GE/HE/UE910, UL865, LE910 V2
Linux USB Driver - User Guide

1VV0301255 Rev.0 – 2016-01-22

APPLICABILITY TABLE

PRODUCT
GE910
HE910
UE910
UL865
LE910 V2

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Contents

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 the Linux devices for typical use cases

1.2. Audience

This document targets 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
TS-NORTHAMERICA@telit.com
TS-LATINAMERICA@telit.com
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 drivers 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, following the CDC-ACM standard
- Network adapter, following the CDC-ECM standard
- Network adapter, following the CDC-NCM standard
- Mobile Broadband adapter, following the CDC-MBIM standard

The Linux kernel supports these kind of devices through the following drivers:

- cdc_acm
- cdc_ether
- cdc_ncm
- cdc_mbim

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

2.3. List of PIDs and related compositions

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

PID	Serial ports	Network adapter	Kernel drivers
0x0021	6 ports `/dev/ttyACMx`	N/A	cdc_acm
0x0022	3 ports `/dev/ttyACMx`	N/A	cdc_acm

0x0023	6 ports `/dev/ttyACMx`	1 `wwanx` (or `usbx`)	cdc_acm, cdc_ether
0x0032	6 ports `/dev/ttyACMx`	1 `wwanx` + 1 `/dev/cdc-wdmx`	cdc_acm, cdc_mbim
0x0035	6 ports `/dev/ttyACMx`	N/A	cdc_acm
0x0036	6 ports `/dev/ttyACMx`	1 `wwanx` (or `usbx`)	cdc_acm, cdc_ncm

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 Telit Ports Arrangement document for further details.

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

3. Modem Setup

3.1. Setting the USB configuration

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/ttyACMx` 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

Most 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 USB composition in use supports a network adapter and the related driver is properly loaded, a network interface is created (usually called `wwanx` in recent kernel version).

Linux command `ifconfig` can be used for configuring the network interface or retrieving network interface related details (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	
0x0023	- Setup the context using AT+CGDCONT command - In a Linux root shell start a dhcp client on the network

	interface, for example:
	`dhclient <wwan network adapter name>`
	- Send the command for starting the data connection:
	AT#ECM=1,0
	- When the dhcp client has finished, check the network adapter ip address with ifconfig
	- To disconnect the data connection, send:
	AT#ECMD=0
	and tear down the network interface:
	`ifconfig <wwan network adapter name> down`
	Please refer to the AT commands User Guide for details on the ECM related commands

0x0032	Standard NetworkManager and ModemManager can be used for setting up the data connection with the MBIM network adapter. For command line data connection setup, the tool mbim-network from project libmbim can be used. Please refer to the libmbim documentation for further details.
0x0036	- Setup the context using AT+CGDCONT command: please note that context number 1 is reserved, while the others can be used - Activate the NCM: AT#NCM=1,<context number> - Activate the PDP context: AT+CGACT=1,<context number> - Check the IP address: AT+CGPADDR=<context number> - Check the gateway and DNS addresses: AT+CGCONTRDP=<context number> - Activate the data connection: AT+CGDATA="M-RAW_IP",<context number> Wait for the CONNECT answer for successful connections. - Configure the network interface on Linux side with all the

	information collected with the AT commands:
	`ifconfig <interface name> <ip address> netmask <netmask> up`
	`route add default gw <gateway address>`
	`arp –s <gateway address> 11:22:33:44:55:66`
	- Add the dns address in /etc/resolv.conf
	`nameserver <dns address>`
	- To disconnect the data connection, send:
	AT+CGATT=0
	Wait for "NO CARRIER", then send:
	AT+CGATT=1
	Tear down the network interface:
	`ifconfig <interface name> down`
	Please refer to the AT commands User Guide for details on the NCM related commands

The `ping` command can be used for a simple network test.

If the ping command does not work correctly, please check the operating system network routes (with the Linux command route) and DNS configuration.

5. Flashing device

5.1. Overview

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

The flashing device appears for a few seconds when the modem is turned on: if the flashing application (lxfp) is not running, the flashing device disconnects and the modem proceeds in normal operative mode.

The following table presents the currently supported flashing devices:

PRODUCT	Flashing device (VID/PID)	Kernel driver	Flashing device name
GE/HE/UE910, UL865	0x058b/0x0041	usb-serial-simple	`/dev/ttyUSBx`
LE910 V2	0x8087/0x0716	usb-serial-simple	`/dev/ttyUSBx`

5.2. Flashing device: 0x058b/0x0041

Even though the flashing device 0x058b/0x0041 presents as an ACM device, it should be driven by the kernel driver usb-serial-simple. Support for this device is present since kernel version 4.4-rc8.

For previous kernel versions 4.4 kernel modifications should be backported according to the following guidelines:

- Blacklist the flashing device 0x058b/0x0041 in cdc-acm driver (`.driver_info = IGNORE_DEVICE`)
- Add support for the device in usb-serial-simple under the define `FLASHLOADER_IDS`

Basically this means backporting Linux kernel commit f235cead56ccc190e373be2287e20cff3078ce35.

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).

5.3. Flashing device: 0x8087/0x0716

Support for flashing device 0x8087/0x0716 is present since kernel version 3.12 with driver usb-serial-simple.

For previous kernel versions usb-serial-simple should be backported, otherwise support could be added at runtime following these steps:

- With root permission, unload usbserial with the following line:

  ```
  rmmod usbserial
  ```

- Load again usbserial with the following line:

  ```
  modprobe usbserial vendor=0x8087 product=0x0716
  ```

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