

# CE/DE/LE910, HE/LE920 Linux USB Driver - User Guide

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## APPLICABILITY TABLE

PRODUCT
CE910
DE910
HE920
LE910
LE920



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# 1. Introduction

## 1.1. Scope

This user guide serves the following purpose:

- Provides details about Telit modems listed in the Applicability Table.
- Explains which Linux driver should be used for Telit modems listed in the Applicability Table.
- Describes how software developers can use Linux devices for typical use cases.

## 1.2. Audience

This document is intended for software developers who are integrating Telit modems listed in the applicability table in their Linux environment.

## 1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

- [TS-EMEA@telit.com](mailto:TS-EMEA@telit.com)
- [TS-NORTHAMERICA@telit.com](mailto:TS-NORTHAMERICA@telit.com)
- [TS-LATINAMERICA@telit.com](mailto:TS-LATINAMERICA@telit.com)
- [TS-APAC@telit.com](mailto:TS-APAC@telit.com)

Alternatively, use:

<http://www.telit.com/en/products/technical-support-center/contact.php>

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

<http://www.telit.com>

To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.



## 1.4. Document Organization

This document contains the following chapters:

[“Chapter 1: “Introduction”](#) provides a scope for this document, target audience, contact and support information, and text conventions.

[“Chapter 2: “Operating System Setup”](#) describes how to setup the operating system for using Telit modems listed in the Applicability Table.

[“Chapter 3: “Modem Setup”](#) describes how to setup the modem for Linux usage.

[“Chapter 4: “Modem Usage”](#) provides some hints about how Telit modems listed in the Applicability Table can be used in Linux.

[“Chapter 5: “Flashing device”](#) explains which driver should be used for flashing the modems listed in the Applicability Table.

## 1.5. Text Conventions



***Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.***



***Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.***



**Tip or Information – Provides advice and suggestions that may be useful when integrating the module.**

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

## 1.6. Related Documents

- AT Commands Reference Guide of Telit modems listed in the applicability table



## 2. Operating System Setup

### 2.1. Summary

Telit modems listed in the Applicability Table expose different kinds of devices according to the Product ID (PID) in use:

- Serial port
- Network adapter, following the CDC-ECM standard
- Network adapter and device management, based on QMI custom protocol
- Network adapter and device management, following the CDC-MBIM standard
- ADB

Linux kernel supports these kinds of devices through the following drivers:

- option, for serial ports
- cdc\_ether, for ECM based network adapters
- qmi\_wwan, for QMI based network adapters and device management
- cdc\_mbim for MBIM based network adapters and device management
- ADB devices do not need a driver.



*Common Linux distributions already have these drivers included: if the devices are not recognized by the operating system, it is possible that the drivers are missing in the kernel. Please recompile the kernel including the above-mentioned drivers. Refer to your Linux vendor for instructions.*

*Some drivers can be found starting from a specific kernel version (e.g. cdc\_mbim is present since 3.8). If the driver is not supported by the used kernel version please consider upgrading the kernel.*

### 2.2. USB compositions

#### 2.2.1. List of PIDs and related compositions

The table below highlights the suggested USB compositions for Linux (identified by the PID):

PID	Serial	Network adapter	Kernel drivers
0x1003	3 ports /dev/ttyUSBx	N/A	option





0x1004	4 ports /dev/ttyUSBx	N/A	option
0x1005	4 ports /dev/ttyUSBx	N/A	option
0x1006	3 ports /dev/ttyUSBx	N/A	option
0x1010	4 ports /dev/ttyUSBx	N/A	option
0x1011	2 ports /dev/ttyUSBx	N/A	option
0x1012	3 ports /dev/ttyUSBx	N/A	option
0x101A	3 ports /dev/ttyUSBx	ECM based network adapter	option, cdc_ether
0x101B	3 ports /dev/ttyUSBx	MBIM based network adapter, /dev/cdc-wdmx management device	option, cdc_mbim
0x1200	4 ports /dev/ttyUSBx	QMI based network adapter, /dev/cdc-wdmx management device	option, qmi_wwan
0x1201	5 ports /dev/ttyUSBx	QMI based network adapter, /dev/cdc-wdmx management device	option, qmi_wwan
0x1204	5 ports /dev/ttyUSBx	MBIM based network adapter, /dev/cdc-wdmx management device	option, cdc_mbim
0x1205	N/A	MBIM based network adapter, /dev/cdc-wdmx management device	cdc_mbim
0x1206	6 ports /dev/ttyUSBx	ECM based network adapter	option, cdc_ether

The number x associated with each Linux device depends on the current configuration of the operating system.

The name associated with the network adapter, if present, depends on the kernel version and on the driver: recent kernel usually shows the name wwanx.



***Not all the ports exposed by a modem can be used for AT commands sending: please refer to the proper AT commands User Guide for port arrangement description.***



**Linux tool lsusb can be used for retrieving the current modem PID.**



## 2.2.2. Customizing the driver: option

If the serial ports are not available, it is possible that the modem PID should be added to the driver option.

Identify the kernel version in use, retrieve the source code and check in

```
/drivers/usb/serial/option
```

under the line

```
#define TELIT_VENDOR_ID
```

if the PID in use is present.

To add a missing PID, consider as an example one of Telit already supported devices and replicate the same structure found in the source code.

For missing PIDs 0x1200, 0x1201, since also the QMI network adapter is involved, consider backporting Telit related changes found in kernel versions since 3.18.



***For all the compositions that present a network adapter, before adding the serial ports make sure that the USB interfaces related to the network adapter are not caught by the option driver. After having modified the code, the kernel should be rebuilt.***

It is possible to temporary modify option behavior for runtime serial ports recognition. With root privileges, type in a shell:

```
modprobe option
```

```
echo 1bc7 PID > /sys/bus/usb-serial/drivers/option1/new_id
```

where PID is the current pid of the modem.



***For all the compositions that present a network adapter, before adding the serial ports make sure that the system has properly recognized the network adapter, otherwise it will not be recognized.***

## 2.2.3. Customizing the driver: qmi\_wwan

If the QMI based network adapter is not available, it is possible that the modem PID should be added to the driver qmi\_wwan.

Identify the kernel version, retrieve the source code and check in

```
drivers/net/usb/qmi_wwan.c
```

for the presence of the related source code line according to the PID:



PID	Line
0x1200	{QMI_FIXED_INTF(0x1bc7, 0x1200, 5)}
0x1201, 0x1040	{QMI_FIXED_INTF(0x1bc7, 0x1201, 2)}

If missing, consider backporting Telit related changes found in kernel versions since 3.13.



***After having modified the code, the kernel should be rebuilt.***

It is possible to temporary modify qmi\_wwan behavior for runtime network adapter recognition. With root privileges, type in a shell:

```
modprobe qmi_wwan
echo 1bc7 PID > /sys/bus/usb/drivers/qmi_wwan/new_id
```

where PID is the current pid of the modem.



## 3. Modem Setup

### 3.1. Setting the USB Composition

For changing the modem USB composition, please refer to the proper AT command user guide.



## 4. Modem Usage

### 4.1. Using the Serial Ports

The devices `/dev/ttyUSBx` are normal Linux character devices and support most of the features implemented by the tty layer.

For sending AT commands, a terminal emulator like Minicom can be used.

When writing code for using the device please refer to the programming language API related to character devices. As an example, C applications can use the functions exported in the system header files `fcntl.h` and `unistd.h`. Please refer to the related man page for further details.



*When an AT command is sent, for receiving the answer it is mandatory to have the DTR asserted*

#### 4.1.1. Data Connection

More recent Linux distributions have GUI tools for creating dial-up connections through serial ports.

If a ppp connection through command line is needed, the software `pppd` can be used. Please refer to the official website for further details and updated source code (<https://ppp.samba.org/>).

### 4.2. Using the Network Adapter

If the modem firmware supports a network adapter and the related driver is properly loaded, a network interface is created (usually called `wanx` in recent kernel version).

Linux command `ifconfig` can be used for retrieving some network interface related info (please refer to the man page for further details).

#### 4.2.1. Data Connection

For establishing a data connection through the network interface, follow the steps related to the PID in use:

PID	Line
0x101A	<ul style="list-style-type: none"> <li>- Setup the context using <code>AT+CGDCONT</code> command</li> <li>- Run a dhcp client towards the wwan network adapter as in the following example:  <code>dhclient &lt;wwan network adapter name&gt;</code></li> <li>- Check the network adapter ip address using <code>ifconfig</code></li> </ul>





<p>0x101B, 0x1204, 0x1205</p>	<p>Standard NetworkManager and ModemManager can be used for setting up the data connection with the MBIM network adapter.</p> <p>For command line data connection setup, the tool mbim-network from project <a href="#">libmbim</a> can be used. Please refer to the libmbim documentation for further details.</p>
<p>0x1200, 0x1201</p>	<p>Standard NetworkManager and ModemManager can be used for setting up the data connection with the QMI network adapter.</p> <p>For command line data connection setup, the tool qmi-network from project <a href="#">libqmi</a> can be used. Please refer to the libqmi documentation for further details.</p>
<p>0x1206</p>	<ul style="list-style-type: none"> <li>- Setup the context using AT+CGDCONT command</li> <li>- In a Linux root shell start a dhcp client on the network interface, for example:              <pre>dhclient &lt;wwan network adapter name&gt;</pre> </li> <li>- Send the command for starting the data connection:              <pre>AT#ECM=1,0</pre> </li> <li>- When the dhcp client has finished, check the network adapter ip address with ifconfig</li> </ul> <p>Please refer to the AT commands User Guide for details on the ECM related commands</p>



## 5. Flashing Device

### 5.1. Overview

The modems listed in the following table support firmware update through a special flashing device when using Telit lxfp application (for further details please refer to Linux XFP User Guide - 1VV0301045).

This flashing device should be bound to a specific driver: the following table presents the currently supported flashing devices:

PRODUCT	Flashing device (VID/PID)	Kernel driver	Flashing device name
LE910, LE920	0x18d1/0xd00d	option	/dev/ttyUSBx

### 5.2. Flashing Device: 0x18d1/0xd00d

For using flashing device 0x18d1/0xd00d with lxfp, it should be added to the Linux kernel option driver as described in paragraph [2.2.2](#).

For testing purposes support could be added at runtime; with root permissions type:

```
modprobe option
```

```
echo 18d1 d00d > /sys/bus/usb-serial/drivers/option1/new_id
```

For production systems it is suggested to modify option source code, in order to permanently link the flashing device to the driver.



**The flashing device name for firmware flashing with lxfp is /dev/ttyUSBx (e.g. /dev/ttyUSB0 if no other ttyUSB devices are present in the system).**



## 6. Document History

Revision	Date	Changes
0	2016-01-22	First issue

