/Trolltech/QtopiaCore-4.3.2-arm/lib

#cp -a /usr/local/Trolltech/QtopiaCore-4.3.2-arm/examples
rootfs/usr/local/Trolltech/QtopiaCore-4.3.2-arm/

#cp -a /usr/local/Trolltech/QtopiaCore-4.3.2-arm/demos
rootfs/usr/local/Trolltech/QtopiaCore-4.3.2-arm/
```

To copy the root file system to the nand flash of the target, please refer to **5.3**.

11.4 Configure touchscreen

Edit /opt/rootfs/etc/profile, add the following 2 lines:

```
QWS_MOUSE_PROTO="LinuxTP:/dev/h3600_tsraw"
export QWS_MOUSE_PROTO
```

11.5 Run application

Boot your target so that it NFS-mounts a previously-prepared root file system on host PC - /opt/rootfs. Go to the examples and demos directories to run those applications.

For example, at the minicom terminal:

```
#./analogclock –qws
```

Now analogclock is running, and touch screen is working.

12 Build Microwindows/Nano-X

The Nano-X Window System is another Open Source project aimed at bringing the features of modern graphical windowing environments to smaller devices and platforms. The Nano-X Window System was previously named Microwindows. Its website is http://www.microwindows.org/.

Compared to Qtopia, it has less documentations and functionalities. However it is licensed under the MPL, which means that it can be used with designs under non-disclosure, without having to release proprietary source code. If it meets your need and you want to keep your commercial products' source codes private without paying expensive license fees, it is a very good choice.

If you require some rich features and commercial support, you can go to seek help from http://embedded.centurysoftware.com/.

12.1 Install

```
#cp microwindows-full-0.91.tar.gz  /opt

#cd /opt

#tar xvfz microwindows-full-0.91.tar.gz
```

12.2 Build and install binaries

```
#cd microwindows-0.91/src
```

Manually modify microwindows-0.91/src/config as below:

```
ARCH = LINUX_ARM
ARMTOOLSPREFIX = arm-linux-
MICROWIN            = N
NANOX               = Y
SHAREDLIBS          = N
MICROWINDEMO        = N
NANOXDEMO           = Y
NANOWM              = N
HAVE_JPEG_SUPPORT         = N
HAVE_FNTGZ_SUPPORT        = N
HAVE_FREETYPE_SUPPORT     = N
HAVE_PCF_SUPPORT          = N
HAVE_PCFGZ_SUPPORT        = N
```

```
X11                  = N
IPAQMOUSE             = Y (N for others)
NOKBD                 = Y (N for others)
```

```
#make clean
```

```
#make
```

```
#make INSTALL_PREFIX=/opt/rootfs install
```

The /opt/rootfs is where your root file system is. The default INSTALL_PREFIX=/usr if you don’t specify it.

After the above is done, we have the following results:
/opt/rootfs /bin/nano-X (server)
/opt/rootfs /lib/*.a (libraries)
/opt/rootfs /include/microwin/*.h (header files, must be included when you compile your applications)

All programs are created in the bin directory. Now copy them to root file system.

```
#cp –a bin /opt/rootfs/opt
```

12.3 Run demo applications

Boot your target board.

```
#cd /opt/rootfs

#nano-X &

#./ntetris &

#./nxcal -d nxcal.dat
```

12.4 Touch screen

The above “./nxcal -d nxcal.dat” is called touchscreen calibration. It actually loads calibration file – nxcal.dat. If the file does not exist, it will ask you to touch the LCD panel to do calibration, and then save this file for future use.

13 Build Busybox

```
#cp busybox-1.3.2.tar.gz /opt

#tar xvfz busybox-1.3.2.tar.gz

#cd busybox-1.3.2

#make menuconfig (if you want to modify some configuration)

#make ARCH=arm CROSS_COMPILE=arm-linux-

#make ARCH=arm CROSS_COMPILE=arm-linux- install
```

Now busybox is installed in /opt/busybox-1.3.2/install