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MOXA Smartio/Industio Family Device Driver Installation Guide
for Linux Kernel 2.4.x, 2.6.x

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Content

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1. Introduction

The Smartio/Industio/UPCI family Linux driver supports following multiport boards.

- 2 ports multiport board
  CP-102U, CP-102UL, CP-102UF
  CP-132U-I, CP-132UL,
  CP-132, CP-132I, CP132S, CP-132IS,
  CI-132, CI-132I, CI-132IS,
  (C102H, C102HI, C102HIS, C102P, CP-102, CP-102S)

- 4 ports multiport board
  CP-104EL,
  CP-104UL, CP-104JU,
  CP-134U, CP-134U-I,
  C104H/PCI, C104HS/PCI,
  CP-114, CP-114I, CP-114S, CP-114IS, CP-114UL,
  C104H, C104HS,
  CI-104J, CI-104JS,
  CI-134, CI-134I, CI-134IS,
  (C114HI, CT-114I, C104P)
  POS-104UL,
  CB-114,
  CB-134I

- 8 ports multiport board
  CP-118EL, CP-168EL,
  CP-118U, CP-168U,
  C168H/PCI,
  C168H, C168HS,
  (C168P),

CB-108

This driver and installation procedure have been developed upon Linux Kernel 2.4.x and 2.6.x. This driver supports Intel x86 hardware platform. In order to maintain compatibility, this version has also been properly tested with RedHat, Mandrake, Fedora and S.u.S.E Linux. However, if compatibility problem occurs, please contact Moxa at support@moxa.com.tw.

In addition to device driver, useful utilities are also provided in this version. They are

- msdiag Diagnostic program for displaying installed Moxa Smartio/Industio boards.
- msmon Monitor program to observe data count and line status signals.
- msterm A simple terminal program which is useful in testing serial ports.
- io-irq.exe Configuration program to setup ISA boards. Please note that this program can only be executed under DOS.

All the drivers and utilities are published in form of source code under GNU General Public License in this version. Please refer to GNU General Public License announcement in each source code file for more detail.

In Moxa's Web sites, you may always find latest driver at http://web.moxa.com.

This version of driver can be installed as Loadable Module (Module driver) or built-in into kernel (Static driver). You may refer to following installation procedure for suitable one. Before you install the driver, please refer to hardware installation procedure in the User's Manual.

We assume the user should be familiar with following documents.
- Serial-HOWTO
- Kernel-HOWTO

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2. System Requirement

- Hardware platform: Intel x86 machine
- Kernel version: 2.4.x or 2.6.x
- gcc version 2.72 or later
- Maximum 4 boards can be installed in combination

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3. Installation

3.1 Hardware installation

There are two types of buses, ISA and PCI, for Smartio/Industio

family multiport board.

ISA board

You'll have to configure CAP address, I/O address, Interrupt Vector as well as IRQ before installing this driver. Please refer to hardware installation procedure in User's Manual before proceed any further. Please make sure the JP1 is open after the ISA board is set properly.

PCI/UPCI board

You may need to adjust IRQ usage in BIOS to avoid from IRQ conflict with other ISA devices. Please refer to hardware installation procedure in User's Manual in advance.

PCI IRQ Sharing

Each port within the same multiport board shares the same IRQ. Up to 4 Moxa Smartio/Industio PCI Family multiport boards can be installed together on one system and they can share the same IRQ.

3.2 Driver files

The driver file may be obtained from ftp, CD-ROM or floppy disk. The first step, anyway, is to copy driver file "mxser.tgz" into specified directory. e.g. /moxa. The execute commands as below.

```
# cd /
# mkdir moxa
# cd /moxa
# tar xvf /dev/fd0
```

or

```
# cd /
# mkdir moxa
# cd /moxa
# cp /mnt/cdrom/<driver directory>/mxser.tgz .
# tar xvfz mxser.tgz
```

3.3 Device naming convention

You may find all the driver and utilities files in /moxa/mxser. Following installation procedure depends on the model you'd like to run the driver. If you prefer module driver, please refer to 3.4. If static driver is required, please refer to 3.5.

Dialin and callout port

This driver remains traditional serial device properties. There are two special file name for each serial port. One is dial-in port which is named "ttyMxx". For callout port, the naming convention is "cumxx".

Device naming when more than 2 boards installed

Naming convention for each Smartio/Industio multiport board is pre-defined as below.

Board Num.	Dial-in Port	Callout port
1st board	ttyM0 - ttyM7	cum0 - cum7
2nd board	ttyM8 - ttyM15	cum8 - cum15
3rd board	ttyM16 - ttyM23	cum16 - cum23
4th board	ttyM24 - ttym31	cum24 - cum31

!!!!!!!!!!!!!!!!!! NOTE !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Under Kernel 2.6 the cum Device is Obsolete. So use ttyM* device instead.
!!!!!!!!!!!!!!!!!! NOTE !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Board sequence

This driver will activate ISA boards according to the parameter set in the driver. After all specified ISA board activated, PCI board will be installed in the system automatically driven.
Therefore the board number is sorted by the CAP address of ISA boards. For PCI boards, their sequence will be after ISA boards and C168H/PCI has higher priority than C104H/PCI boards.

3.4 Module driver configuration

Module driver is easiest way to install. If you prefer static driver installation, please skip this paragraph.

---------- Prepare to use the MOXA driver----------

3.4.1 Create tty device with correct major number

Before using MOXA driver, your system must have the tty devices which are created with driver's major number. We offer one shell script "msmknod" to simplify the procedure.
This step is only needed to be executed once. But you still need to do this procedure when:

a. You change the driver's major number. Please refer the "3.7" section.
b. Your total installed MOXA boards number is changed. Maybe you add/delete one MOXA board.
c. You want to change the tty name. This needs to modify the shell script "msmknod"

The procedure is:

```
# cd /moxa/mxser/driver
# ./msmknod
```

This shell script will require the major number for dial-in device and callout device to create tty device. You also need to specify the total installed MOXA board number. Default major numbers for dial-in device and callout device are 30, 35. If you need to change to other number, please refer section "3.7" for more detailed procedure.
Msmknod will delete any special files occupying the same device

naming.

3.4.2 Build the MOXA driver and utilities

Before using the MOXA driver and utilities, you need compile the all the source code. This step is only need to be executed once. But you still re-compile the source code if you modify the source code. For example, if you change the driver's major number (see "3.7" section), then you need to do this step again.

Find "Makefile" in /moxa/mxser, then run

```
# make clean; make install
```

!!!!!!!!!! NOTE !!!!!!!!!!!!!!!!!

For Red Hat 9, Red Hat Enterprise Linux AS3/ES3/WS3 & Fedora Core1:

```
# make clean; make installsp1
```

For Red Hat Enterprise Linux AS4/ES4/WS4:

```
# make clean; make installsp2
```

!!!!!!!!!! NOTE !!!!!!!!!!!!!!!!!

The driver files "mxser.o" and utilities will be properly compiled and copied to system directories respectively.

---------- Load MOXA driver----------

3.4.3 Load the MOXA driver

```
# modprobe mxser <argument>
```

will activate the module driver. You may run "lsmod" to check if "mxser" is activated. If the MOXA board is ISA board, the <argument> is needed. Please refer to section "3.4.5" for more information.

---------- Load MOXA driver on boot ----------

3.4.4 For the above description, you may manually execute "modprobe mxser" to activate this driver and run "rmmod mxser" to remove it.
However, it's better to have a boot time configuration to eliminate manual operation. Boot time configuration can be achieved by rc file. We offer one "rc.mxser" file to simplify the procedure under "moxa/mxser/driver".

But if you use ISA board, please modify the "modprobe ..." command to add the argument (see "3.4.5" section). After modifying the rc.mxser, please try to execute "/moxa/mxser/driver/rc.mxser" manually to make sure the modification is ok. If any error encountered, please try to modify again. If the modification is completed, follow the below step.

Run following command for setting rc files.

```
# cd /moxa/mxser/driver
# cp ./rc.mxser /etc/rc.d
# cd /etc/rc.d
```

Check "rc.serial" is existed or not. If "rc.serial" doesn't exist, create it by vi, run "chmod 755 rc.serial" to change the permission. Add "/etc/rc.d/rc.mxser" in last line,

Reboot and check if moxa.o activated by "lsmod" command.

3.4.5. If you'd like to drive Smartio/Industio ISA boards in the system, you'll have to add parameter to specify CAP address of given board while activating "mxser.o". The format for parameters are as follows.

```
modprobe mxser ioaddr=0x???,0x???,0x???,0x???
                       |      |      |      |
                       |      |      |      +- 4th ISA board
                       |      |      +-------- 3rd ISA board
                       |      +--------------- 2nd ISA board
                       +---------------------- 1st ISA board
```

3.5 Static driver configuration for Linux kernel 2.4.x and 2.6.x

Note: To use static driver, you must install the linux kernel source package.

3.5.1 Backup the built-in driver in the kernel.

```
# cd /usr/src/linux/drivers/char
# mv mxser.c mxser.c.old
```

For Red Hat 7.x user, you need to create link:

```
# cd /usr/src
# ln -s linux-2.4 linux
```

3.5.2 Create link

```
# cd /usr/src/linux/drivers/char
# ln -s /moxa/mxser/driver/mxser.c mxser.c
```

3.5.3 Add CAP address list for ISA boards. For PCI boards user, please skip this step.

In module mode, the CAP address for ISA board is given by parameter. In static driver configuration, you'll have to assign it within driver's source code. If you will not install any ISA boards, you may skip to next portion. The instructions to modify driver source code are as below.

a.
```
# cd /moxa/mxser/driver
# vi mxser.c
```
b. Find the array mxserBoardCAP[] as below.

```
static int mxserBoardCAP[]
= {0x00, 0x00, 0x00, 0x00};
```

c. Change the address within this array using vi. For example, to driver 2 ISA boards with CAP address 0x280 and 0x180 as 1st and 2nd board. Just to change the source code as follows.

```
static int mxserBoardCAP[]
= {0x280, 0x180, 0x00, 0x00};
```

3.5.4 Setup kernel configuration

Configure the kernel:

```
# cd /usr/src/linux
# make menuconfig
```

You will go into a menu-driven system. Please select [Character devices][Non-standard serial port support], enable the [Moxa SmartIO support] driver with "[*]" for built-in (not "[M]"), then select [Exit] to exit this program.

3.5.5 Rebuild kernel

The following are for Linux kernel rebuilding, for your reference only.
For appropriate details, please refer to the Linux document.

a. cd /usr/src/linux
b. make clean /* take a few minutes */
c. make dep /* take a few minutes */
d. make bzImage /* take probably 10-20 minutes */
e. make install /* copy boot image to correct position */
f. Please make sure the boot kernel (vmlinuz) is in the correct position.
g. If you use 'lilo' utility, you should check /etc/lilo.conf 'image' item specified the path which is the 'vmlinuz' path, or you will load wrong (or old) boot kernel image (vmlinuz). After checking /etc/lilo.conf, please run "lilo".

Note that if the result of "make bzImage" is ERROR, then you have to go back to Linux configuration Setup. Type "make menuconfig" in directory /usr/src/linux.

3.5.6 Make tty device and special file

```
# cd /moxa/mxser/driver
# ./msmknod
```

3.5.7 Make utility

```
# cd /moxa/mxser/utility
# make clean; make install
```

3.5.8 Reboot

3.6 Custom configuration

Although this driver already provides you default configuration, you still can change the device name and major number. The instruction to change these parameters are shown as below.

Change Device name

If you'd like to use other device names instead of default naming convention, all you have to do is to modify the internal code within the shell script "msmknod". First, you have to open "msmknod" by vi. Locate each line contains "ttyM" and "cum" and change them to the device name you desired. "msmknod" creates the device names you need next time executed.

Change Major number

If major number 30 and 35 had been occupied, you may have to select 2 free major numbers for this driver. There are 3 steps to change major numbers.

3.6.1 Find free major numbers
In /proc/devices, you may find all the major numbers occupied in the system. Please select 2 major numbers that are available. e.g. 40, 45.

3.6.2 Create special files
Run /moxa/mxser/driver/msmknod to create special files with specified major numbers.

3.6.3 Modify driver with new major number
Run vi to open /moxa/mxser/driver/mxser.c. Locate the line contains "MXSERMAJOR". Change the content as below.

```
#define         MXSERMAJOR              40
#define         MXSERCUMAJOR            45
```

3.6.4 Run "make clean; make install" in /moxa/mxser/driver.

3.7 Verify driver installation
You may refer to /var/log/messages to check the latest status log reported by this driver whenever it's activated.

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4. Utilities

There are 3 utilities contained in this driver. They are msdiag, msmon and msterm. These 3 utilities are released in form of source code. They should be compiled into executable file and copied into /usr/bin.

Before using these utilities, please load driver (refer 3.4 & 3.5) and make sure you had run the "msmknod" utility.

msdiag - Diagnostic

This utility provides the function to display what Moxa Smartio/Industio board found by driver in the system.

msmon - Port Monitoring

This utility gives the user a quick view about all the MOXA ports' activities. One can easily learn each port's total received/transmitted (Rx/Tx) character count since the time when the monitoring is started. Rx/Tx throughputs per second are also reported in interval basis (e.g. the last 5 seconds) and in average basis (since the time the monitoring is started). You can reset all ports' count by <HOME> key. <+> <-> (plus/minus) keys to change the displaying time interval. Press <ENTER> on the port, that cursor stay, to view the port's communication

parameters, signal status, and input/output queue.

msterm - Terminal Emulation

This utility provides data sending and receiving ability of all tty ports, especially for MOXA ports. It is quite useful for testing simple application, for example, sending AT command to a modem connected to the port or used as a terminal for login purpose. Note that this is only a dumb terminal emulation without handling full screen operation.

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5. Setserial

Supported Setserial parameters are listed as below.

uart	set UART type(16450-->disable FIFO, 16550A-->enable FIFO)
close_delay	set the amount of time(in 1/100 of a second) that DTR should be kept low while being closed.
closing_wait	set the amount of time(in 1/100 of a second) that the serial port should wait for data to be drained while being closed, before the receiver is disable.
spd_hi	Use 57.6kb when the application requests 38.4kb.
spd_vhi	Use 115.2kb when the application requests 38.4kb.
spd_shi	Use 230.4kb when the application requests 38.4kb.
spd_warp	Use 460.8kb when the application requests 38.4kb.
spd_normal	Use 38.4kb when the application requests 38.4kb.
spd_cust	Use the custom divisor to set the speed when the application requests 38.4kb.
divisor	This option set the custom divison.
baud_base	This option set the base baud rate.

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6. Troubleshooting

The boot time error messages and solutions are stated as clearly as possible. If all the possible solutions fail, please contact our technical support team to get more help.

Error msg: More than 4 Moxa Smartio/Industio family boards found. Fifth board and after are ignored.
Solution:
To avoid this problem, please unplug fifth and after board, because Moxa driver supports up to 4 boards.

Error msg: Request_irq fail, IRQ(?) may be conflict with another device.
Solution:
Other PCI or ISA devices occupy the assigned IRQ. If you are not sure which device causes the situation, please check /proc/interrupts to find free IRQ and simply change another free IRQ for Moxa board.

Error msg: Board #: C1xx Series(CAP=xxx) interrupt number invalid.
Solution:
Each port within the same multiport board shares the same IRQ. Please set one IRQ (IRQ doesn't equal to zero) for one Moxa board.

Error msg: No interrupt vector be set for Moxa ISA board(CAP=xxx).
Solution:
Moxa ISA board needs an interrupt vector.Please refer to user's manual "Hardware Installation" chapter to set interrupt vector.

Error msg: Couldn't install MOXA Smartio/Industio family driver!
Solution:
Load Moxa driver fail, the major number may conflict with other devices. Please refer to previous section 3.7 to change a free major number for Moxa driver.

Error msg: Couldn't install MOXA Smartio/Industio family callout driver!
Solution:
Load Moxa callout driver fail, the callout device major number may conflict with other devices. Please refer to previous section 3.7 to change a free callout device major number for Moxa driver.
