TELIT 3G MODULES PORTS ARRANGEMENTS

USER GUIDE

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Applicability Table

PRODUCTS

	Platform Version ID[1]	Technology
HE910 SERIES	12	3G
UE910 SERIES		
UL865 SERIES		
UE866 SERIES		

[1] Platform Version ID is a reference used in the document. It identifies the different SW versions, e.g. 12 for SW version 12.xx.xxx, 13 for SW version 13.xx.xxx, etc.

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1 INTRODUCTION

1.1 Scope

The document provides a guideline to connect logically the physical serial ports of the module to the services supported by the module itself (GPS, Python, etc.). It is up to the user to configure the module to avoid hardware/software resources conflicts. With the generic "ports/services arrangement" expression is intended each possible set of logical connections regarding physical ports and Service Access Points (AT0, AT1, AT2, TT, PYSER, etc.) supported by the used module.

1.2 Audience

This guide is addressed to the application developers that need to exploit at best the logical connections regarding the physical serial ports and services provided by the used module, without run up against resources contentions among the involved services.

1.3 Contact Info and Support

For general contact, technical support services, technical questions and report documentation errors contact Telit Technical Support at:

- TS-EMEA@telit.com
- TS-AMERICAS@telit.com
- TS-APAC@telit.com
- TS-SRD@telit.com (for Short Range Devices)

Alternatively, use:

http://www.telit.com/support

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

http://www.telit.com

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 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.

1.5 Related Documents

[1] Telit's CMUX Implementation User Guide, 1vv0300994
[2] Telit 3G Modules AT Commands Reference Guide, 80378ST10091A
[3] Telit Easy Script Python, 80000ST10020a
[4] HE910 Hardware User Guide, 1vv0300925
[5] UE910 Hardware User Guide, 1vv0301012
[6] UL865 Hardware User Guide, 1vv0301050
[7] AppZone C User Guide, 1vv0301335
[8] AppZone C API Reference Guide, 1vv0301130
[9] UE866 Hardware User Guide, 1vv0301157
[10] UE910 3G Hardware User Guide, 1vv0301171
[11] UL865 3G Hardware User Guide, 1vv0301114
[12] Telit USB Drivers Installer User Guide, 1vv0301164

2 VIRTUAL SERVICE DEVICE

Before describing the AT#PORTCFG command, it is to useful introduce the Virtual Serial Device (VSD).

VSD is a software layer designed to run on Telit's modules. It manages logical connections between the physical serial ports, accessible to the user, and the services provided by the module. VSD supports a set of Service Access Points used as anchorage points for the internal logical connections. Here are the items involved in the configurations.

- Physical Serial Ports:
  USIF0[2]
  USIF1
  USB (Seven USB channels: USB0÷USB6)
  SPI
  HSIC

- Services Access Points:
  AT0, AT1, AT2, AT3
  TT
  DLink
  VHWDTE0
  VHWDTE1
  PYSER, PYSER2, PYUSB0
  Python Debugging
  GPS

- CMUX Protocol
  Used to create four virtual ports

- Services
  GPS
  Python
  AppZone

Referring to the figure on the right side:

the modules provide three AT Commands Parser Instances, which are logically independent and connected to three different Service Access Points; each parser recognizes and executes the AT commands received on its Service Access Point.

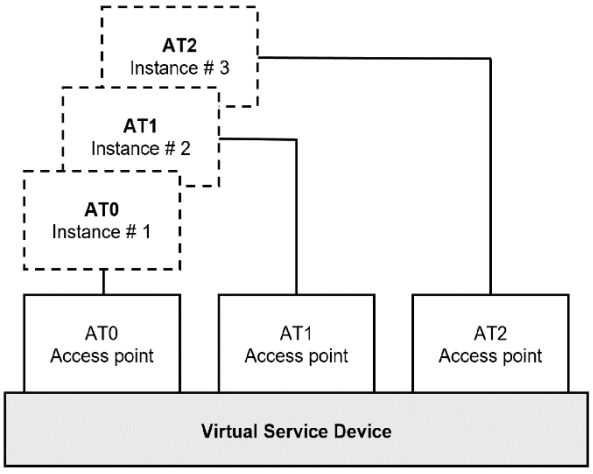


Fig.1: AT Parser Instances

[2] In documents [4], [5], [6], [9], [10], and [11] USIF0 and USIF1 are called respectively Modem Serial Port1 and Modem Serial Port 2.

3 PRELIMINARY INFORMATION

It is strongly recommended to use the AT#USBCFG=? and AT#PORTCFG=? Test commands to have information respectively on the USBx ports configuration modes and ports arrangements provided by the module that you are using. Refer to document [2] to have information on AT commands syntax.

3.1 USB Ports Configuration Modes

Assume that the module is using the factory-setting ports configuration, and the USB cable is plugged in. Fig.2 shows the USBx ←→ COMx ports mapping. The mapping depends on the Windows-PC configuration, in this case USB0 port is mapped into COM9 port.

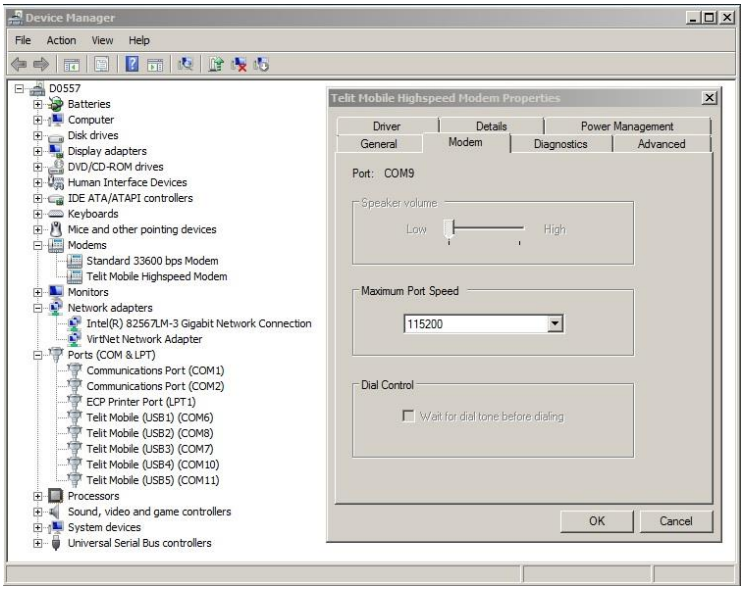


Fig.2: USBx Mapped into Virtual COMx

Tab.2 summarizes the mapping shown in Fig.2

USBx Ports	COMx Ports
USB0	COM9
USB1	COM6
USB2	COM8
USB3	COM7
USB4	COM10
USB5	COM11

Tab.1: Mapping Table

Enter the AT#USBCFG=? Test command to check the number of USB ports modes provided by the module.

AT#USBCFG=?
#USBCFG: (0-5) ← the module provides six modes
OK

Check the current mode
AT#USBCFG?
#USBCFG: 0 ← 0 is the factory-setting mode
OK

Change the mode, for example mode=5
AT#USBCFG=5
OK

Check the current mode
AT#USBCFG?
#USBCFG: 5 ← but, mode 5 is not still active
OK

To activate the new mode power off/on the module, or enter the AT#REBOOT command.

Tab.2 describes the USB0÷USB5 ports configuration for each mode.

Mode	USB Ports Configurations				Description	PID
	ACM	SS	ECM	DLINK		
0 (factory-setting)	✓	standard			All USBx ports support the ACM subclass, and Selective Suspend standard type.	0X21
1	Data only	standard		✓	All USBx ports support the ACM subclass in Data only mode, Selective Suspend standard type, and DLink feature.	0x26
2	✓	standard		✓	All USBx ports support the ACM subclass, Selective Suspend standard type, and DLink feature.	0x21
3	✓	standard	✓		All USBx ports support the ACM subclass, Selective Suspend standard type, and ECM protocol.	0x23
4	✓	custom			All USBx ports support the ACM subclass, and Selective Suspend custom type.	0x24
5	✓	custom	✓		All USBx ports implement the ACM subclass, Selective Suspend custom type, and ECM protocol.	0x25

Tab.2: #USBCFG Modes

Tab.3 shows the #USBCFG modes supported by Windows and Ubuntu Operating Systems, see chapter 8.1.

	Windows	Ubuntu
Mode	Telit Driver	In box Driver
0	✓	✓
1		✓
2	✓	✓
3	✓	✓
4	✓	✓
5	✓	✓

Tab.3: #USBCFG Modes & OS

Telit provides the USB driver to install on the PC-Windows (DTE). With Ubuntu operating system, the attached USB device works with in-box drivers. See chapters 8.1, 8.2, and 8.2.1.

For DLink, see AT#DLINK command, document [2], and the following chapters 4.13, and 5.3.

3.2 Serial Ports & Service Access Points

Enter the AT#PORTCFG=? Test command to know at which Service Access Point a physical serial port is connected in accordance with the Variant value. The command returns a short description on the logical connection for each Variant value provided by the module. Here are all the possible configurations, regardless the module you are using.

AT#PORTCFG=?

```
#PORTCFG: Variant=0:   AT= USIF0  USB0  USB3;          MA(Trace)= USB1
#PORTCFG: Variant=1:   AT= USIF0  USB0  USB3;          MA(Trace)= USIF1
#PORTCFG: Variant=2:   AT= USIF0  SPI    USB0;         MA(Trace)= USB1
#PORTCFG: Variant=3:   AT= USIF0  USIF1  USB0;         MA(Trace)= USB1
#PORTCFG: Variant=4:   AT= USIF0  SPI    USB0  USB3;  MA(Trace)= USB1
#PORTCFG: Variant=5:   AT= SPI    USB0   USB3;         MA(Trace)= USB1
#PORTCFG: Variant=6:   AT= USIF0  SPI    USB0;         MA(Trace)= USB1
#PORTCFG: Variant=7:   AT= USIF0  USB0   USB3;         MA(Trace)= USB1;  3G-Trace= USB2
#PORTCFG: Variant=8:   AT= USB0   USB3   USB4;         MA(Trace)= USB1
#PORTCFG: Variant=9:   AT= USIF0  USB0   HSIC0;        MA(Trace)= USB1;  3G-Trace= USB2
#PORTCFG: Variant=10:  AT= USIF0  USB0   HSIC0  HSIC1;MA(Trace)= USB1;  3G-Trace= USB2
#PORTCFG: Variant=11:  AT= USIF0  USB3   USB0;         MA(Trace)= USB1;  ExtGNSS= USIF1
#PORTCFG: Variant=12:  AT= USIF0  USB0   USB3  USB4;  MA(Trace)= USB1;  DLINK= USB5
```

Message meaning for each Variant value:

Variant=0:

- USIF0, USB0, and USB3 are connected respectively to AT parser 0, 1, 2. They are not specified in the message. USB1 supports MA trace.

Variant=1:

- USIF0, USB0, and USB3 are connected respectively to AT parser 0, 1, 2. They are not specified in the message. USIF1 is connected to TT Service Access Point.

Variant=2, 3...

- And so on for each Variant value.

The ports arrangement that you set, can be used with one of the six #USBCFG modes:

- #PORTCFG assigns a Service Access Point to one or more USBx port,
- #USBCFG assigns a "mode" to all USBx ports. Each mode defines a product (USB device) by means of the PID, each product provides different features described in Tab.2.

4 AT#PORTCFG COMMAND

The AT#PORTCFG command manages several internal ports arrangements by means of its parameter value called ‘Variant’, refer to document [2]. The tables and figures illustrated on the next pages show the various ports configurations obtained changing the "Variant" value of the command and plugging in/unplugging the USB cable.

Follow this sequence to make active the entered AT#PORTCFG command:

- Start from the configuration shown in Tab.6, it is the factory setting: #PORTCFG is 1;
- Enter, for example, the AT#PORTCFG=0 command through USIF0 port, AT0 parser elaborates the just entered command, but no actions are taken;
- Power down the module;
- Power on the module. The AT#PORTCFG=0 command is executed and the ports/services arrangement of Tab.4 is set. To power off/on the module, you can use the AT#REBOOT command.

The DTE shown in the next examples is a Windows-PC, and does not provide the SPI and HSIC interfaces. The figures show SPI and HSIC ports in the same box, but they are two distinct entities.

Referring to the next tables, the use of the GPS access point is described in the chapters dedicated to the Build-in and External GPS receivers. See chapter 6.1.

In addition, the tables show the use of three types of trace tools in accordance with the selected AT#PORTCFG configuration:

- MA (tool for internal use only) or TTC (Telit Trace Client tool) must be connected to the same physical port as shown by the AT#PORTCFG=? Test command. Both tools collect the protocol binary file.
- 3G tool (for internal use only) must be connected to the physical serial ports as shown by the AT#PORTCFG=? Test command. It collects the binary file of the low-level protocol (layer 1 protocol).

MA and 3G tools are closed in round brackets. To have more information contact Telit Technical Support.

4.1 AT#PORTCFG=0

AT#PORTCFG=0					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI					

Tab.4: #PORTCFG=0, no USB Cable

AT#PORTCFG=0					
	AT0	AT1	AT2	TT	GPS
USB0		X			
USB1				TTC (or MA)	
USB2					
USB3			X		
USB4					
USB5					
USB6	NA				
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI					

Tab.5: #PORTCFG=0, with USB Cable

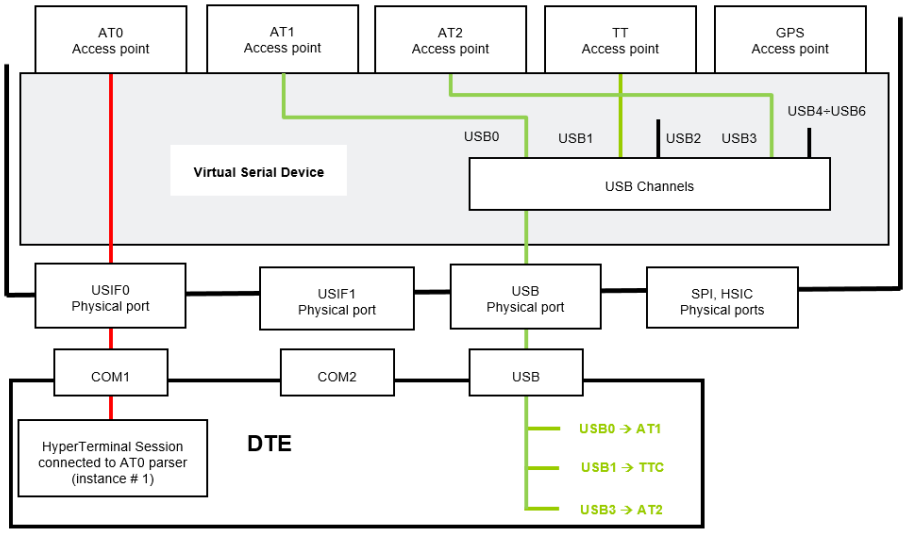


Fig.3: #PORTCFG=0 + USB Cable

4.2 AT#PORTCFG=1

AT#PORTCFG=1 is the factory-setting.

AT#PORTCFG=1 (factory-setting)					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1				TTC (or MA)	
SPI					

Tab.6: #PORTCFG=1, no USB Cable

AT#PORTCFG=1 (factory-setting)					
	AT0	AT1	AT2	TT	GPS
USB0		X			
USB1					
USB2					
USB3			X		
USB4					
USB5					
USB6	NA				
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1				TTC (or MA)	
SPI					

Tab.7: #PORTCFG=1, with USB Cable

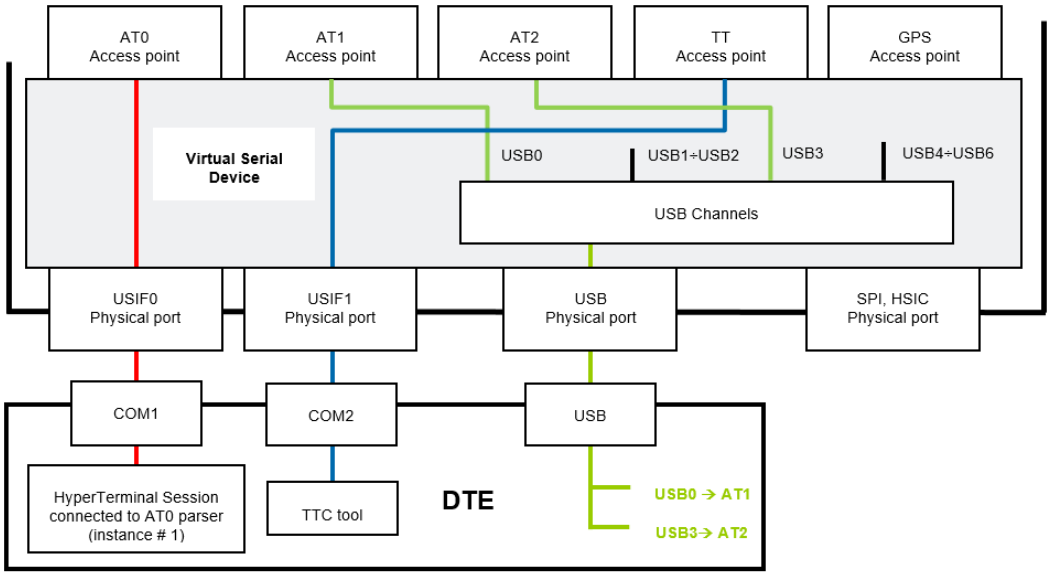


Fig.4: #PORTCFG=1 + USB Cable

4.3 AT#PORTCFG=2

AT#PORTCFG=2					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI			X		

Tab.8: #PORTCFG=2, no USB Cable

AT#PORTCFG=2					
	AT0	AT1	AT2	TT	GPS
USB0		X			
USB1				TTC (or MA)	
USB2					
USB3					
USB4					
USB5					
USB6	NA				
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI			X		

Tab.9: #PORTCFG=2, with USB Cable

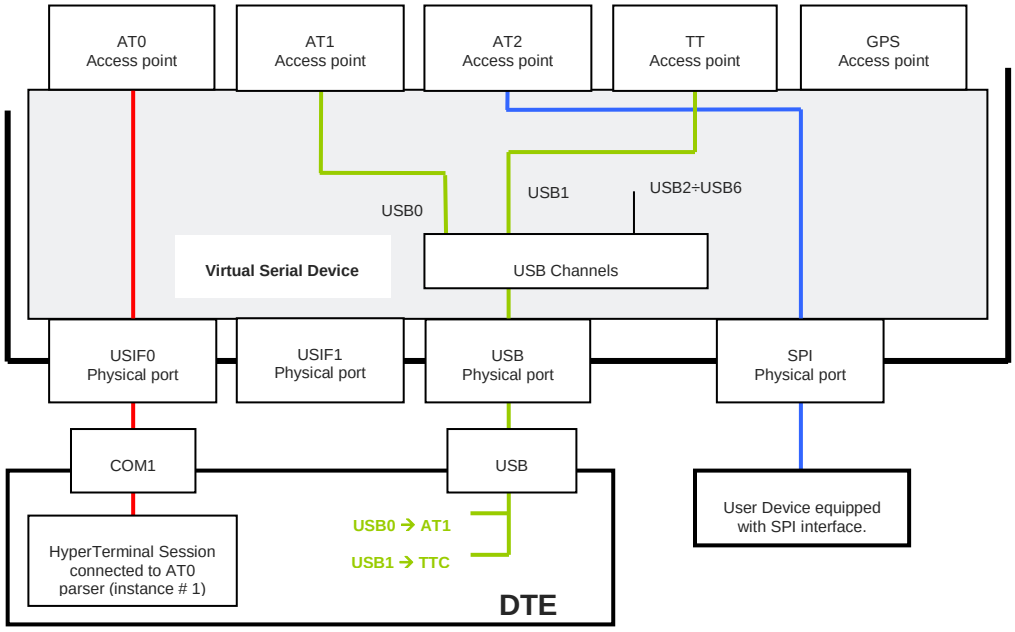


Fig.5: #PORTCFG=2 + USB Cable

4.4 AT#PORTCFG=3

AT#PORTCFG=3					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1			X		
SPI					

Tab.10: #PORTCFG=3, no USB Cable

AT#PORTCFG=3					
	AT0	AT1	AT2	TT	GPS
USB0		X			
USB1				TTC (or MA)	
USB2					
USB3					
USB4					
USB5					
USB6	NA				
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1			X		
SPI					

Tab.11:#PORTCFG=3, with USB Cable

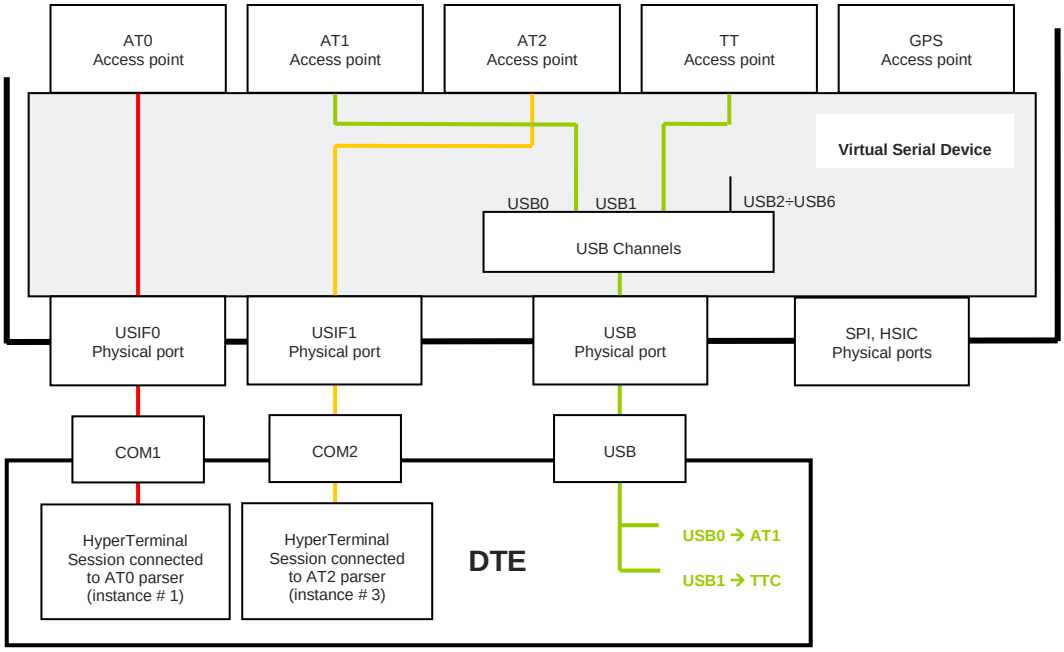


Fig.6: #PORTCFG=3 + USB Cable

4.5 AT#PORTCFG=4

AT#PORTCFG=4					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0		X			
USIF1					
SPI			X		

Tab.12: #PORTCFG=4, no USB Cable

AT#PORTCFG=4					
	AT0	AT1	AT2	TT	GPS
USB0	X				
USB1				TTC (or MA)	
USB2					
USB3			X		
USB4					
USB5					
USB6	NA				
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0		X			
USIF1					
SPI					

Tab.13: #PORTCFG=4, with USB Cable

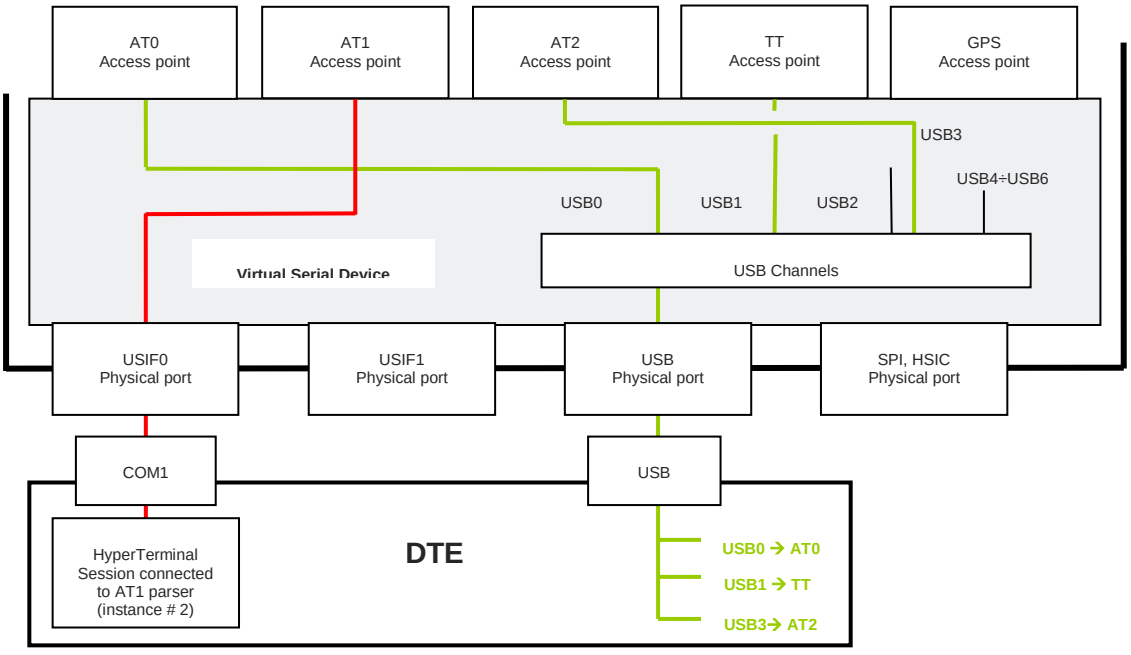


Fig.7: #PORTCFG=4 + USB Cable

4.6 AT#PORTCFG=5

AT#PORTCFG=5					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0					
USIF1					
SPI			X		

Tab.14: #PORTCFG=5, no USB Cable

AT#PORTCFG=5					
	AT0	AT1	AT2	TT	GPS
USB0		X			
USB1				TTC (or MA)	
USB2					
USB3	X				
USB4					
USB5					
USB6	NA				
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0					
USIF1					
SPI			X		

Tab.15: #PORTCFG=5, with USB Cable

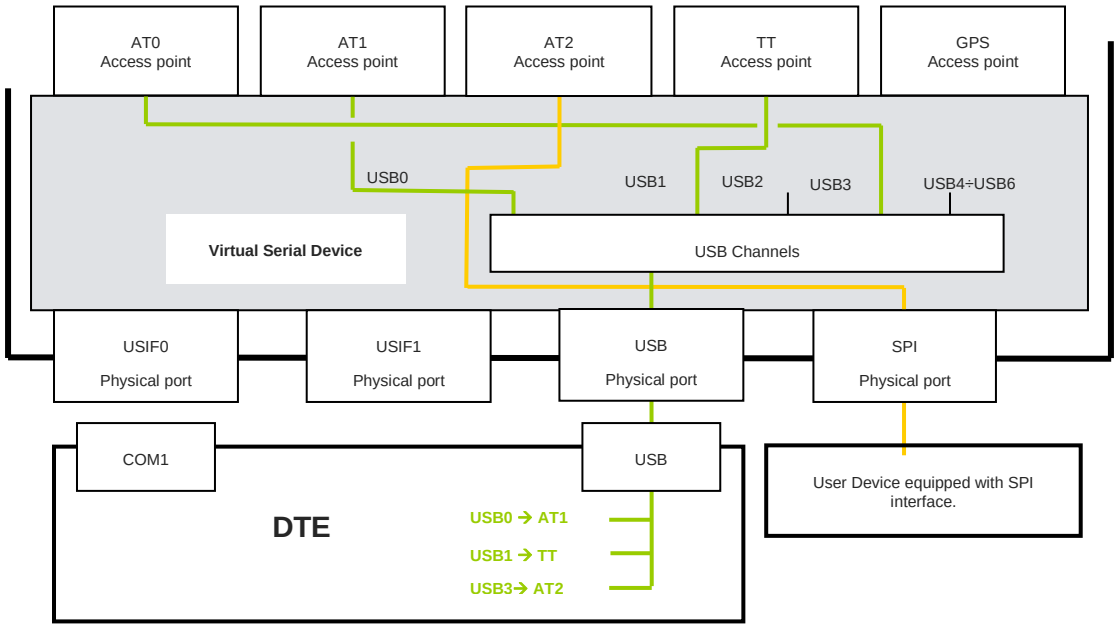


Fig.8: #PORTCFG=5 + USB Cable

4.7 AT#PORTCFG=6

AT#PORTCFG=6					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0			X		
USIF1					
SPI	X				

Tab.16: #PORTCFG=6, no USB Cable

AT#PORTCFG=6					
	AT0	AT1	AT2	TT	GPS
USB0		X			
USB1				TTC (or MA)	
USB2					
USB3					
USB4					
USB5					
USB6	NA				
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0			X		
USIF1					
SPI	X				

Tab.17: #PORTCFG=6, with USB Cable

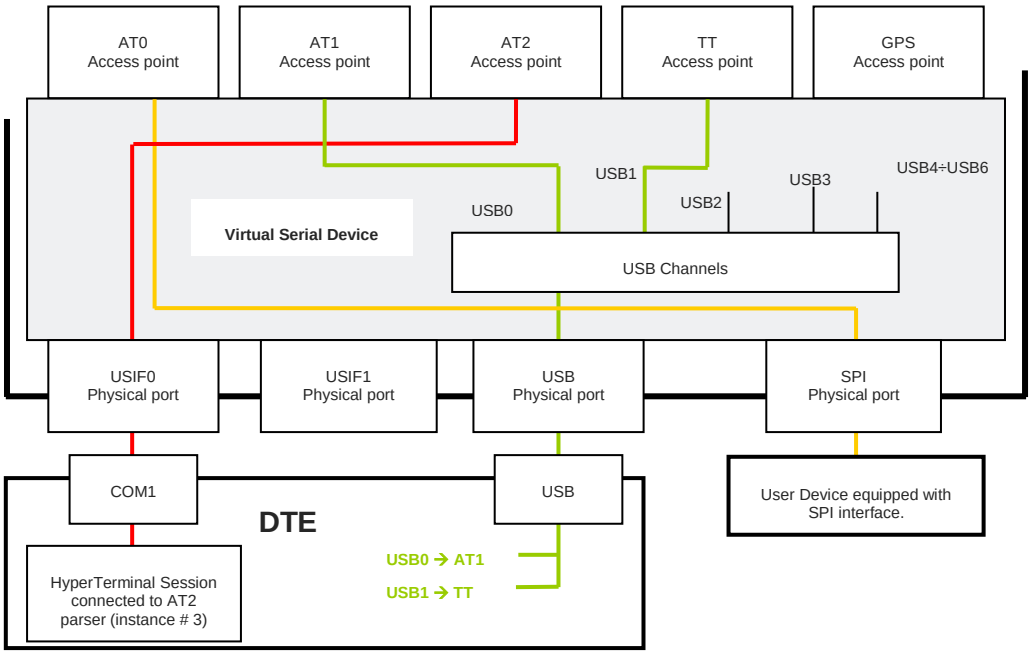


Fig.9: #PORTCFG=6 + USB Cable

4.8 AT#PORTCFG=7

AT#PORTCFG=7					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI					

Tab.18: #PORTCFG=7, no USB Cable

AT#PORTCFG=7					
	AT0	AT1	AT2	TT	GPS
USB0		X			
USB1				TTC (or MA)	
USB2				(3G)	
USB3			X		
USB4					
USB5					
USB6	NA				
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI					

Tab.19: #PORTCFG=7, with USB Cable

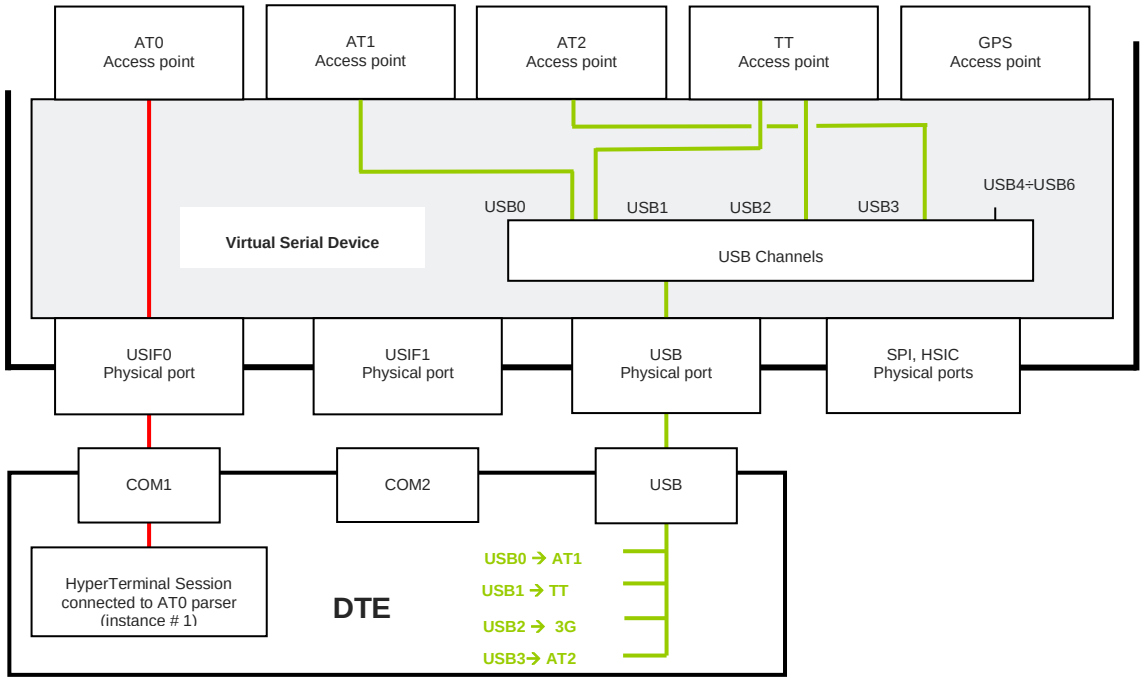


Fig.10: #PORTCFG=7 + USB Cable

4.9 AT#PORTCFG=8

AT#PORTCFG=8					
	AT0	AT1	AT2	TT	GPS
NO USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0					
USIF1					
SPI					

Tab.20: #PORTCFG=8, no USB Cable

AT#PORTCFG=8					
	AT0	AT1	AT2	TT	GPS
USB0	X				
USB1				TTC (or MA)	
USB2					
USB3		X			
USB4			X		
USB5					
USB6	NA				
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0					
USIF1					
SPI					

Tab.21: #PORTCFG=8, with USB Cable

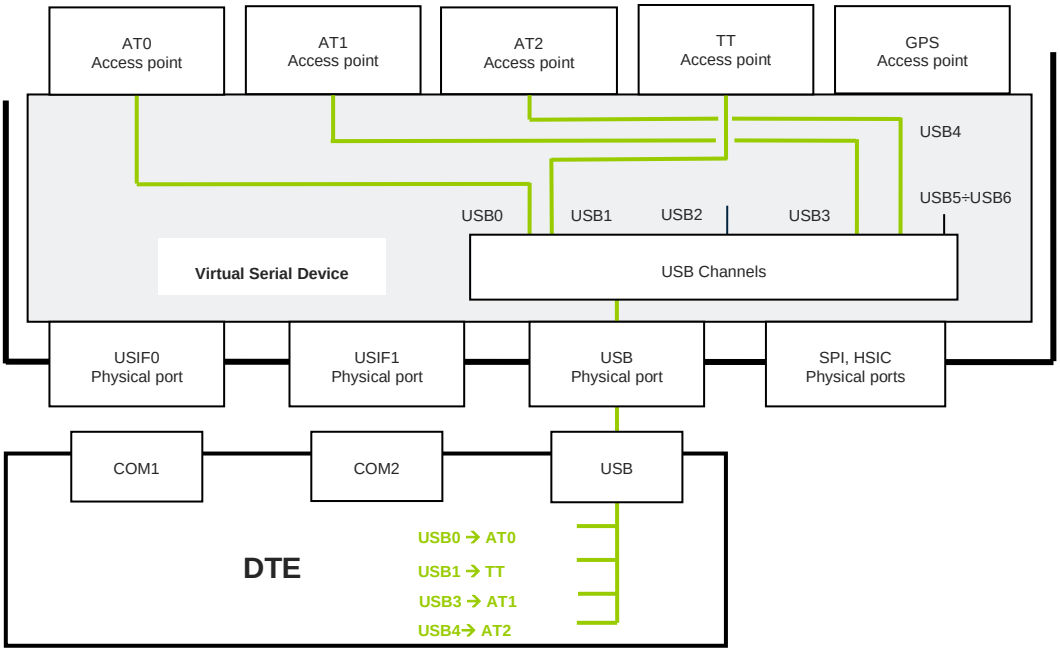


Fig.11: #PORTCFG=8 USB Cable Only

4.10 AT#PORTCFG=9

AT#PORTCFG=9					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0			X		
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI					

Tab.22: #PORTCFG=9, no USB Cable

AT#PORTCFG=9					
	AT0	AT1	AT2	TT	GPS
USB0		X			
USB1				TTC (or MA)	
USB2				(3G)	
USB3					
USB4					
USB5					
USB6	NA				
USBHSI0			X		
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI					

Tab.23: #PORTCFG=9, with USB Cable

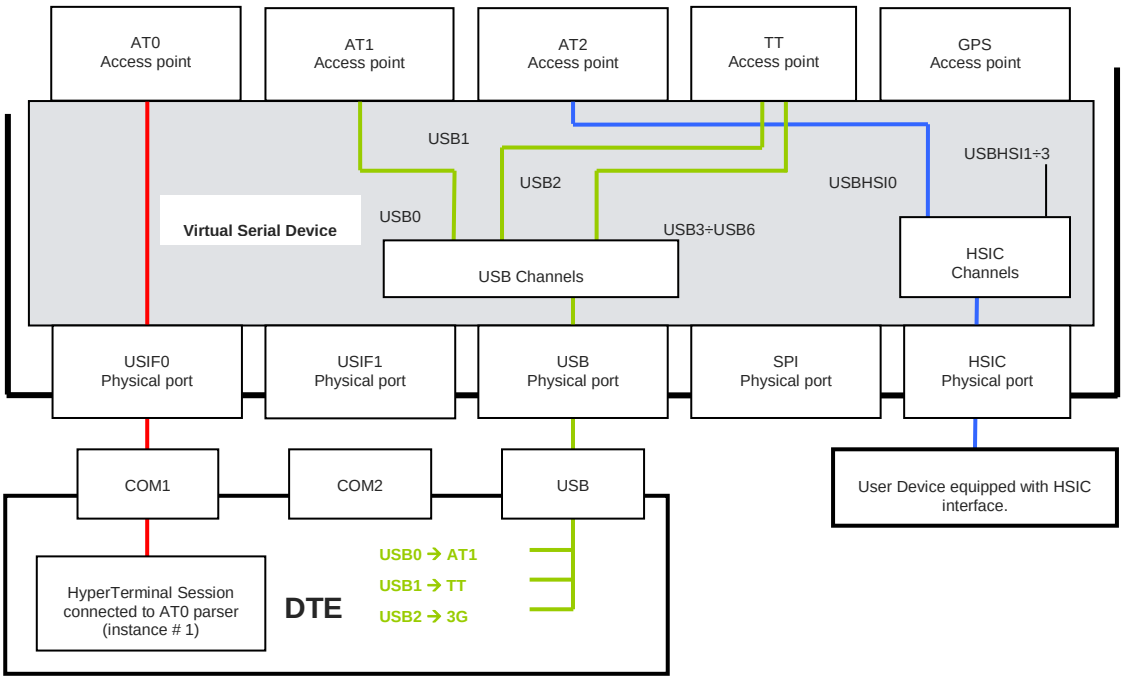


Fig.12: #PORTCFG=9 + USB Cable

4.11 AT#PORTCFG=10

AT#PORTCFG=10					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0	X				
USBHSI1		X			
USBHSI2					
USBHSI3					
USIF0			X		
USIF1					
SPI					

Tab.24: #PORTCFG=10, no USB Cable

AT#PORTCFG=10					
	AT0	AT1	AT2	TT	GPS
USB0			X		
USB1				TTC (or MA)	
USB2				(3G)	
USB3					
USB4					
USB5					
USB6	NA				
USBHSI0	X				
USBHSI1		X			
USBHSI2					
USBHSI3					
USIF0					
USIF1					
SPI					

Tab.25: #PORTCFG=10, with USB Cable

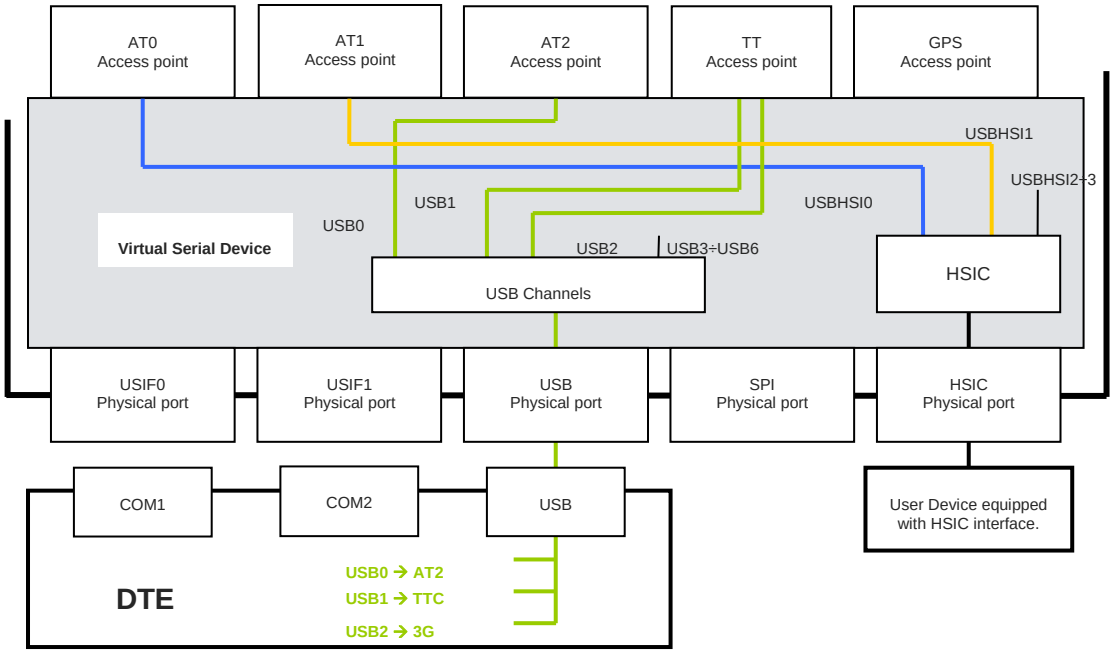


Fig.13: #PORTCFG=10 + USB Cable

4.12 AT#PORTCFG=11

The modules not equipped with an embedded GPS receiver, support Variant value equal to 11. This configuration is used to connect the module to an external GPS receiver through USIF1 serial port, see chapter 6.1.2.

AT#PORTCFG=11					
	AT0	AT1	AT2	TT	GPS
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI					

Tab.26: #PORTCFG=11, no USB Cable

AT#PORTCFG=11					
	AT0	AT1	AT2	TT	GPS
USB0		X			
USB1				TTC (or MA)	
USB2					
USB3			X		
USB4					
USB5					
USB6	NA				
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI					

Tab.27: #PORTCFG=11, with USB Cable

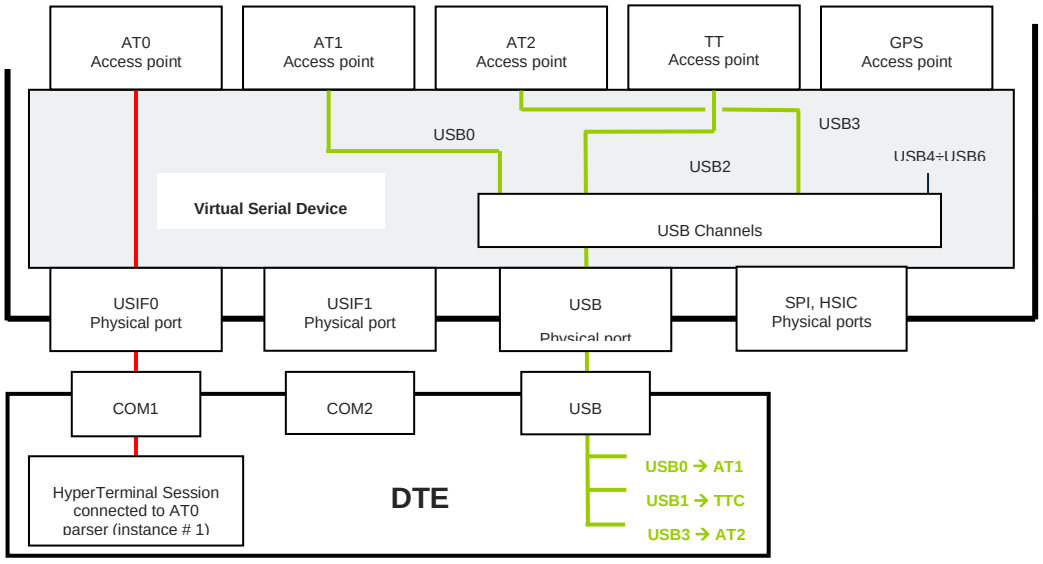


Fig.14 : #PORTCFG=11 + USB Cable

4.13 AT#PORTCFG=12

AT#PORTCFG=12 provides two new access points: AT3, and DLink

AT#PORTCFG=12							
	AT0	AT1	AT2	AT3	TT	GPS	DLink
No USB cable							
USBHSI0							
USBHSI1							
USBHSI2							
USBHSI3							
USIF0	X						
USIF1							
SPI							

Tab.28: #PORTCFG=12, no USB Cable

AT#PORTCFG=12							
	AT0	AT1	AT2	AT3	TT	GPS	DLink
USB0		X					
USB1					TTC (or MA)		
USB2							
USB3			X				
USB4				X			
USB5							X
USB6	NA						
USBHSI0							
USBHSI1							
USBHSI2							
USBHSI3							
USIF0	X						
USIF1							
SPI							

Tab.29: #PORTCFG=12, with USB Cable

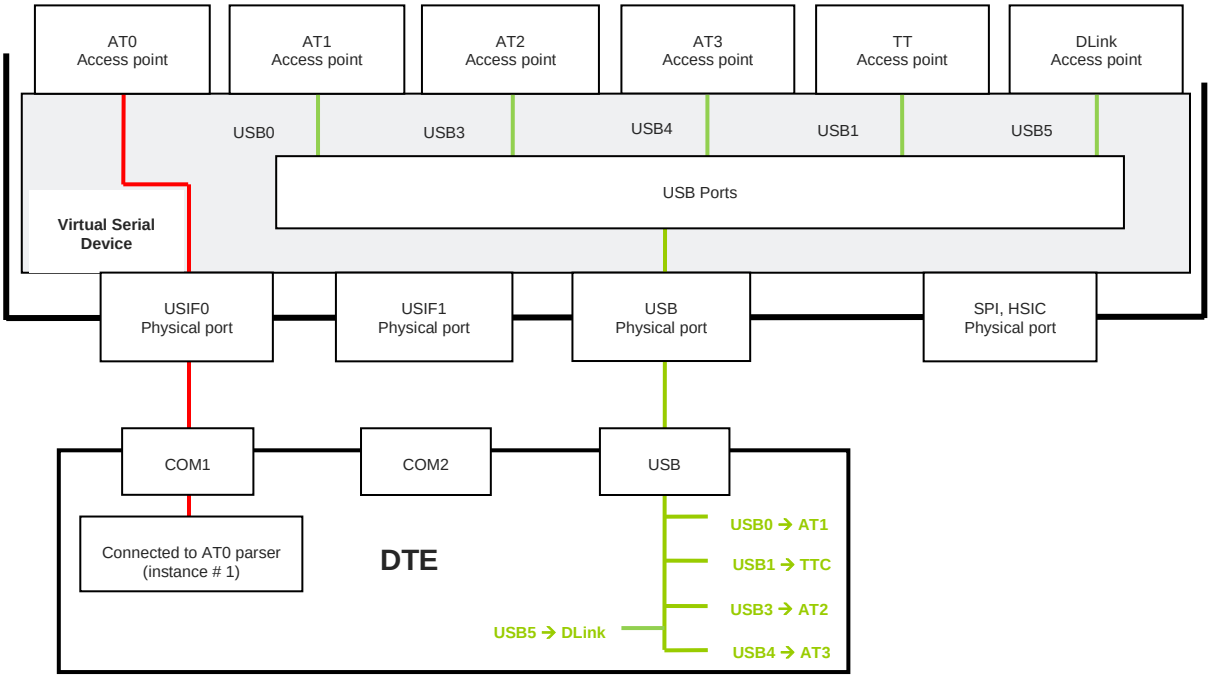


Fig.15: #PORTCFG=12 + USB Cable

5 CMUX PROTOCOL

This section shows examples of ports/services arrangement using CMUX protocol. If you need to develop a Multiplexing Protocol running on your application processor (for example, a user micro-controller), refer to document [1] to get detailed information.

5.1 CMUX Protocol on USIF0 Port

Here is an example of ports/services arrangement based on CMUX protocol on USIF0 serial port.

Assume that the module is configured as indicated in Tab.6: #PORTCFG=1, and no USB cable plugged in. In addition, suppose that the used DTE is a Windows-PC, and Fig.16 shows its device configuration. Now, run on the DTE the Telit Serial Port MUX application configured as shown in Fig.17, and connect the MUX application to COM1 physical port, refer to Fig.18. When the user starts an application (e.g. Hyper Terminal) connected to one of the three Virtual Ports (COM20 ÷ COM22), Telit Serial Port MUX application sends automatically the AT+CMUX=0 command to the module and the CMUX protocol is activated.

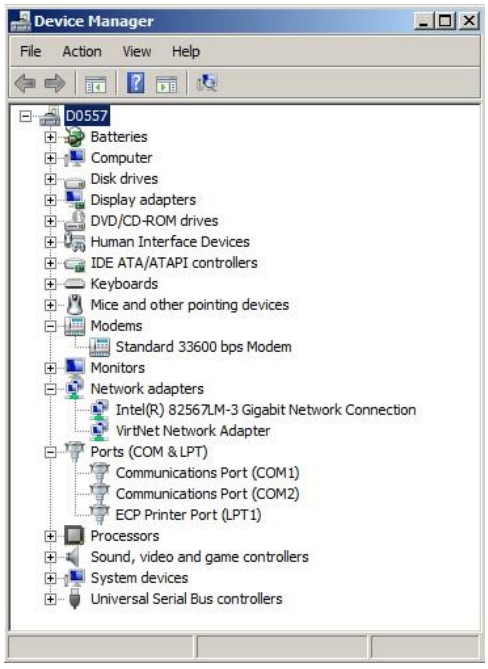


Fig.16: Physical COMx Ports

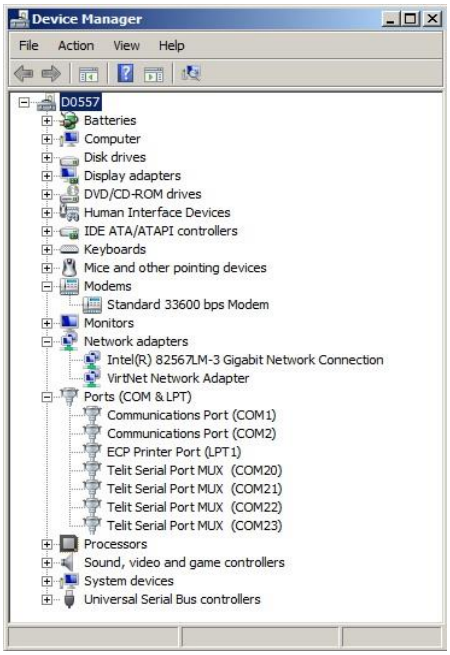


Fig.17: Virtual Serial Ports of MUX

The configuration of the Telit Serial Port MUX application must avoid virtual serial ports conflict with the physical or virtual serial ports already present on the Windows-PC. The table below summarizes the new configuration.

Module ←→DTE connection	COMx → VCx	AT0	AT1	AT2	TT	GPS
USB not used						
HSIC not used						
USIF0 ←→COM1	COM20→VC1	X				
	COM21→VC2		X			
	COM22→VC3			X		
	COM23→VC4					
USIF1 not used						
SPI not used						

Tab.30: Ports/Services Arrangement with CMUX Connected to USIF0

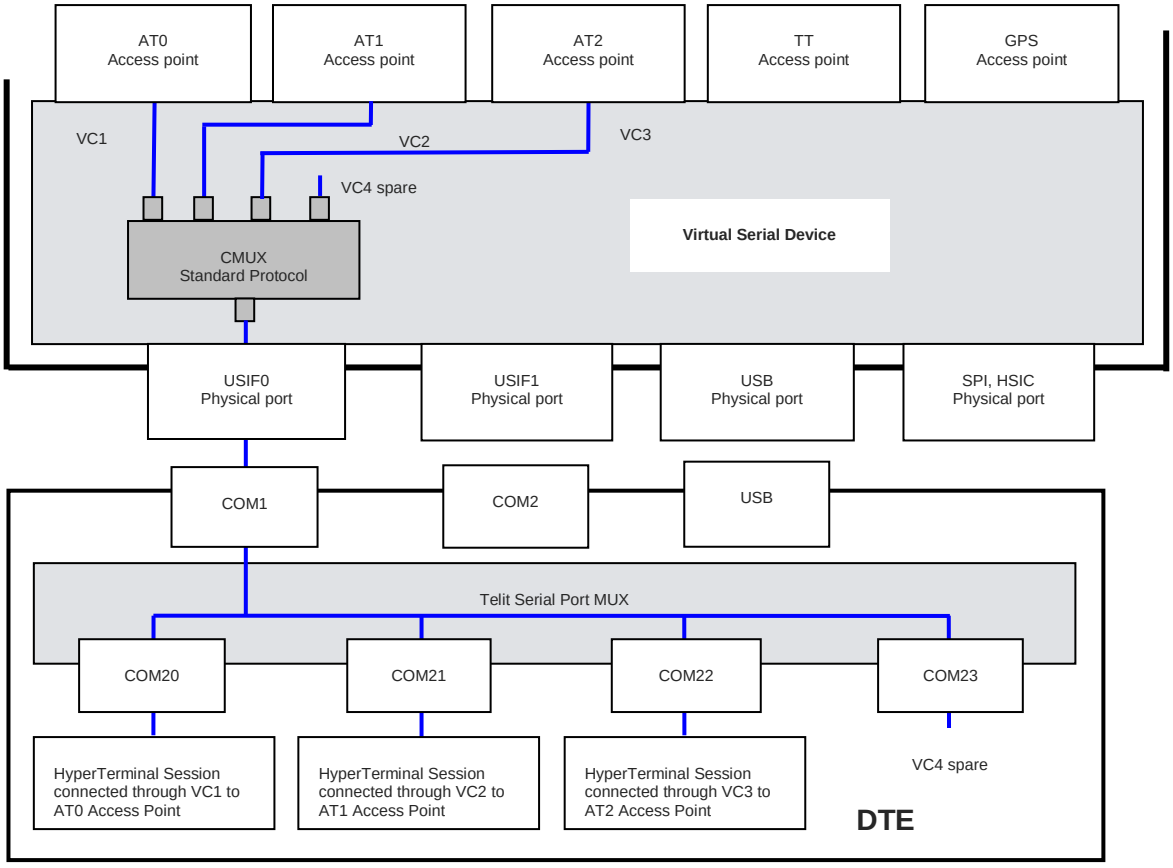


Fig.18: CMUX Connected to USIF0

5.1.1 Connection with TTC Tool

If TTC connection is needed, start from the configuration: #PORTCFG=1, no USB cable, see Tab.6. Follow the steps stated above, and refer to Fig.19. The table below summarizes the new configuration.

Module ←→DTE connection	COMx → VCx	AT0	AT1	AT2	TT	GPS
USB not used						
HSIC not used						
USIF0 ←→ COM1	COM20→VC1	X				
	COM21→VC2		X			
	COM22→VC3			X		
	COM23→VC4					
USIF1 ←→ COM2					TTC	
SPI not used						

Tab.31: Ports/Services Arrangement with CMUX + TTC

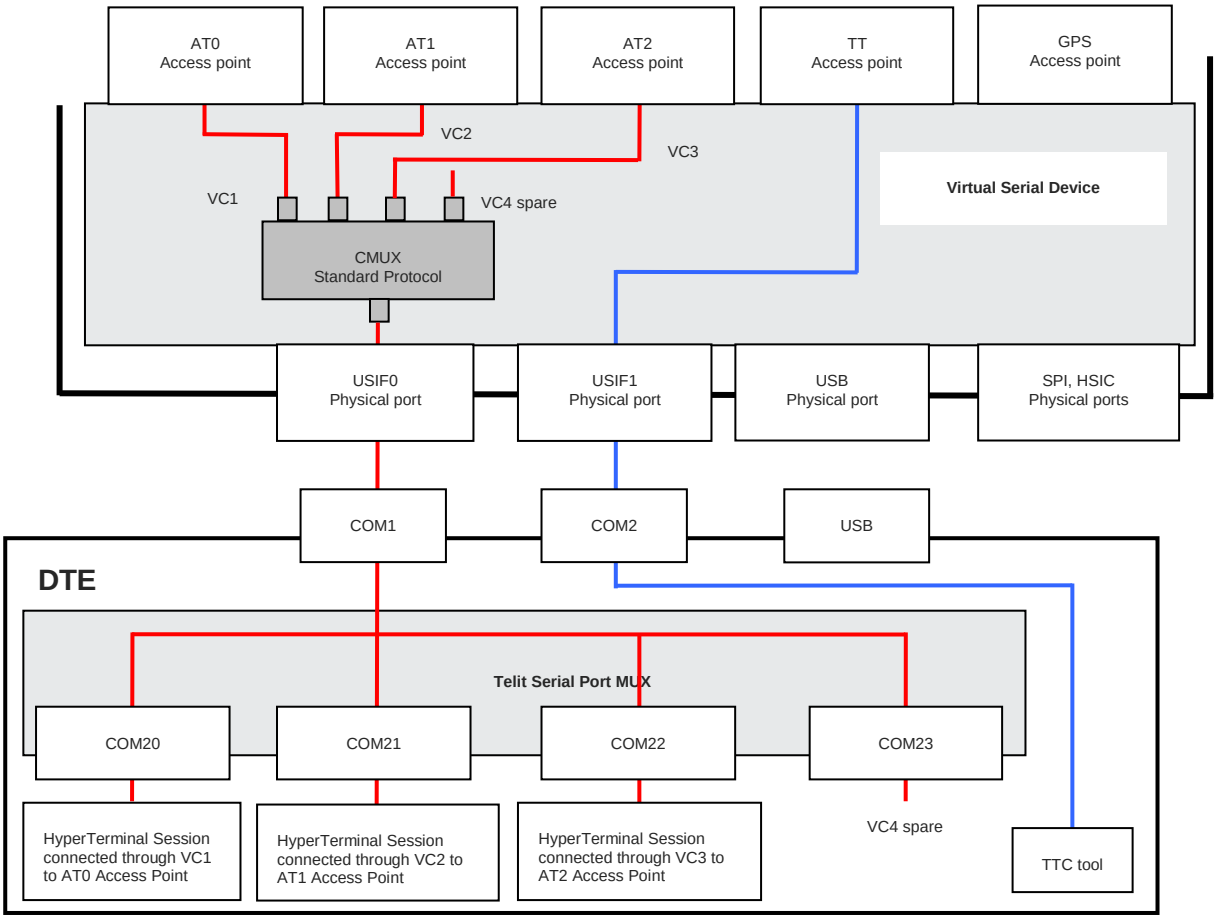


Fig.19: CMUX Connected to USIF0 + TTC Connected to USIF1

5.2 CMUX Protocol on USB3 Port

Here is an example of ports/services arrangement based on CMUX protocol on USB port.

Assume that the module is configured as indicated in Fig.3: #PORTCFG=0, and USB cable plugged in. In addition, suppose that the used DTE is a Windows PC, and Fig.2 shows its device configuration. Now, run on the DTE the Telit Serial Port MUX application configured as shown in Fig.20, and connect the MUX application to USB3 port mapped into COM7 virtual port. When the user starts an application (e.g. Hyper Terminal) connected to one of the three Virtual Ports (COM20 ÷ COM22), Telit Serial Port MUX application sends automatically the AT+CMUX=0 command to the module and the CMUX protocol is activated, refer to Fig.21.

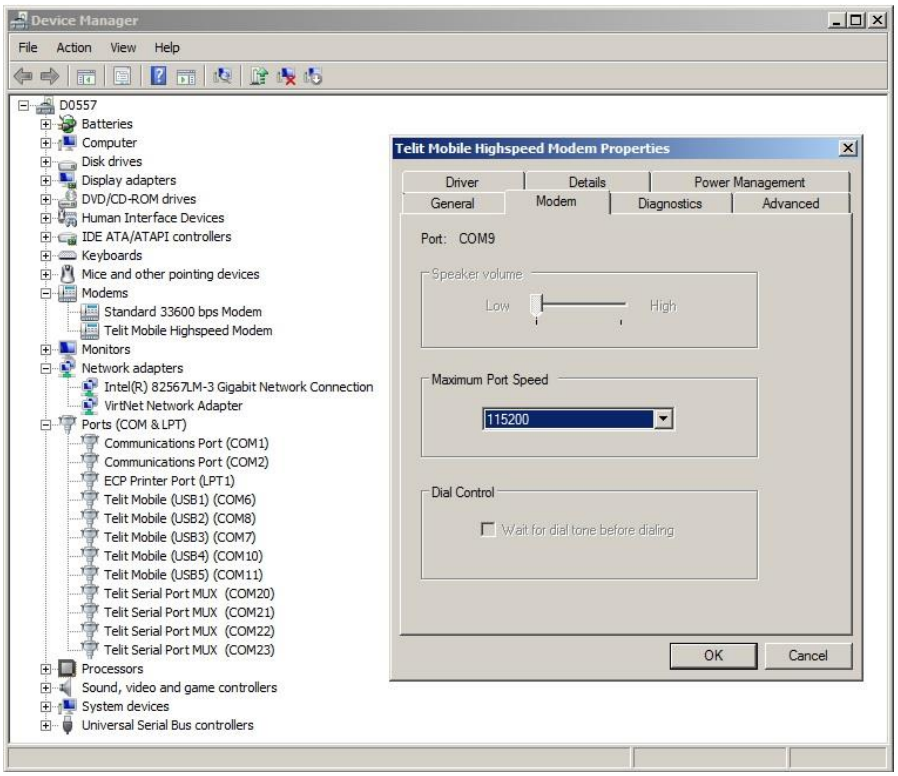


Fig.20: Virtual Serial Ports of Telit Serial Port MUX

The table below summarizes the new configuration.

Module ←→DTE connection	Ports	USBx → COM	COMx → VCx	AT0	AT1	AT2	TT	GPS
USB ←→ USB	USB0							
	USB1						TTC	
	USB2							
	USB3	COM8	COM20 → VC1	X				
			COM21 → VC2		X			
			COM22 → VC3			X		
			COM23 → VC4					
	USB4							
	USB5							
	USB6							
HSIC not used								
USIF0 not used								
USIF1 not used								
SPI not used								

Tab.32: Ports/Services Arrangement with CMUX Connected to USB3 Port

AT0 (instance # 1) is disconnected from USIF0 and connected to VC1/USB3/COM8/COM20, the TTC tool stays on USB1 port.

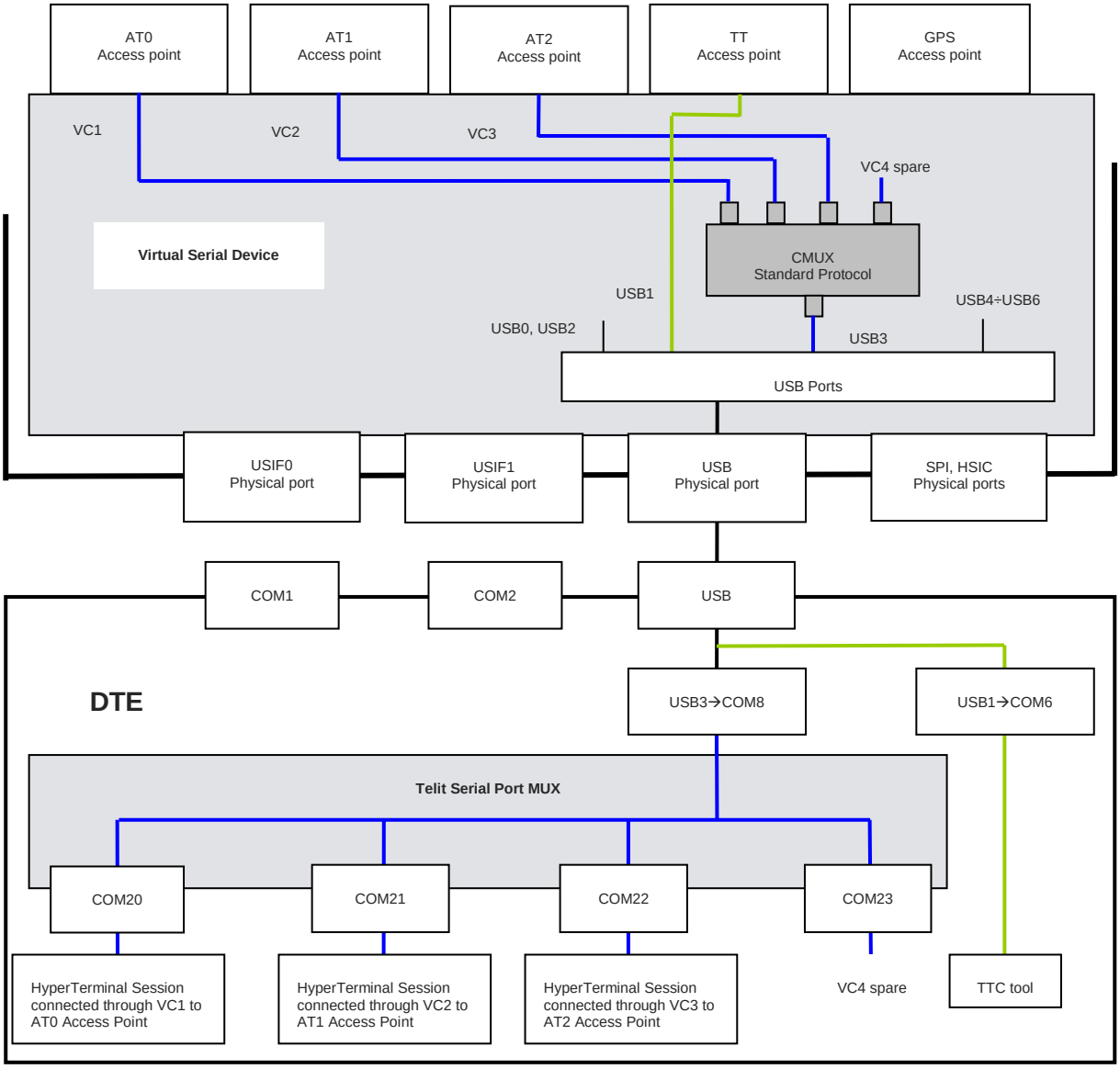


Fig.21: CMUX Connected to USB3 Port

5.3 CMUX Protocol and AT#PORTCFG=12

The DLink access point permits the logical connection between two user applications (named for example: "A" and "B") running on two different devices connected to the module by means of serial lines, refer to Fig.22.

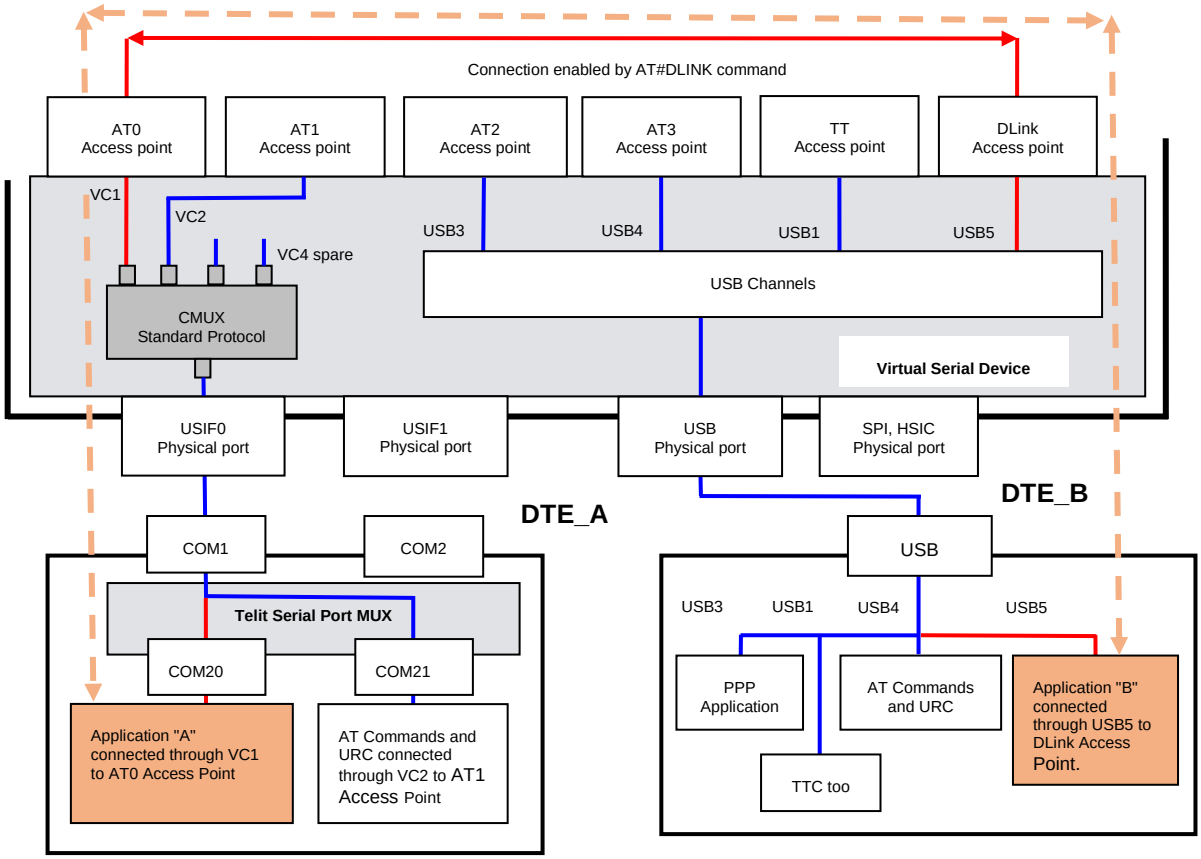


Fig.22: CMUX & AT#PORTCFG=12

Window-PC (DTE_A), equipped with the Telit Serial Port MUX tool, is running:

- User application "A"
- User application to send AT commands and receive URC (e.g. Hyper Terminal)

Window-PC (DTE_B) is running:

- User application "B"
- User PPP application
- User application to send AT commands and receive URC (e.g. Hyper Terminal)

The module is configured as indicated in Fig.15 #PORTCFG=12, and USB cable plugged in. The used DTE is a Windows-PC, and Fig.2 shows its device configuration. Run on the DTE the Telit Serial Port MUX application configured as shown in Fig.17, and connect the MUX application to COM1 physical port, refer to Fig.22.

When the user starts an application (e.g. Hyper Terminal) connected to one of the two Virtual Ports (COM20, COM21), Telit Serial Port MUX application sends automatically the AT+CMUX=0 command to the module and the CMUX protocol is activated.

Use the AT#DLINK command to enable the logical internal connection between AT0 and DLink access points. Now, user application "A" is connected to user application "B". Refer to document [2] to have information on the AT#DLINK syntax.

Before using the AT#DLINK command, you must issue the AT#PORTCFG=12 command and one of the two commands: AT#USBCFG=1 or AT#USBCFG=2 in accordance with your needs, see Tab.2

6 SERVICES

As stated in chapter 2, Service Access Points are used to connect the services to the Virtual Serial Device software layer. This section describes how the user can access the supported service by means of the external physical serial ports, which in their turn are connected to the VSD layer.

6.1 GPS

The GPS receiver can be “built-in” or external to the module.

6.1.1 Built-in GPS Receiver

The built-in GPS receiver can send NMEA sentences on different physical ports, in accordance with the current ports configuration. In general, NMEA sentences run on the physical port used by the operator to enter the AT$GPSP and AT$GPSNMUN commands, in this case AT commands and NMEA sentences share the same physical port at the same time. Refer to document [2] to have information on AT commands syntax.

Here are sub-chapters showing some examples of logical connections settings.

6.1.1.1 AT#PORTCFG=0

Tab.4 shows the starting ports configuration of the module: #PORTCFG=0. Now, enable GPS/NMEA sentences via AT$GPSP=1 and AT$GPSNMUN=1… AT commands entered through USIF0 port. AT0 parser executes the AT commands, and after that NMEA sentences and AT commands run on USIF0 port as summarized in Tab.33. See also Fig.23.

AT#PORTCFG=0					
	AT0	**AT1**	**AT2**	**TT**	**GPS**
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				X
USIF1					
SPI					

Tab.33: USIF0 port supports NMEA sentences

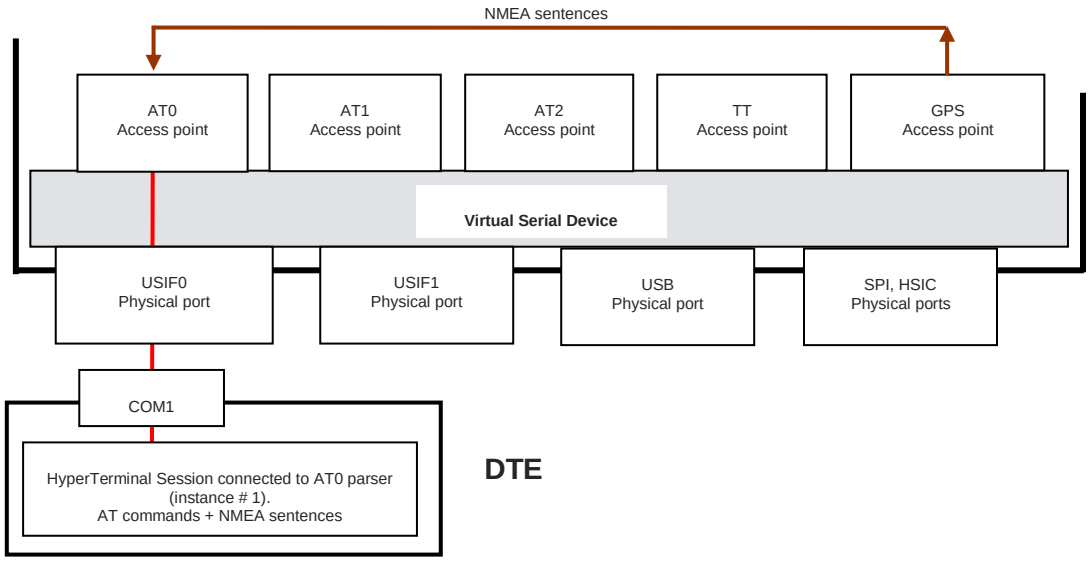


Fig.23: USIF0 Port Supports AT Commands + NMEA Sentences

6.1.1.2 AT#PORTCFG=0 + USB

Tab.5 shows the starting ports configuration of the module: #PORTCFG=0 + USB. Now, enable GPS/NMEA sentences via AT$GPSP=1 and AT$GPSNMUN=1… AT commands entered, for example, through USB0 port. AT1 parser executes the AT commands, and after that NMEA sentences and AT commands run on USB0 port as summarized and shown in table and figure below.

AT#PORTCFG=0					
	AT0	AT1	AT2	TT	GPS
USB0		X			X
USB1				TTC	
USB2					
USB3			X		
USB4					
USB5					
USB6					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					
SPI					

Tab.34: USB0 Supports NMEA Sentences

The user can issue the AT commands through USIF0/AT0, USB0/AT1, or USB3/AT2 port/parser. The NMEA sentences are routed respectively on USIF0, USB0 (as shown by this example), or USB3 port

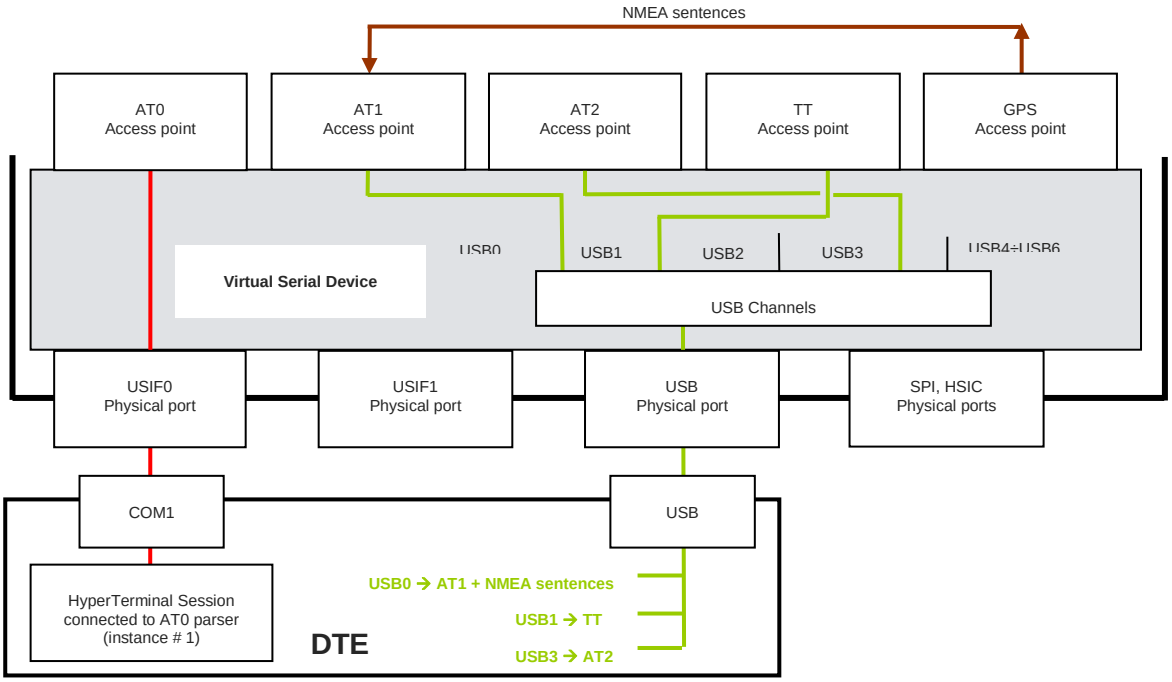


Fig.24: USB0 Port Supports AT Commands + NMEA Sentences

6.1.1.3 AT#PORTCFG=0 + USB3 + CMUX

Here is an example of ports/services arrangement running NMEA sentences on USB port using CMUX protocol.

Tab.32 shows the starting ports configuration of the module: #PORTCFG=0+USB+CMUX. Now, enable GPS/NMEA sentences via the AT$GPSP=1 and AT$GPSNMUN=1… AT commands entered, for example, through COM22/COM8/USB3/VC3 port. AT2 parser executes the AT commands, and after that NMEA sentences and AT commands run on COM22→VC3 port as summarized in the table below. See also

Fig.25.

Module←→DTE connection	Ports	USBx → COM	COMx → VCx	AT0	AT1	AT2	TT	GPS
USB ←→ USB	USB0							
	USB1						TTC	
	USB2							
	USB3	COM8	COM20 → VC1	X				
			COM21 → VC2		X			
			COM22 → VC3			X		X
			COM23 → VC4					
	USB4							
	USB5							
	USB6							
HSIC not used								
USIF0 not used								
USIF1 not used								
SPI not used								

Tab.35: USB3-VC3 Port Supports AT Commands + NMEA Sentences

The user can issue the AT commands through COM20 → VC1/AT0, COM21 → VC2/AT1, or COM22 → VC3/AT2 port/parser. The NMEA sentences are routed respectively on VC1, VC2, or VC3 port. This example works with VC3 port.

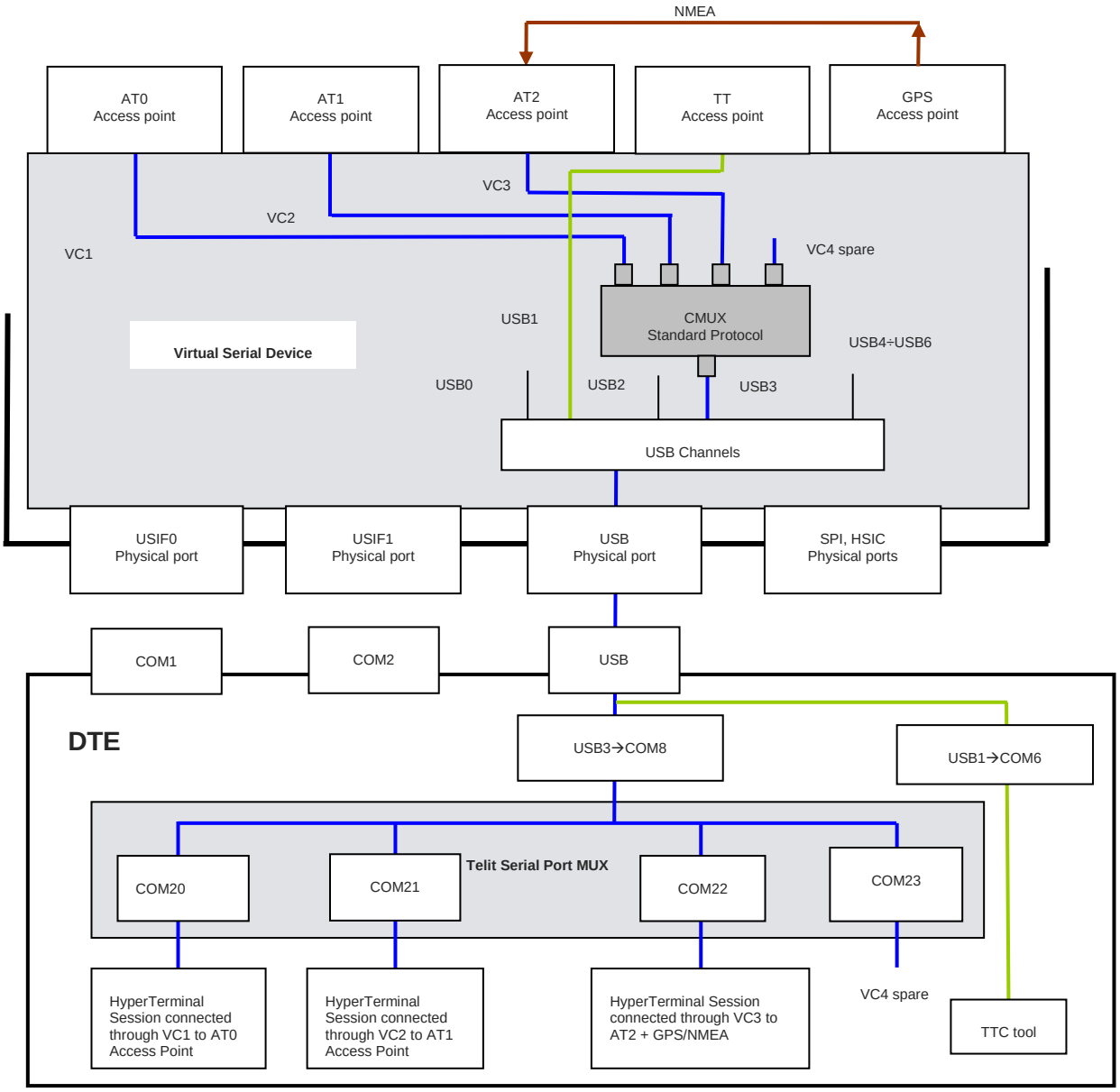


Fig.25: USB3-VC3 Port Supports AT Commands + NMEA Sentences

6.1.1.4 AT#PORTCFG=4

Tab.12 shows the starting ports configuration of the module: #PORTCFG=4. Now, enable GPS/NMEA sentences via AT$GPSP=1 and AT$GPSNMUN=1… AT commands entered, for example, through SPI port. AT2 parser executes the AT commands, and after that NMEA sentences and AT commands run on SPI port as summarized in the table below. See also the Fig.26.

AT#PORTCFG=4					
	AT0	**AT1**	**AT2**	**TT**	**GPS**
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0		X			
USIF1					
SPI			X		X

Tab. 36: SPI Port Supports NMEA Sentences

The user can issue the AT commands through USIF0/AT1, or SPI/AT2 port/parser. The NMEA sentences are routed respectively on USIF0 or SPI port. This example works with SPI port.

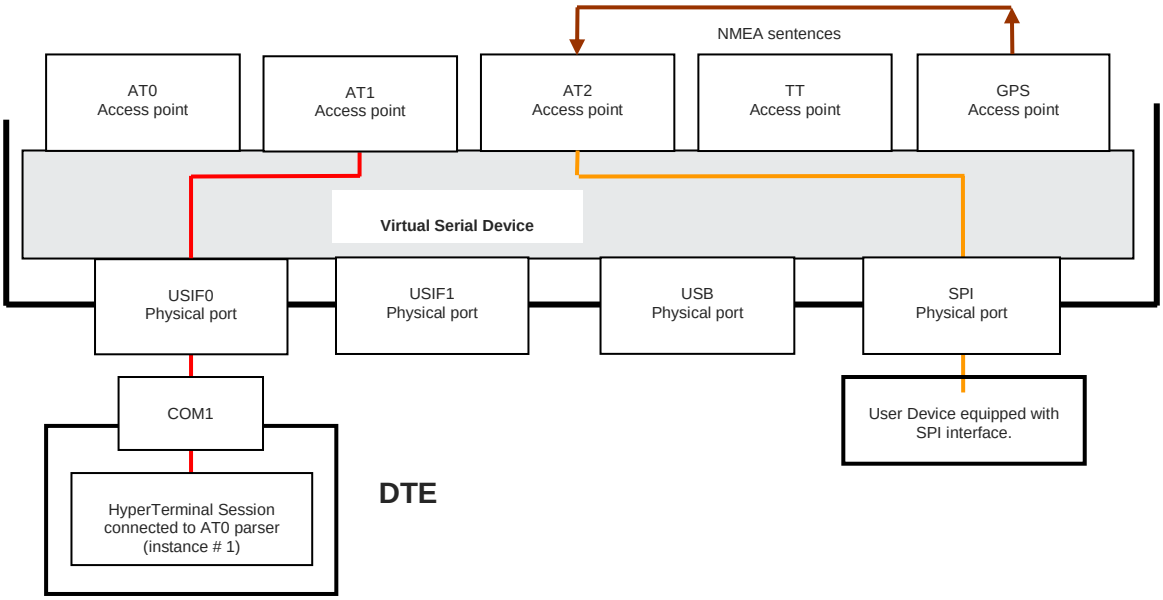


Fig.26: SPI Port Supports AT Commands + NMEA Sentences

6.1.1.5 AT#PORTCFG=8

Tab.17 shows the starting ports configuration of the module: #PORTCFG=8. Now, enable GPS/NMEA sentences via AT$GPSP=1 and AT$GPSNMUN=1… AT commands entered, for example, through USB3 port. AT1 parser executes the AT commands, and after that NMEA sentences run on USB5 port as summarized in Tab.33. See also Fig.28

AT#PORTCFG=8					
	AT0	AT1	AT2	TT	GPS
USB0	X				
USB1				TTC	
USB2					
USB3		X			
USB4			X		
USB5					X
USB6					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0					
USIF1					
SPI					

Tab. 37: USB Supports NMEA Sentences

The user can issue the AT commands through USB0/AT0, USB3/AT1, and USB4/AT2 ports/parsers. In any case, the GPS/NMEA sentences are routed on USB5 port.

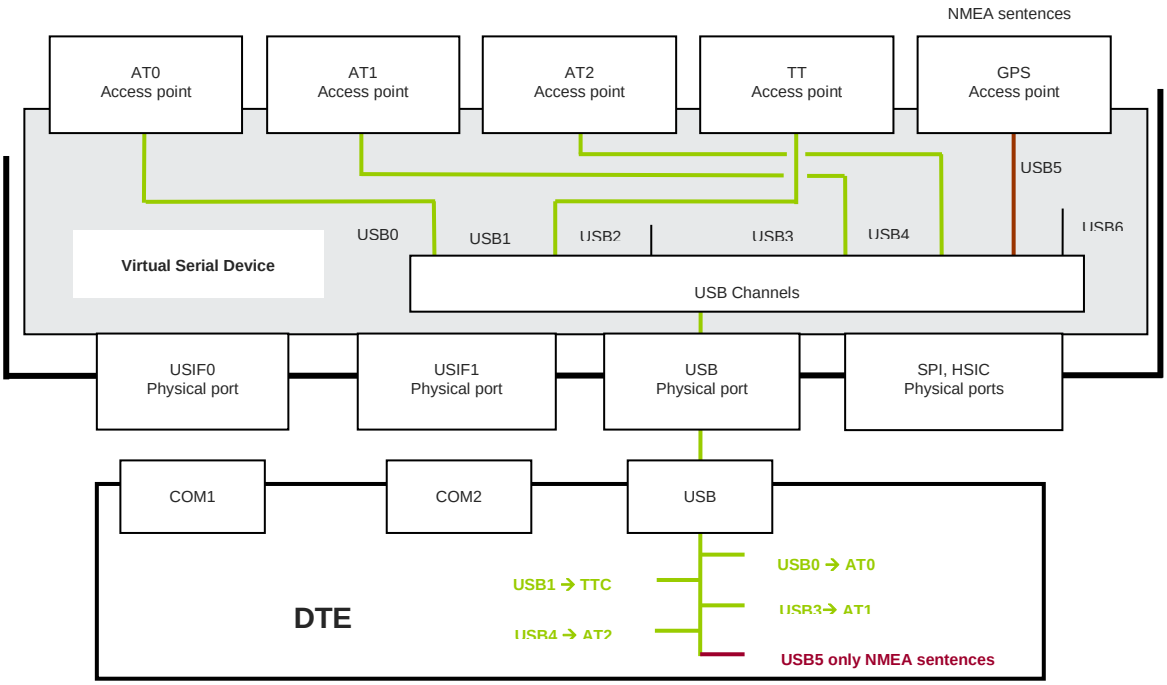


Fig.27: USB5 Port Supports Only NMEA Sentences

6.1.2 External GPS Receiver

The external GPS receiver is connected to the module through USIF1 serial port

6.1.2.1 AT#PORTCFG=11

Tab.26 shows the starting ports configuration of the module: #PORTCFG=11. Now, enable GPS/NMEA sentences via AT$GPSP=1 and AT$GPSNMUN=1… AT commands entered through USIF0 port. AT0 parser executes the AT commands, and after that NMEA sentences and AT commands run on USIF0 port as summarized in the table below. See also Fig.28.

AT#PORTCFG=11					
	AT0	**AT1**	**AT2**	**TT**	**/**
No USB cable					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	**X**				
USIF1					**External GPS**
SPI					

Tab.38: USIF1 Port Connected to External GPS

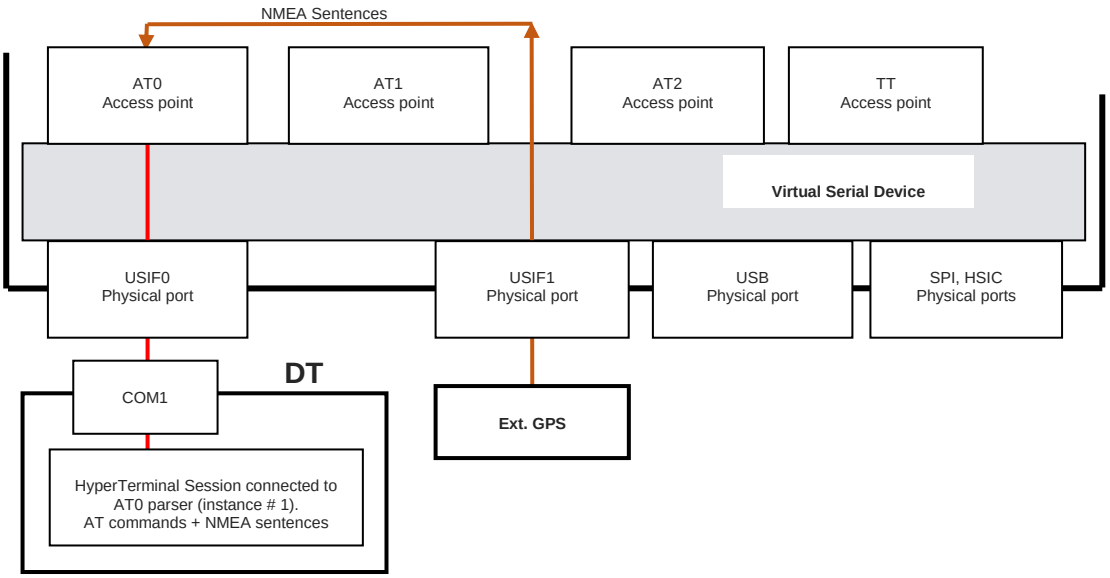


Fig.28: USIF0 Port Support AT Commands + NMEA Sentences (External GPS)

6.1.2.2 AT#PORTCFG=11 + USB

Tab.27 shows the starting ports configuration of the module: #PORTCFG=11+USB. Now, enable GPS/NMEA sentences via AT$GPSP=1 and AT$GPSNMUN=1… AT commands entered, for example, through USB0 port. AT1 parser executes the AT commands, and after that NMEA sentences and AT commands run on USB0 port as summarized in the table below. See also Fig.29.

AT#PORTCFG=11					
	AT0	AT1	AT2	TT	/
USB0		X			
USB1				TTC	
USB2					
USB3			X		
USB4					
USB5					
USB6					
USBHSI0					
USBHSI1					
USBHSI2					
USBHSI3					
USIF0	X				
USIF1					External GPS
SPI					

Tab.39: USIF1 Port Connected to External GPS + USB Cable

The user can issue the AT commands through USIF0/AT0, USB0/AT1, or USB3/AT2 port/parser. The NMEA sentences are routed respectively on USIF0, USB0 (as shown by this example), or USB3 port.

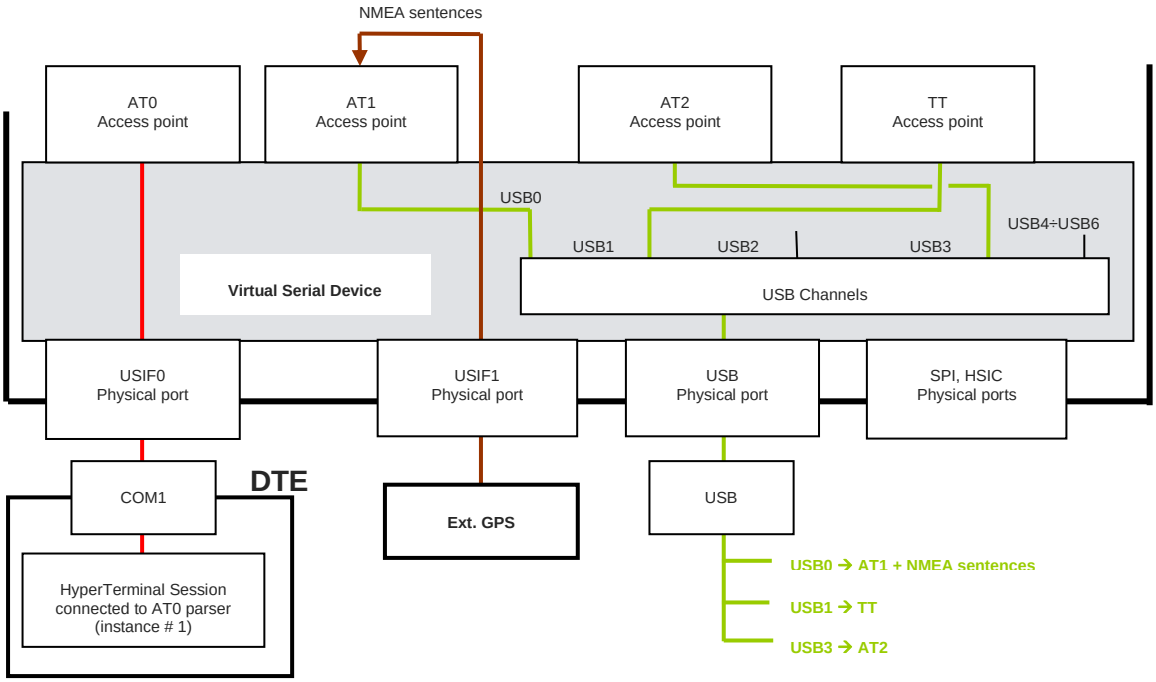


Fig.29: USB0 Port Support AT Commands + NMEA Sentences (External GPS)

6.2 Python

It is assumed that the reader is familiar with Python language. Refer to document [3] to have information on it. Telit's modules provide the Python programming language to develop user control scripts. As shown in Fig.30, the VSD provides two access points called VHWDTE0 and VHWDTE1. MDM and MDM2 Python modules are logically connected respectively to VHWDTE0 and VHWDTE1.

Assume that the module is using the ports configuration #PORTCFG=1, summarized on Tab.6 (factoring-setting), no USB cable is plugged in.

Referring to Fig.30: when the Python script runs the *import MDM instruction*, the VSD disconnects the USIF0/AT0 logical connection and sets up the logical connection VHWDTE0/AT0; now, the script can access AT0 parser. In the same way, *import MDM2 instruction* requires that the VSD sets up the logical connection VHWDTE1/AT1. The figure shows that USIF0 is disconnected and cannot be used by an external device.

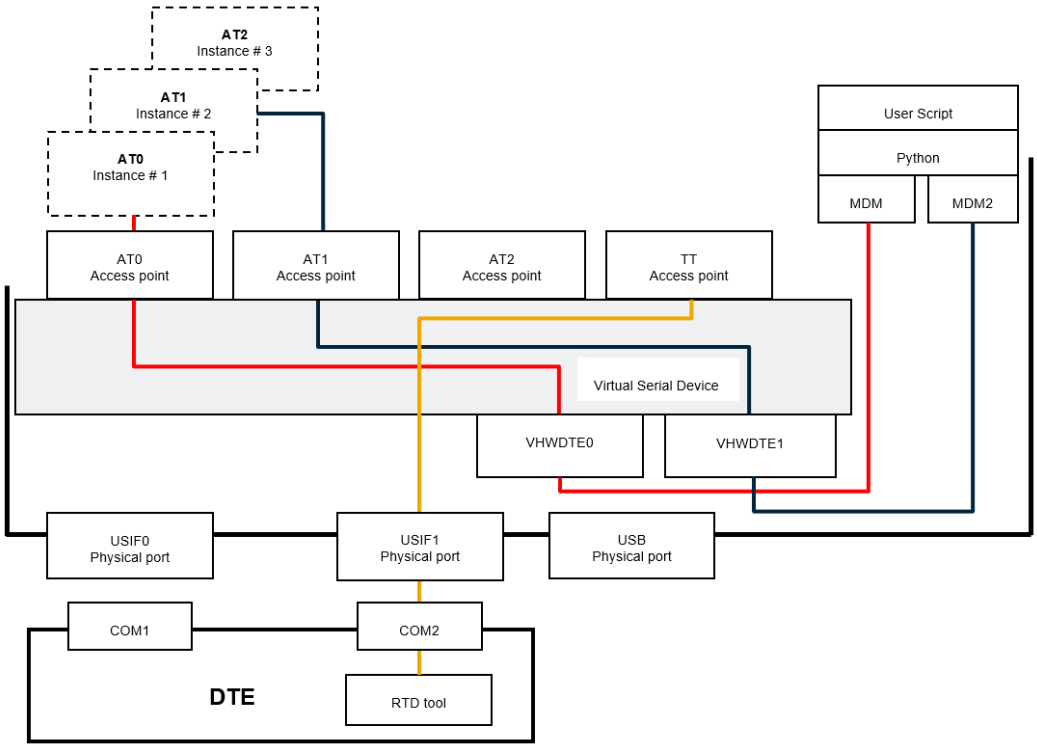


Fig.30: Python & MDM, MDM2 Modules

Python script can use the USIF0 port through the *import SER instruction*. See Fig.31

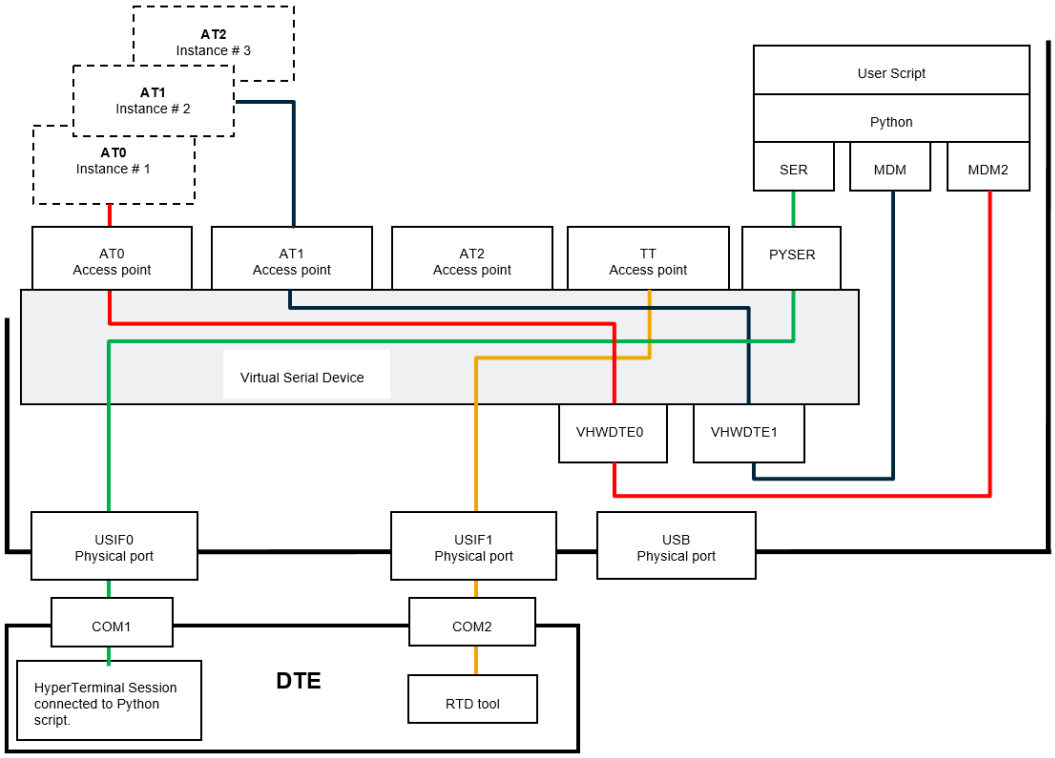


Fig.31: Python & MDM, MDM2, SER Modules

In accordance with the installed software version, Python script can run the *import USB0 instruction* to access the USB0 port by means of PYUSB0 access point. See Fig.32.

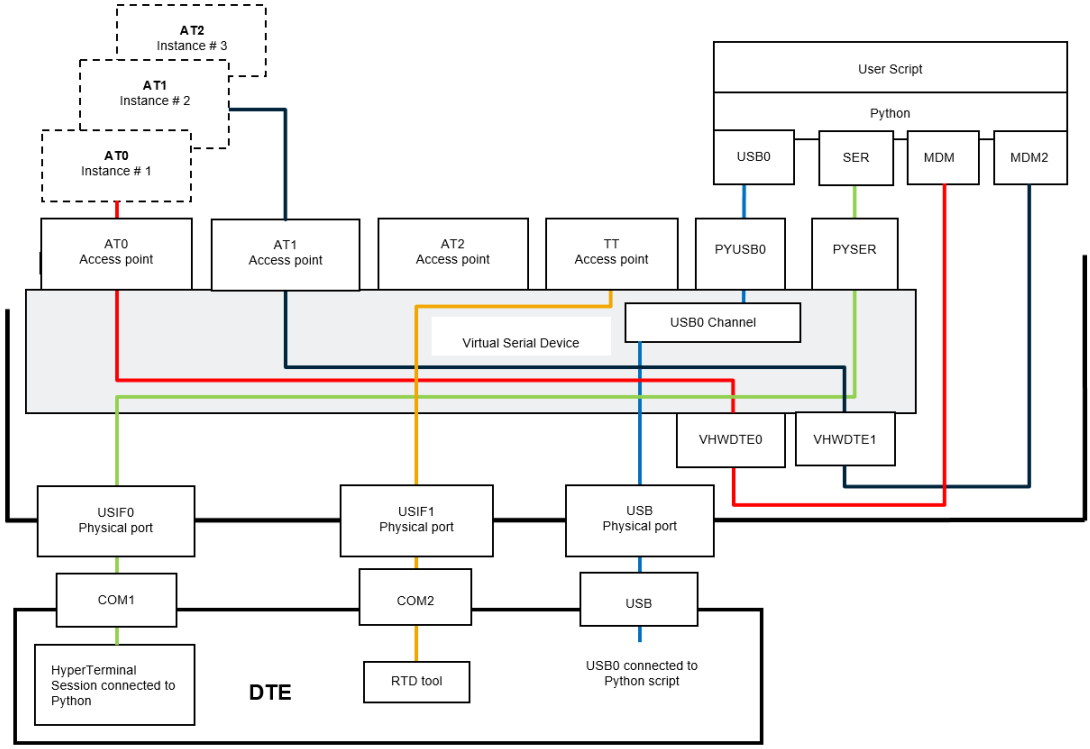


Fig.32: Python & MDM, MDM2, SER, USB0 Modules

The Python software modules MDM, MDM2, SER, and USB0 use four independent resources: AT0, AT1 Access Points, and USIF0 physical port, USB0 port. No resources contention can arise among them. MDM, MDM2, SER, and USB0 instructions steal the above-mentioned resources regardless their current owner.

As shown in the next sub-chapters there are other Python modules to create logical connection between a physical port and an Access point.

6.2.1 Python Script Debugging

Assume that the user needs to debug a new Python script. To perform the debugging session, the user forces the module into #PORTCFG=3 ports configuration, refer to Tab.10. Suppose that the Python script runs: *import MDM*, *import MDM2*, *import SER* and *print instructions*.

The next figure shows the actions results of the first tree instructions. Moreover, the figure shows that the Python script switches the USIF1 from AT2 Access point to Python Debugging Access point; the print messages are available on USIF1 port.

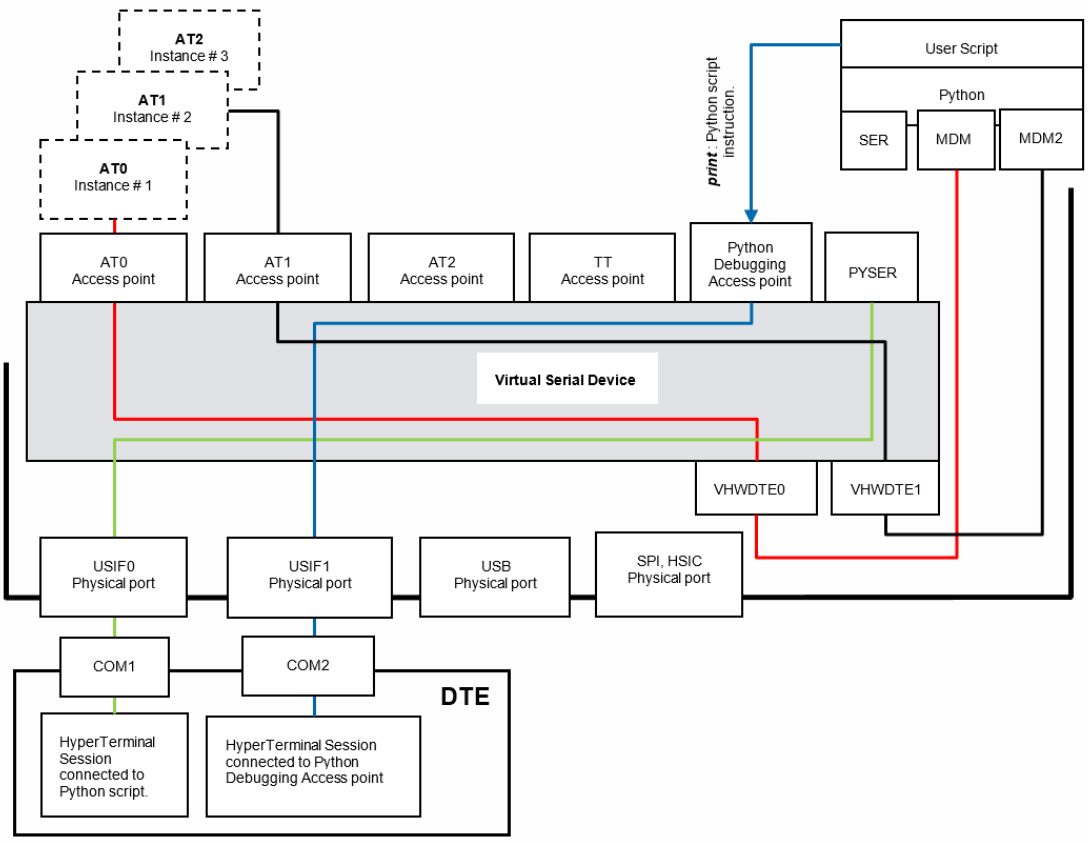


Fig.33: Python & MDM, MDM2, SER and Print Modules

6.2.2 SER2 Instruction

6.2.2.1 AT#PORTCFG=3

Assume that the module is using the ports configuration #PORTCFG=3, no USB cable, refer to Tab.10. When the Python script runs the instruction *import MDM*, the VSD disconnects the USIF0/AT0 logical connection and establishes the logical connection VHWDTE0/AT0; now, the script can access AT0 parser. In the same way, *import MDM2 instruction* requires that VSD sets up the logical connection VHWDTE1/AT1; refer to

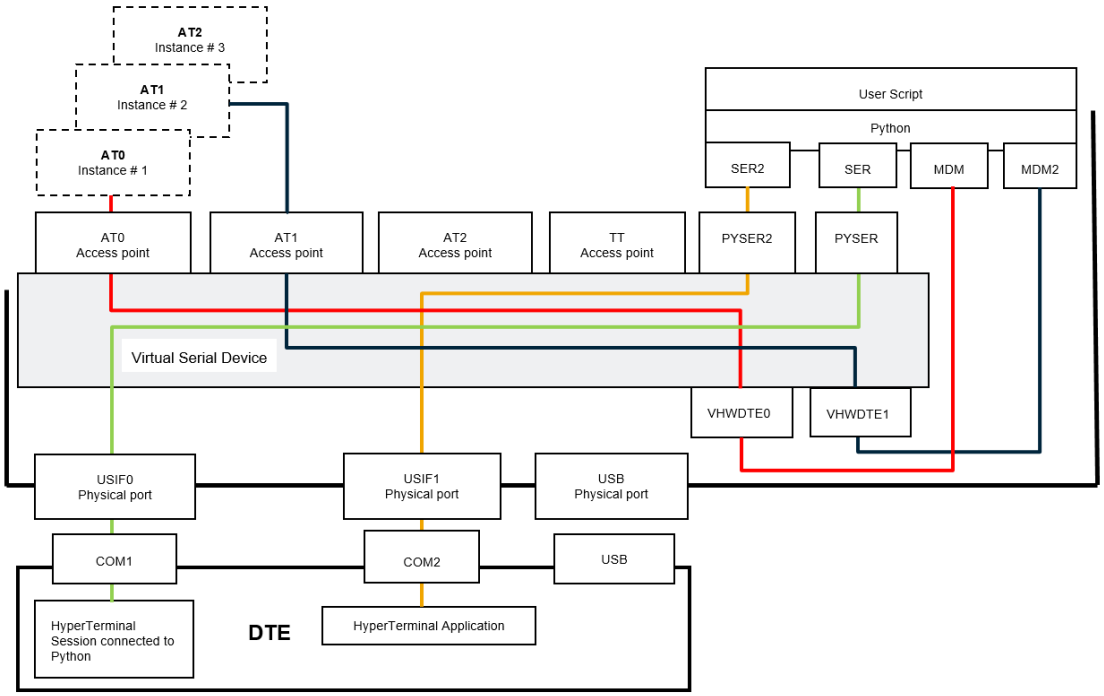


Fig.34.

In accordance with the installed software version, refer to document [3], Python script can run the *import SER2 instruction*. In this case, the VSD disconnects the USIF1/AT2 logical connection and sets up the logical connection USIF1/PYSER2; now, the script can access USIF1.
The Python software modules MDM, MDM2, SER, and SER2 use four independent resources: AT0, AT1 Access Points, and USIF0, USIF1 physical ports. No resources contention can arise among them. As a rule, we can say that the MDM, MDM2, SER, and SER2 instructions steal the resources regardless their current owner.

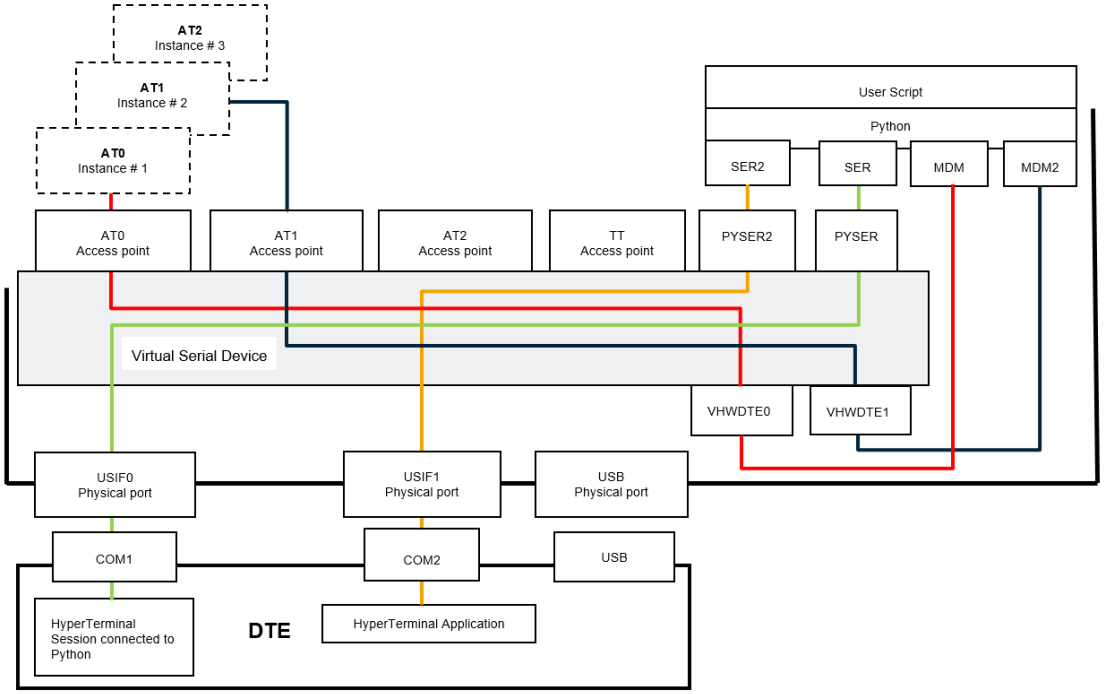


Fig.34: Python & MDM, MDM2, SER, SER2 Modules

print instruction, see chapter 6.2.1, and SER2 instruction, both use the USIF1 hardware resource. In case of USF1 contention, SER2 instruction steals USIF1 to *print instruction*.

6.3 AppZone

Refer to documents [7], and [8] to have information on the AppZone layer and its functions (APIs).

6.3.1 USIFx Ports

Example 1

Tab.6 shows the starting ports configuration of the module: #PORTCFG=1, no USB cable is connected. For example, run a user AppZone Application that does not use neither serial ports nor any ATx parsers. Fig.35 shows the resulting ports configuration.

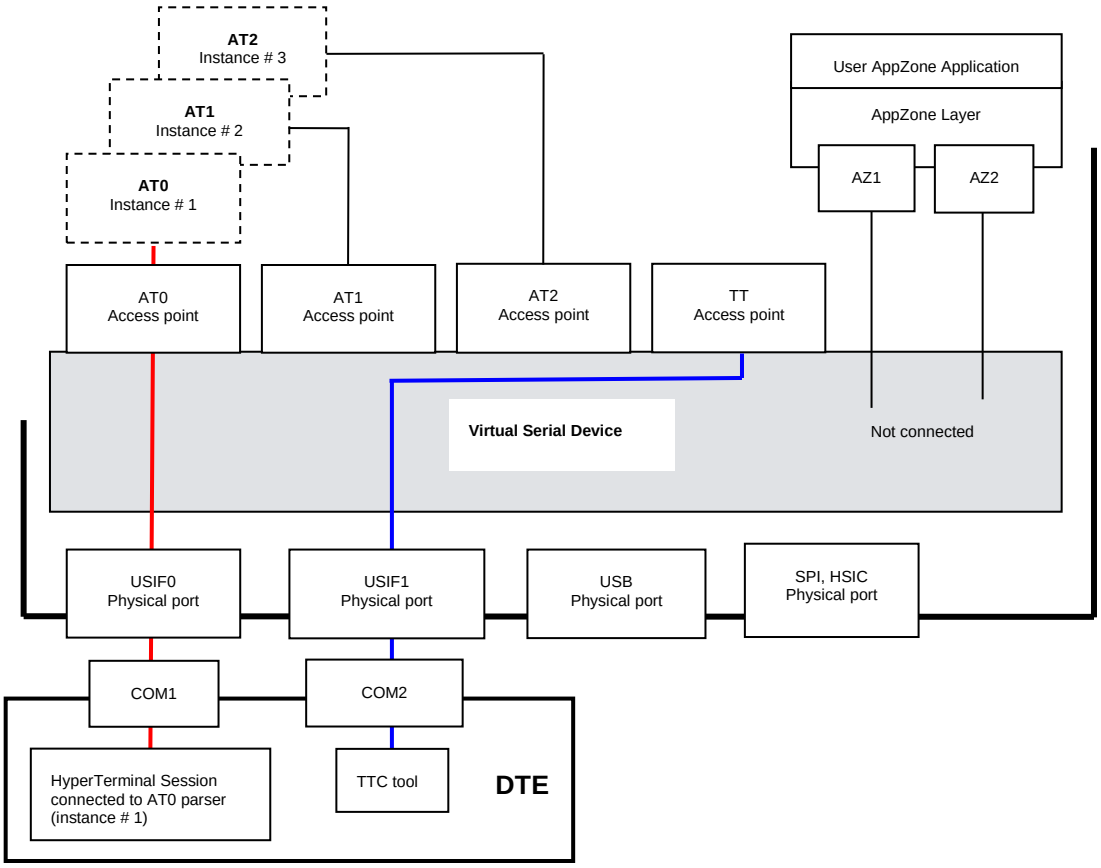


Fig.35: AppZone Application without Connections

Example 2

Starting from the configuration of the Example 1, use:
m2m_os_iat_set_at_command_instance(...) function to connect logically the AZ1 and AZ2 Service Access Points respectively to AT1 and AT2 parsers, in addition use **PrintToUart(...)** function to use USIF0 port. Fig.36 shows the resulting ports configuration.

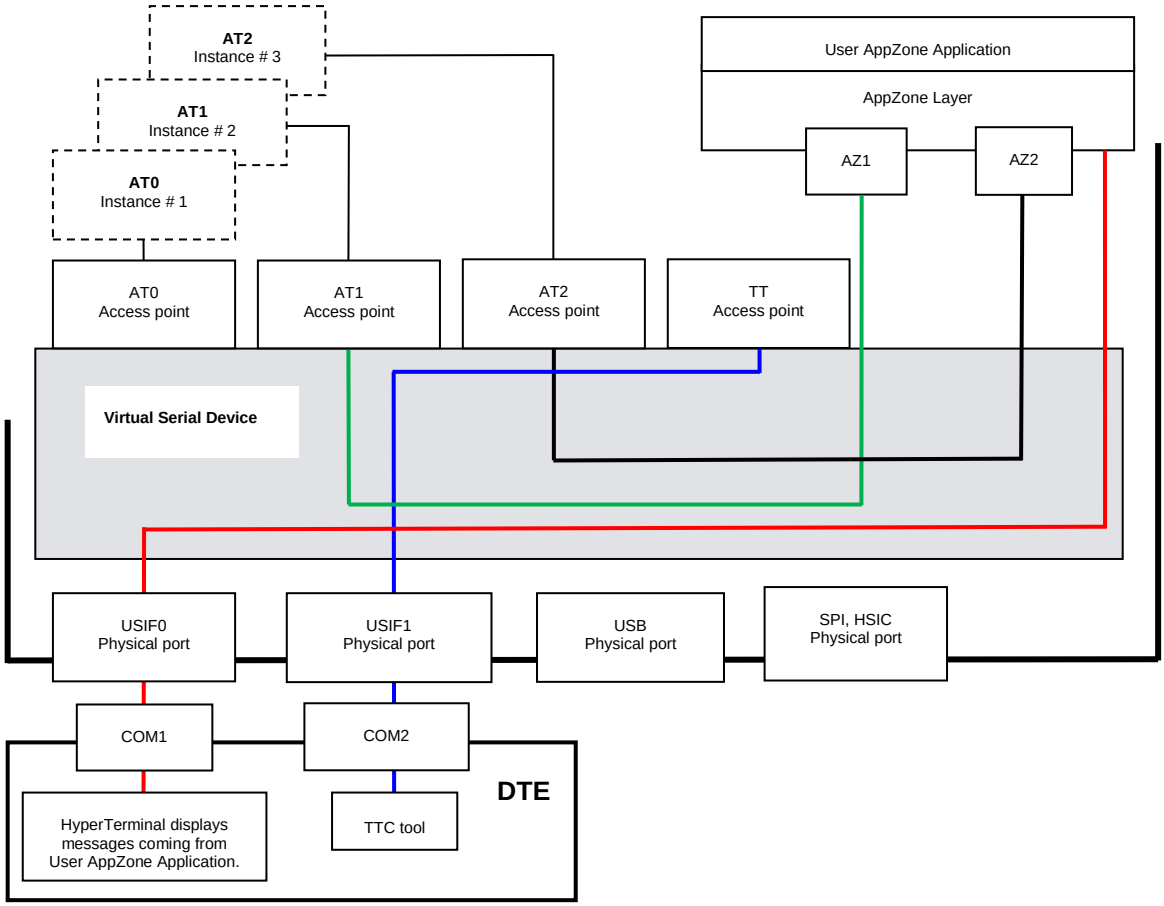


Fig.36: AppZone Application Connected to AT1, AT2 Parsers, and USIF0 Serial Port

Example 3

Starting from the configuration of the Example 1, use

m2m_hw_uart_ioctl (uart_fd, M2M_HW_UART_IO_AT_MODE_SET, M2M_HW_UART_IO_AT_MODE_ON)

API to route data, received from USIF0, to AT1 parser. Fig.37 shows the resulting ports configuration.

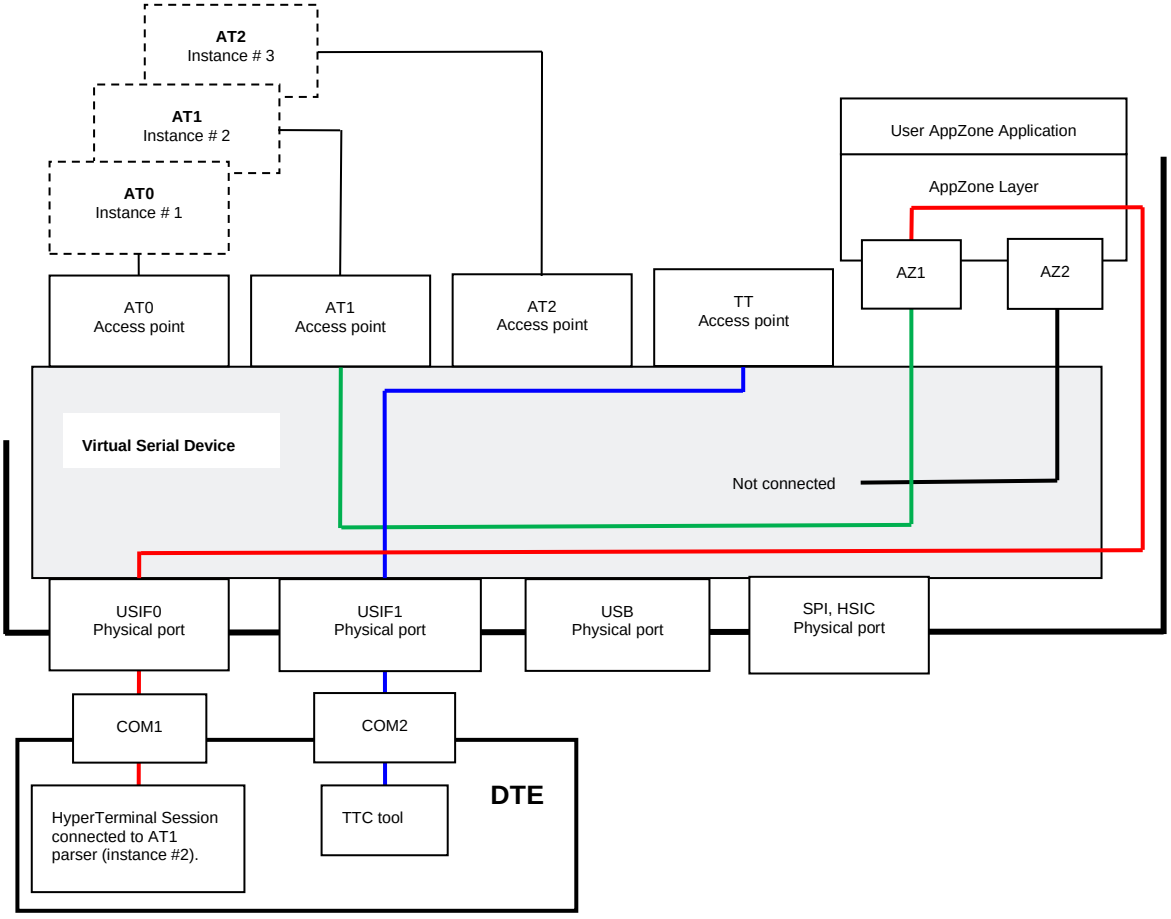


Fig.37: USIF0 Connected to AT1 Parser through AppZone Layer

6.3.2 USBx Ports

Example 1

Tab.7 shows the starting ports configuration of the module: #PORTCFG=1 (factory-setting) with USB cable. Out of the six USB ports, only two ports are available for the user AppZone applications: USB0, and USB3. Use:

m2m_hw_usb_open(USB_CH0, handle0) to disconnect USB0 port from AT1 parser, connect it to AppZone layer, and get its handle. When you use **USB_CH0**, the API try to open the USB0 port, and returns the related handle.

m2m_hw_usb_open(USB_CH3, handle3) to disconnect USB3 port from AT2 parser, connect it to AppZone layer, and get its handle. When you use **USB_CH3**, the API try to open the USB3 port, and returns the related handle.

Fig.38 shows the new configuration:

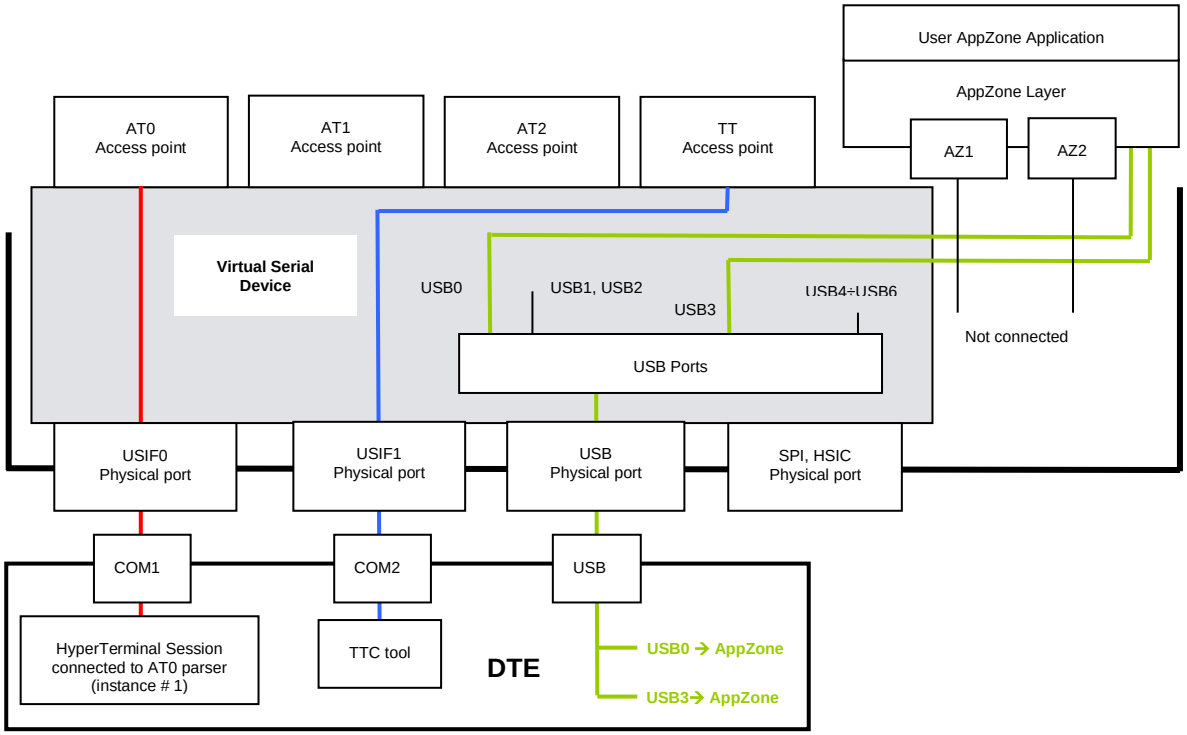


Fig.38: USB0 and USB3 Ports Available for AppZone Application

Example 2

Tab.21 shows the starting ports configuration of the module: #PORTCFG=8, with USB cable. Out of the six USB ports, only three ports are available for the user AppZone applications: USB0, USB3, and USB4, USB1 is reserved for TTC. Use:

m2m_hw_usb_open(USB_CH0, handle0) to disconnect USB0 port from AT0 parser, connect it to AppZone layer, and get its handle. When you use **USB_CH0**, the API try to open the USB0 port, and returns the related handle.

m2m_hw_usb_open(USB_CH3, handle3) to disconnect USB3 port from AT1 parser, connect it to AppZone layer, and get its handle. When you use **USB_CH3**, the API try to open the USB0 port, and returns the related handle.

m2m_hw_usb_open(USB_CH4, handle4) to disconnect USB4 port from AT2 parser, connect it to AppZone layer, and get its handle. When you use **USB_CH4**, the API try to open the USB0 port, and returns the related handle.

Fig.39 shows the new configuration:

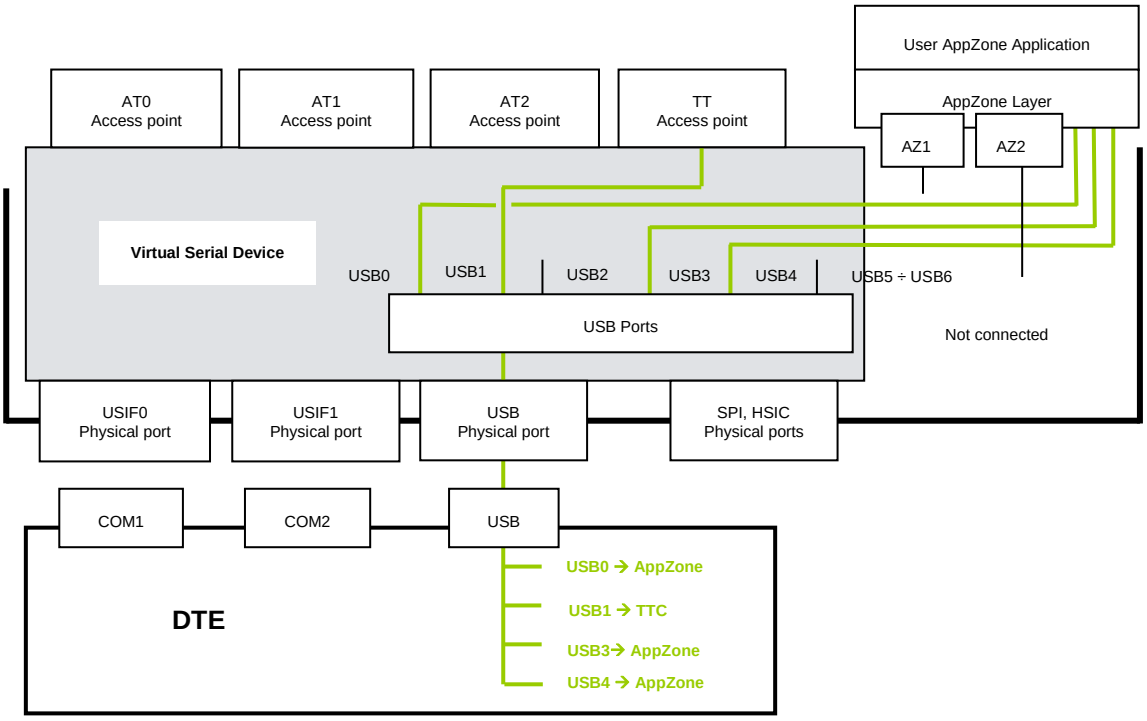


Fig.39: USB0, USB3, and USB4 Ports Available for AppZone Application

Example 3

Tab.21 shows the starting ports configuration of the module: #PORTCFG=8, with USB cable.

Use:
m2m_hw_usb_ioctl(handle4, M2M_USB_AT_MODE_SET, M2M_HW_USB_IO_AT_MODE_ON) API to route data received from USB4 port to AT1 parser.

Fig.40 shows the new configuration:

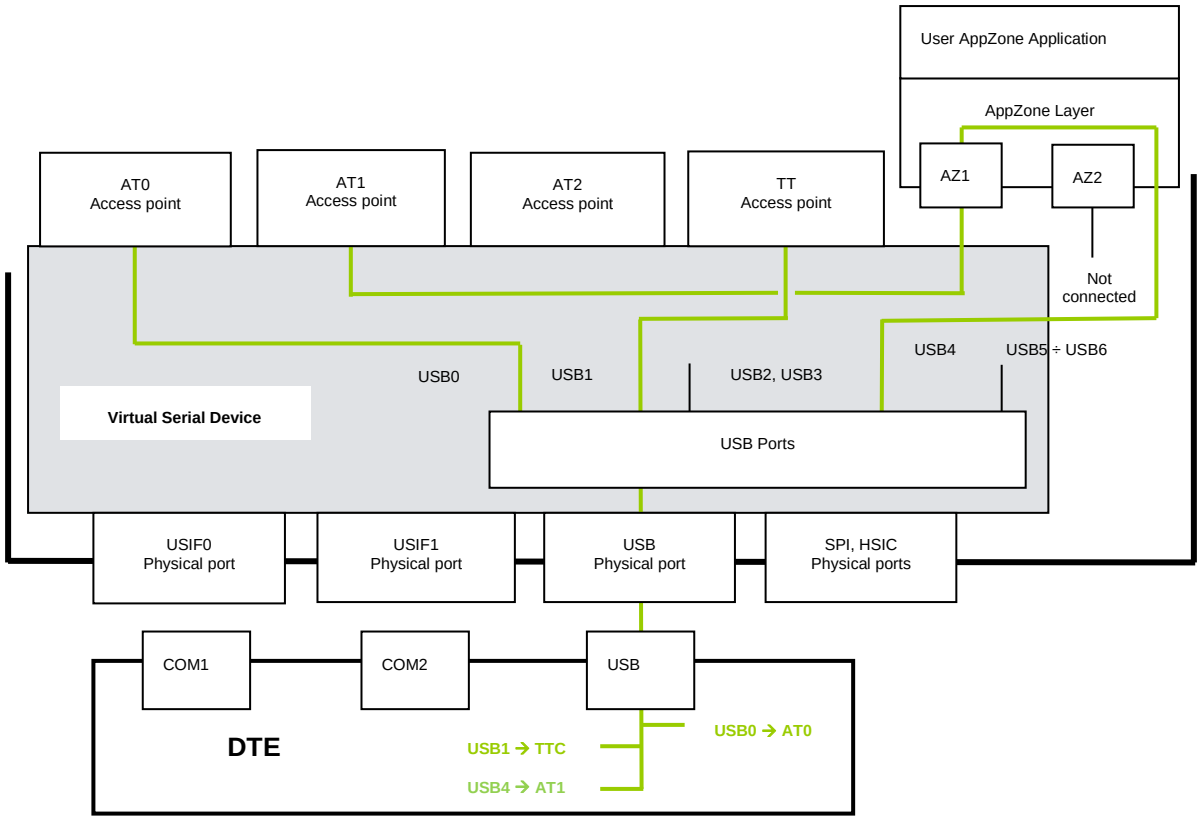


Fig.40: USB4 Port connected to AT1

Use:
m2m_hw_usb_read(...) or **m2m_hw_usb_write(...)** to read or write data from/to USBx ports.

m2m_hw_usb_open(...) returns the control to the calling task only if the USB cable is connected.

7 GLOSSARY AND ACRONYMS

	Description
3G Tool	Third Generation Trace Tool (for internal use only)
DTE	Data Terminal Equipment
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HSIC	USB High Speed Inter-Chip Interface
MA	Mobile Analyzer (for internal use only)
NMEA	National Marine Electronics Association
OS	Operating System
PPP	Point to Point Protocol
SPI	Serial Peripheral Interface
TTC Tool	Telit Trace Client Tool
USIFx	Universal Serial Interface
VSD	Virtual Service Device
ACM	Abstract Control Model
SS	Selective Suspend
ECM	Ethernet Control Model

8 APPENDIXES

8.1 #USBCFG Modes

If you are using a Windows-PC, before plugging the USB cable in, and issuing the AT commands described in the following chapters, install the USB driver provided by Telit, see chapter 8.2.

8.1.1 Mode #USBCFG=0

Set USB mode 0 (factoring setting).
AT#USBCFG=0
OK

Activate the just set mode.
AT#REBOOT
OK

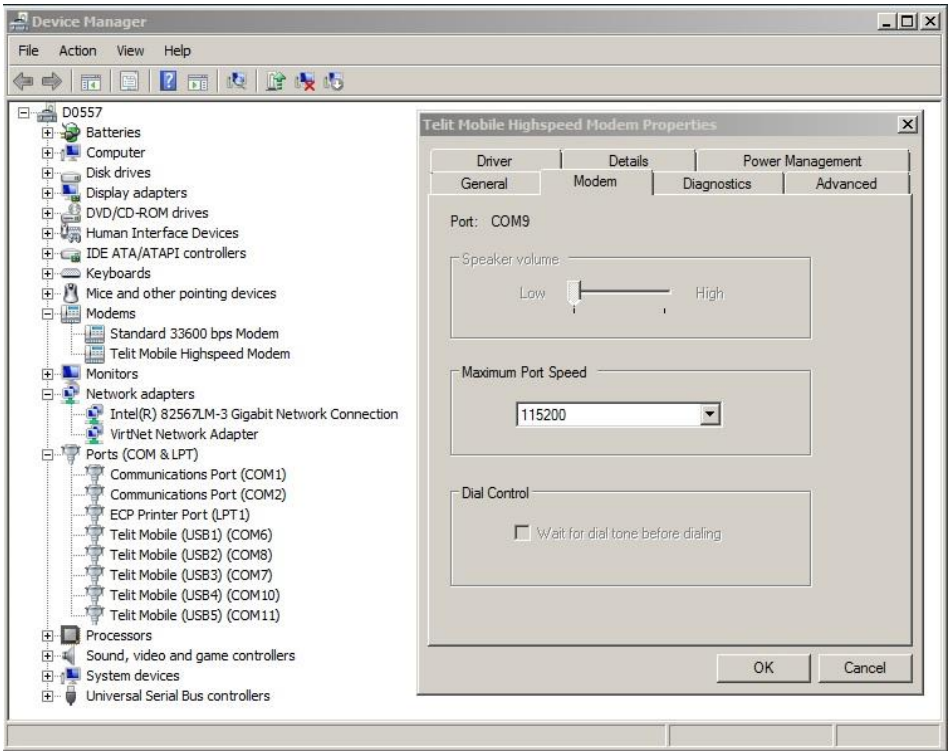
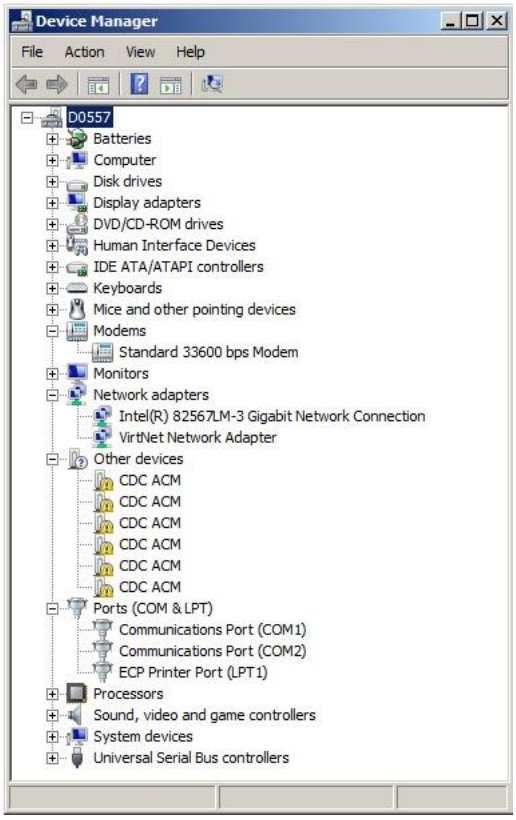


Fig.41: #USBCFG=0

If the device driver is not installed, and you plug in the USB cable, the "Device Manager" displays the folder "Other devices". See the figure on the right, and compare it with the Tab.2.



8.1.1.1 Ubuntu OS

Fig.42 shows the message returned by the dmesg command when you plug in the USB cable. This OS uses the in-box driver, see Telit idVendor=1bc7, and idProduct=0021 (#USBCFG=0).

```
usb 1-3: New USB device found, idVendor=1bc7, idProduct=0021
usb 1-3: New USB device strings: Mfr=1, Product=2, SerialNumber=3
usb 1-3: Product: 6 CDC-ACM
usb 1-3: Manufacturer: Telit
usb 1-3: SerialNumber: 357164040526850
cdc_acm 1-3:1.0: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.0: ttyACM0: USB ACM device
cdc_acm 1-3:1.2: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.2: ttyACM1: USB ACM device
cdc_acm 1-3:1.4: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.4: ttyACM2: USB ACM device
cdc_acm 1-3:1.6: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.6: ttyACM3: USB ACM device
cdc_acm 1-3:1.8: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.8: ttyACM4: USB ACM device
cdc_acm 1-3:1.10: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.10: ttyACM5: USB ACM device
```

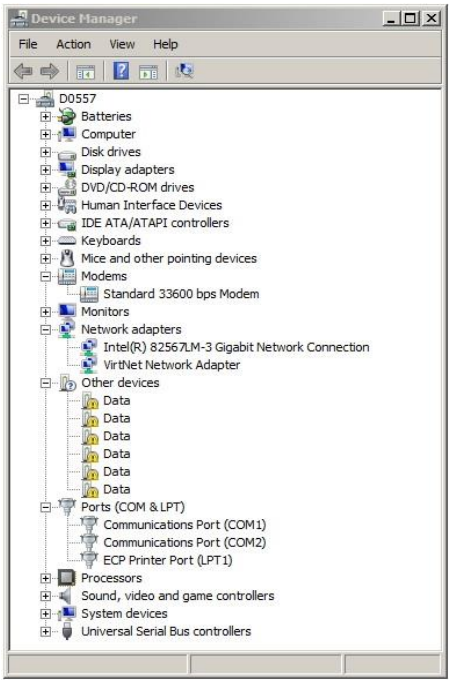
Fig.42: #USBCFG=0 Mode, Ubuntu

8.1.2 Mode #USBCFG=1

Mode #USBCFG=1 is not working in Windows

Set USB mode 1
AT#USBCFG=1
OK

Activate the just set mode
AT#REBOOT
OK



8.1.2.1 Ubuntu OS

Use the following commands to activate the right in-box driver.

user@d0508-U64:~ sudo su
root@d0508-U64:/home/user# modprobe option
root@d0508-U64:/home/user# echo 1bc7 0026 > /sys/bus/usb-serial/drivers/option1/new_id

Where: idVendor = 1bc7, idProduct = 0026

The following figure shows the message returned by the dmesg command when you plug in the USB cable, see Telit idVendor=1bc7, and idProduct=0026 (#USBCFG=1).

```
usbcore: registered new interface driver option
usbserial: USB Serial support registered for GSM modem (1-port)
usb 1-3: new high-speed USB device number 112 using ehci-pci
usb 1-3: New USB device found, idVendor=1bc7, idProduct=0026
usb 1-3: New USB device strings: Mfr=1, Product=2, SerialNumber=3
usb 1-3: Product: 6 CDC-ACM Data Only
usb 1-3: Manufacturer: Telit
usb 1-3: SerialNumber: 357164040526850
option 1-3:1.0: GSM modem (1-port) converter detected
usb 1-3: GSM modem (1-port) converter now attached to ttyUSB0
option 1-3:1.1: GSM modem (1-port) converter detected
usb 1-3: GSM modem (1-port) converter now attached to ttyUSB1
option 1-3:1.2: GSM modem (1-port) converter detected
usb 1-3: GSM modem (1-port) converter now attached to ttyUSB2
option 1-3:1.3: GSM modem (1-port) converter detected
usb 1-3: GSM modem (1-port) converter now attached to ttyUSB3
option 1-3:1.4: GSM modem (1-port) converter detected
usb 1-3: GSM modem (1-port) converter now attached to ttyUSB4
option 1-3:1.5: GSM modem (1-port) converter detected
usb 1-3: GSM modem (1-port) converter now attached to ttyUSB5
```

Fig.43: #USBCFG=1 Mode, Ubuntu

8.1.3 Mode #USBCFG=2

Set USB mode 2.
AT#USBCFG=2
OK

Activate the just set mode
AT#REBOOT
OK

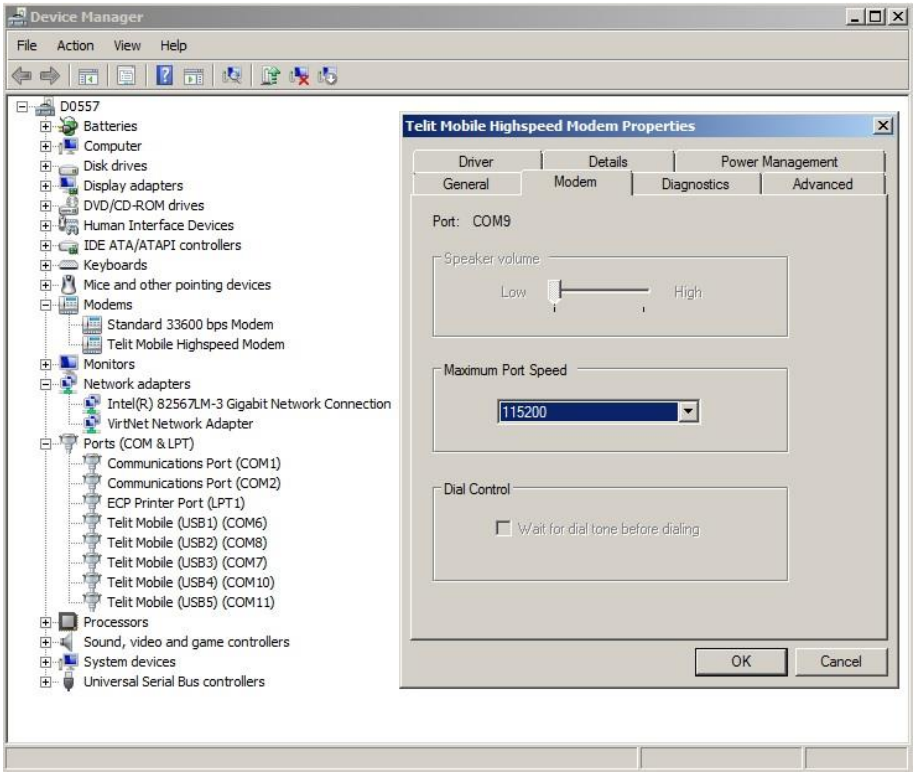
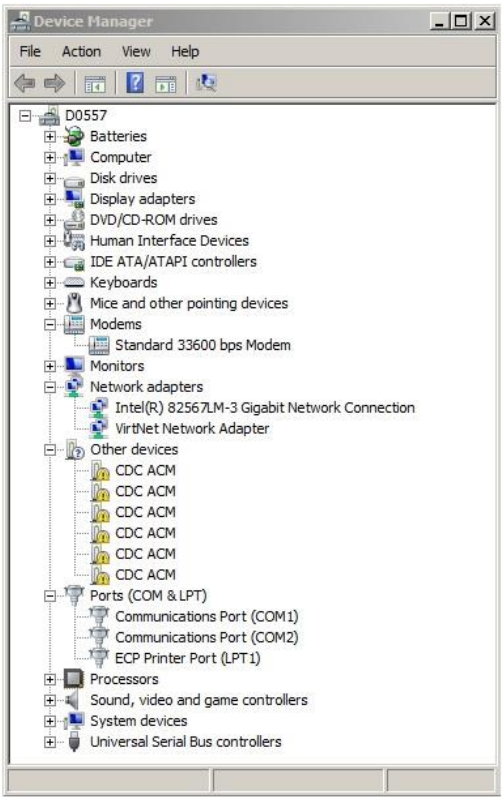


Fig.44: #USBCFG=2

If the device driver is not installed, and you plug in the USB cable, the "Device Manager" displays the folder "Other devices". See the figure on the right, and compare it with the Tab.2.



8.1.3.1 Ubuntu OS

Fig.45 shows the message returned by the dmesg command when you plug the USB cable in. This OS uses the in-box driver, see Telit idVendor=1bc7, and idProduct=0021 (#USBCFG=2).

```
usb 1-3: New USB device found, idVendor=1bc7, idProduct=0021
usb 1-3: New USB device strings: Mfr=1, Product=2, SerialNumber=3
usb 1-3: Product: 6 CDC-ACM
usb 1-3: Manufacturer: Telit
usb 1-3: SerialNumber: 357164040526850
cdc_acm 1-3:1.0: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.0: ttyACM0: USB ACM device
cdc_acm 1-3:1.2: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.2: ttyACM1: USB ACM device
cdc_acm 1-3:1.4: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.4: ttyACM2: USB ACM device
cdc_acm 1-3:1.6: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.6: ttyACM3: USB ACM device
cdc_acm 1-3:1.8: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.8: ttyACM4: USB ACM device
cdc_acm 1-3:1.10: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.10: ttyACM5: USB ACM device
```

Fig.45: #USBCFG=2 Mode, Ubuntu.

8.1.4 Mode #USBCFG=3

Set USB mode 3.
AT#USBCFG=3
OK

Activate the just set mode
AT#REBOOT
OK

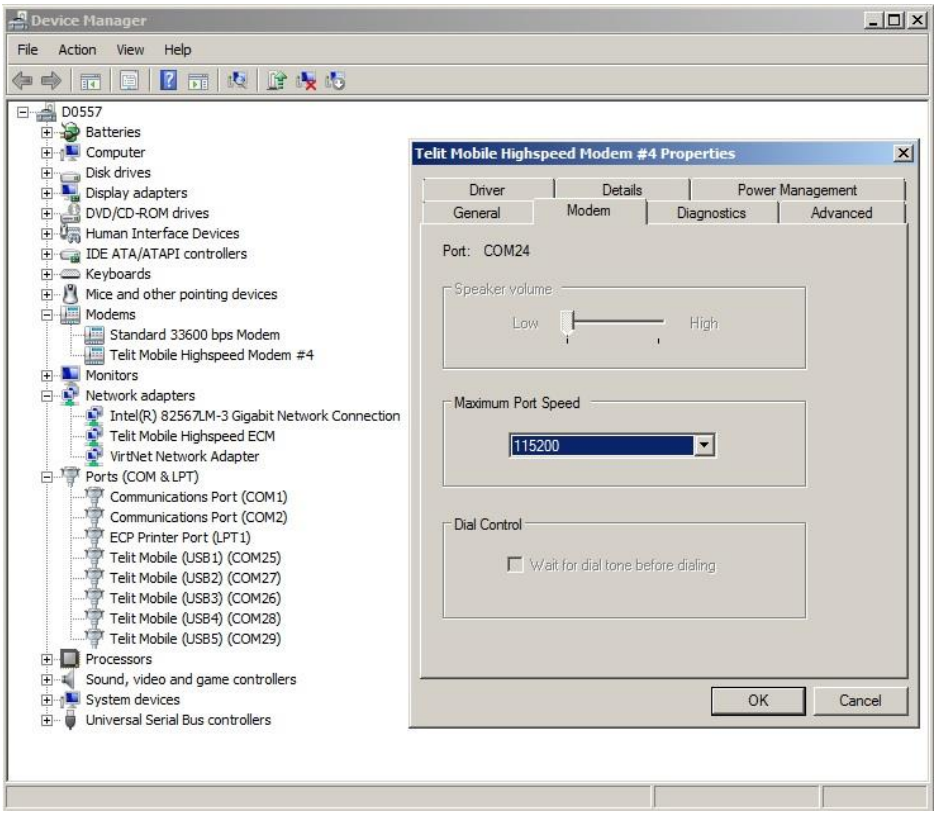
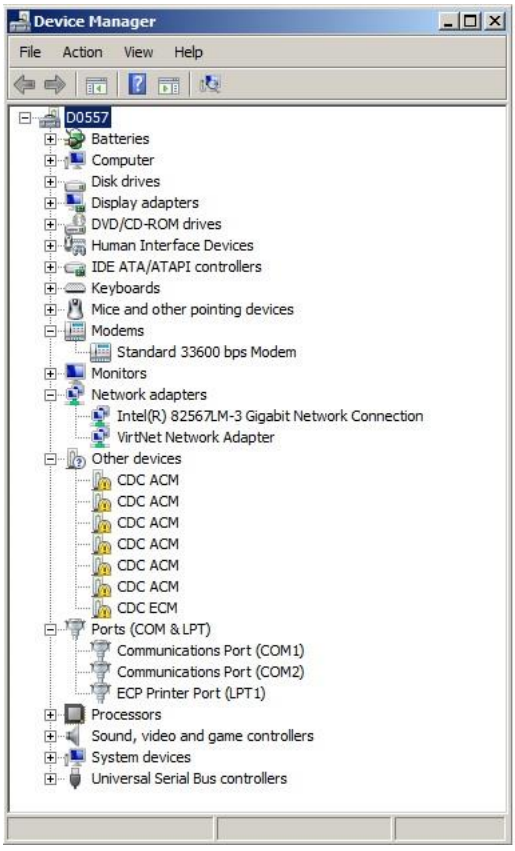


Fig.46: #USBCFG=3

If the device driver is not installed, and you plug in the USB cable, the "Device Manager" displays the folder "Other devices". See the figure on the right, and compare it with the Tab.2.



8.1.4.1 Ubuntu OS

Fig.47 shows the message returned by the dmesg command when you plug in the USB cable. This OS uses the in-box driver, see Telit idVendor=1bc7, and idProduct=0023 (#USBCFG=3).

```
usb 1-3: New USB device found, idVendor=1bc7, idProduct=0023
usb 1-3: New USB device strings: Mfr=1, Product=2, SerialNumber=3
usb 1-3: Product: 6 CDC-ACM + 1 CDC-ECM
usb 1-3: Manufacturer: Telit
usb 1-3: SerialNumber: 357164040526850
cdc_acm 1-3:1.0: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.0: ttyACM0: USB ACM device
cdc_acm 1-3:1.2: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.2: ttyACM1: USB ACM device
cdc_acm 1-3:1.4: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.4: ttyACM2: USB ACM device
cdc_acm 1-3:1.6: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.6: ttyACM3: USB ACM device
cdc_acm 1-3:1.8: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.8: ttyACM4: USB ACM device
cdc_acm 1-3:1.10: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.10: ttyACM5: USB ACM device
cdc_ether 1-3:1.12 wwan0: register 'cdc_ether' at usb-0000:00:1a.7-3, Mobile Broadband Network Device, 00:00:11:12:13:14
usbcore: registered new interface driver cdc_ether
```

Fig.47: #USBCFG=3, Ubuntu

8.1.5 Mode #USBCFG=4

Set USB mode 4.
AT#USBCFG=4
OK

Activate the just set mode
AT#REBOOT
OK

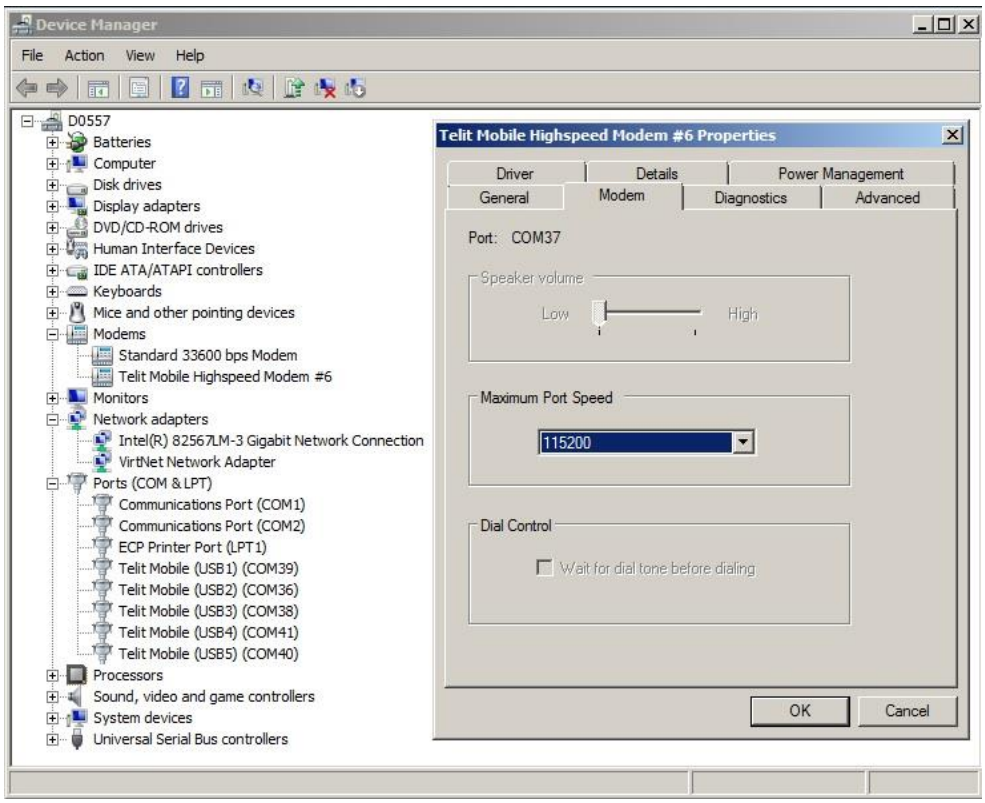
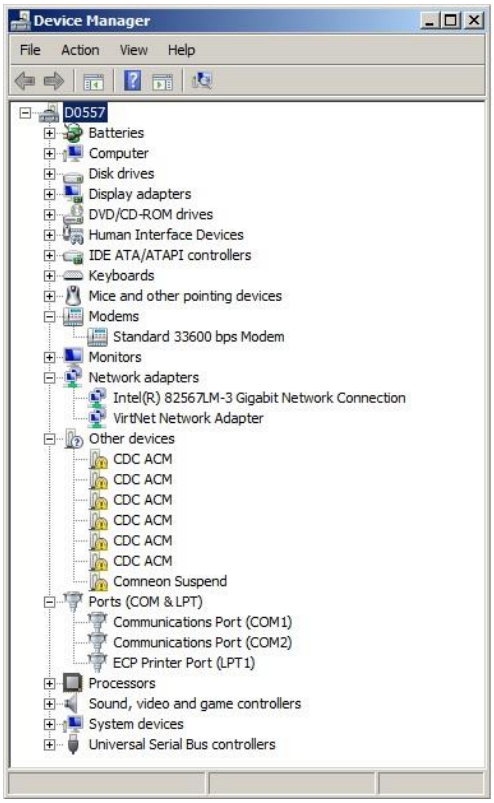


Fig.48: #USBCFG=4

If the device driver is not installed, and you plug in the USB cable, the "Device Manager" displays the folder "Other devices". See the figure on the right, and compare it with the Tab.2.



8.1.5.1 Ubuntu OS

Fig.49 shows the message returned by the dmesg command when you plug the USB cable in. This OS uses the in-box driver, see Telit idVendor=1bc7, and idProduct=0024 (#USBCFG=4).

```
usb 1-3: New USB device found, idVendor=1bc7, idProduct=0024
usb 1-3: New USB device strings: Mfr=1, Product=2, SerialNumber=3
usb 1-3: Product: 6 CDC-ACM
usb 1-3: Manufacturer: Telit
usb 1-3: SerialNumber: 357164040526850
cdc_acm 1-3:1.0: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.0: ttyACM0: USB ACM device
cdc_acm 1-3:1.2: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.2: ttyACM1: USB ACM device
cdc_acm 1-3:1.4: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.4: ttyACM2: USB ACM device
cdc_acm 1-3:1.6: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.6: ttyACM3: USB ACM device
cdc_acm 1-3:1.8: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.8: ttyACM4: USB ACM device
cdc_acm 1-3:1.10: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.10: ttyACM5: USB ACM device
```

Fig.49: #USBCFG=4, Ubuntu

8.1.6 Mode #USBCFG=5

Set USB mode 5.
AT#USBCFG=5
OK

Activate the just set mode
AT#REBOOT
OK

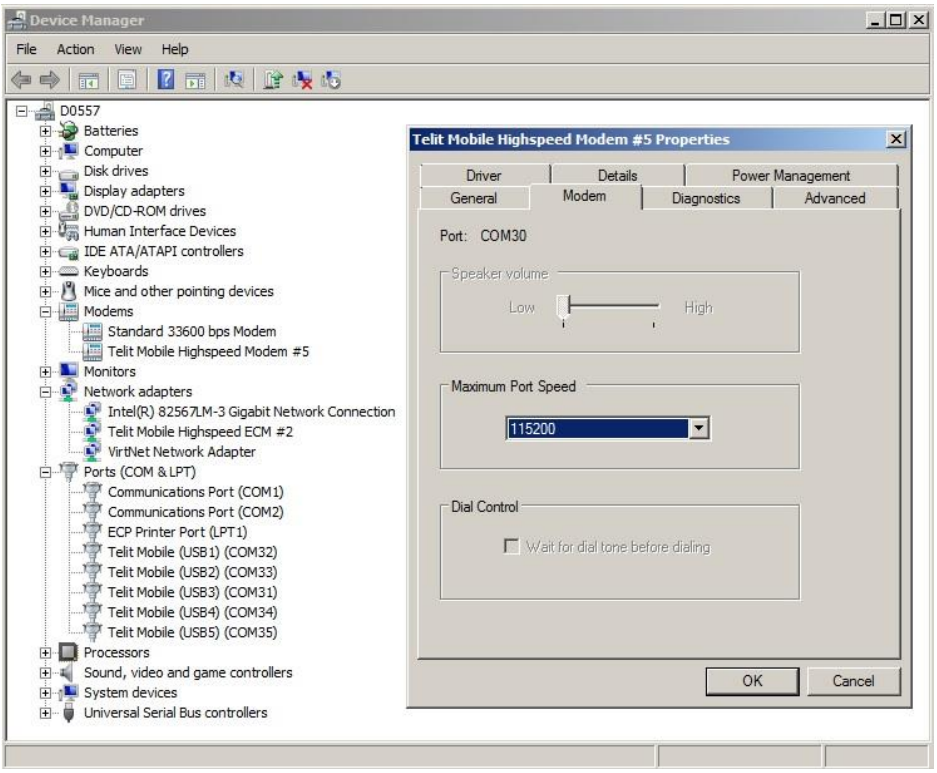
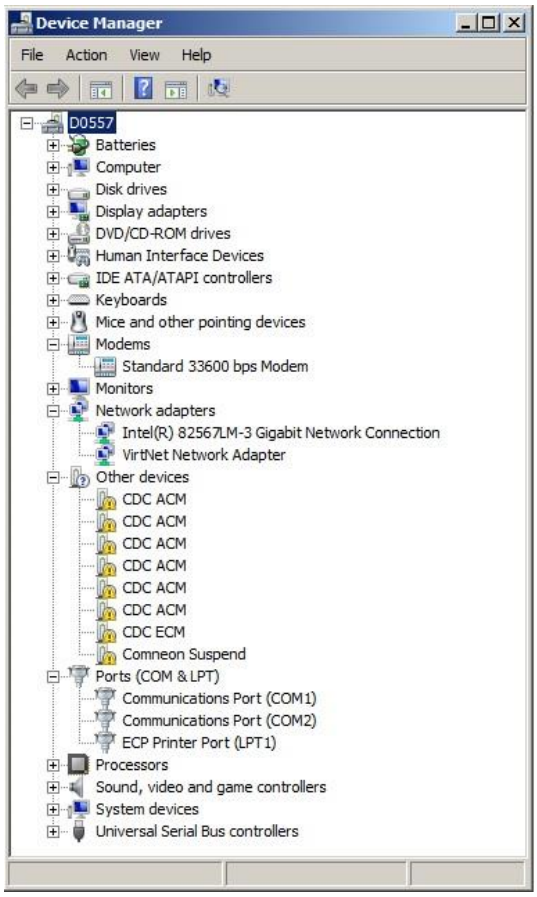


Fig.50: #USBCFG=5

If the device driver is not installed, and you plug in the USB cable, the "Device Manager" displays the folder "Other devices". See the figure on the right, and compare it with the Tab.2



8.1.6.1 Ubuntu OS

Fig.51 shows the message returned by the dmesg command when you plug the USB cable in. This OS uses the in-box driver, see Telit idVendor=1bc7, and idProduct=0025 (#USBCFG=5).

```
usb 1-3: New USB device found, idVendor=1bc7, idProduct=0025
usb 1-3: New USB device strings: Mfr=1, Product=2, SerialNumber=3
usb 1-3: Product: 6 CDC-ACM + 1 CDC-ECM
usb 1-3: Manufacturer: Telit
usb 1-3: SerialNumber: 357164040526850
cdc_acm 1-3:1.0: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.0: ttyACM0: USB ACM device
cdc_acm 1-3:1.2: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.2: ttyACM1: USB ACM device
cdc_acm 1-3:1.4: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.4: ttyACM2: USB ACM device
cdc_acm 1-3:1.6: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.6: ttyACM3: USB ACM device
cdc_acm 1-3:1.8: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.8: ttyACM4: USB ACM device
cdc_acm 1-3:1.10: This device cannot do calls on its own. It is not a modem.
cdc_acm 1-3:1.10: ttyACM5: USB ACM device
cdc_ether 1-3:1.12 wwan0: register 'cdc_ether' at usb-0000:00:1a.7-3, Mobile Broadband Network Device, 00:00:11:12:13:14
```

Fig.51: #USBCFG=5, Ubuntu

8.2 USB Driver

Telit provides the USB driver to install on Windows-PC, refer to document []. Before installing the driver, it is suggested to remove the old one, if present. To verify if the right USB driver has been installed check its Vendor Identifier and the Product Identifier by means of the Windows Device Manager, see the figure below.

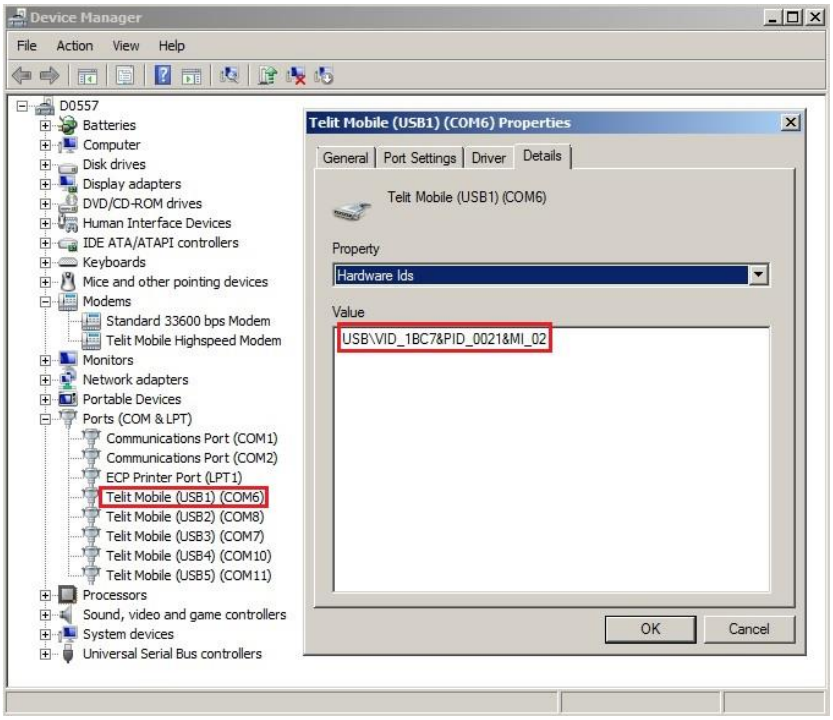


Fig.52: Vendor Identifier & Product Identifier

- Telit Vendor Identifier is 1BC7.
- Product Identifier depends on the #USBCGF mode, refer to Tab.2

8.2.1 Ubuntu

With Ubuntu, the USB device (module) uses the in-box drivers. It means that no Telit's USB driver is needed. To get Telit Vendor Identifier and Product Identifier in Ubuntu environment use the command dmesg as shown in sub-chapters of the chapter #USBCFG Modes

9 DOCUMENT HISTORY

Revision	Date	Changes
0	2011-11-23	First issue
1	2011-11-23	Mobile Analyzer changed in Trace Tool (Generic TT)
2	2012-01-27	Updated the Applicability Table AT+CMUX=1 changed in AT+CMUX=0
3	2012-02-28	Updated parameter range of AT#PORTCFG Command Modified the SPI Physical port connection on all figures Introduced TTC and 3G (see TT
4	2012-07-03	Added PORTCFG=7 and updated PORTCFG tables. Modified document title “HE Family Ports Arrangements” in “HE910 Family Ports Arrangements”. General review of the entire document.
5	2012-09-17	Added PORTCFG=8. Updated Applicability Table
6	2013-07-29	The document title has been changed from “HE910 Family Ports Arrangements” to “HE910/UE910 Families Ports Arrangements” Updated Applicability Table, and some figures. Rearranged GPS chapters and modified some names of chapters. Added the note about +CFUN command in chapter 2. New features supported from SW version 12.00.004: PORTCFG=9, PORTCFG=10, and HSIC physical port. The factory setting has been changed from #PORTCFG=0 to #PORTCFG=1. Added products: UE910-EUR/EUD/12.00.xx4 UE910-NAR/NAD/12.00.xx4
7	2014-02-24	Added some figures and related descriptions.

Revision	Date	Changes
8	2014-02-28	The document title has been changed from “HE910/UE910 Family Ports Arrangements” to “HE910/UE910/UL865 Families Ports Arrangements”. Added products: UL865-EUR/EUD 12.00.xx4 UL865-NAR/NAD 12.00.xx4 UL865-N3G 12.00.xx4
9	2015-02-16	Chapters’ organization has been rearranged; some chapters have been reviewed or removed. Added: Services Coexistence Table, AppZone Service, AT#PORTCFG=11, and AT#PORTCFG=12 Updated Applicability Table HE910 Family HE910 12.00.xx6 HE910-D 12.00.xx6 HE910-EUR / HE910 EUD 12.00.xx6 HE910-EUG / HE910-NAG 12.00.xx6 HE910-NAR / HE910-NAD 12.00.xx6 UE/UL Family (Embedded) UE910-EUR / UE910-EUD 12.00.xx6 UE910-NAR / UE910-NAD 12.00.xx6 UL865-EUR / UL865-EUD 12.00.xx6 UL865-NAR / UL865-NAD 12.00.xx6 UL865-N3G 12.00.xx6
10	2016-02-10	This revision has adopted the new Telit format. According to the new format, chapters and figures has been rearranged. The document title has been changed from “HE910/UE910/UL865 Family Ports Arrangements” to “Telit 3G Modules Ports Arrangements” Has been added the chapters dedicated to the AT#USBCFG command. Updated Applicability Table and Modules & SW ver. Table: HE910 Series HE910 12.00.xx6 HE910-D 12.00.xx6 HE910-GL 12.00.xx6 HE910-EUR / HE910 EUD 12.00.xx6

Revision	Date	Changes
		HE910-EUG / HE910-NAG 12.00.xx6 HE910-NAR / HE910-NAD 12.00.xx6 UE/UL Series (Embedded) UE910-EUR / UE910-EUD 12.00.xx6 UE910-NAR / UE910-NAD 12.00.xx6 UL865-EUR / UL865-EUD 12.00.xx6 UL865-NAR / UL865-NAD 12.00.xx6 UL865-N3G 12.00.xx6 UE910-N3G 12.00.xx6 UE866-N3G 12.00.xx6
11	2016-07-06	Changed AT#PORTSCFG=? into AT#PORTCFG=?, chapter 3.
12	2017-02-14	2017 Template applied
13	2017-08-08	Chapter 6.2.2.1 AT#PORTCFG=0 removed. Applicability Table updated Chapter 7 The Winning Configuration changed in Last Ports Setting. Chapter 8 Acronyms & Abbreviations changed in Glossary and Acronyms; format table update. Chapter 9 Modules & SW Ver. Table removed Format table of the Document History chapter updated. Format tables of the document updated.
14	2017-10-24	Fixed the title of chapters 4.12, and 4.13. Removed chapter 9.2 USB Interface & Endpoints. Removed chapter 7 Last Ports Setting. Updated 1.5 Related Documents.

SUPPORT INQUIRIES

Link to **www.telit.com** and contact our technical support team for any questions related to technical issues.

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