DE910 Family Serial Interface
User Guide

1VV0301068 Rev.0 – 2013-07-11

Making machines talk.

APPLICABILITY TABLE

PRODUCT
DE910-DUAL
DE910-SC

SW Version
15.00.xx2

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Contents

1. Introduction

1.1. Scope

This document deals with an overview of serial interface on Telit production and helps host SW developers implement the serial driver layer of the host system to control Telit productions, efficiently.

1.2. Audience

This document is intended for host SW developers who are about to implement their serial driver layer with Telit production described in this documents.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit's 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

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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: "Serial Interface Architecture" gives an overview and the characteristic of the serial interface on Telit products.

"Chapter 3: "UART Interface" describes the detailed information and the characteristic of UART interface on Telit products

"Chapter 4: "USB Interface" describes the detailed information and the characteristic of USB interface on Telit products

"Chapter 5: "CMUX Interface" describes the MUX protocol implemented on Telit products, the characteristic of each CMUX channels and how to use "Telit serial port mux" tool on Window-OS

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

- DE910 Family AT Commands Reference Guide Rev.3
- 3GPP TS 27.010
- V.250 ITU-T
- USB Specification Revision 2.0
- USB Class Definitions for Communication Devices Reversion 1.2

2. Serial Interface Architecture

DE910 Family products allow DTE to transmit and receive DUN, Embedded TCP/IP/FTP, GPS, SMS data and so on via the serial interface composed of UART and USB, or CMUX

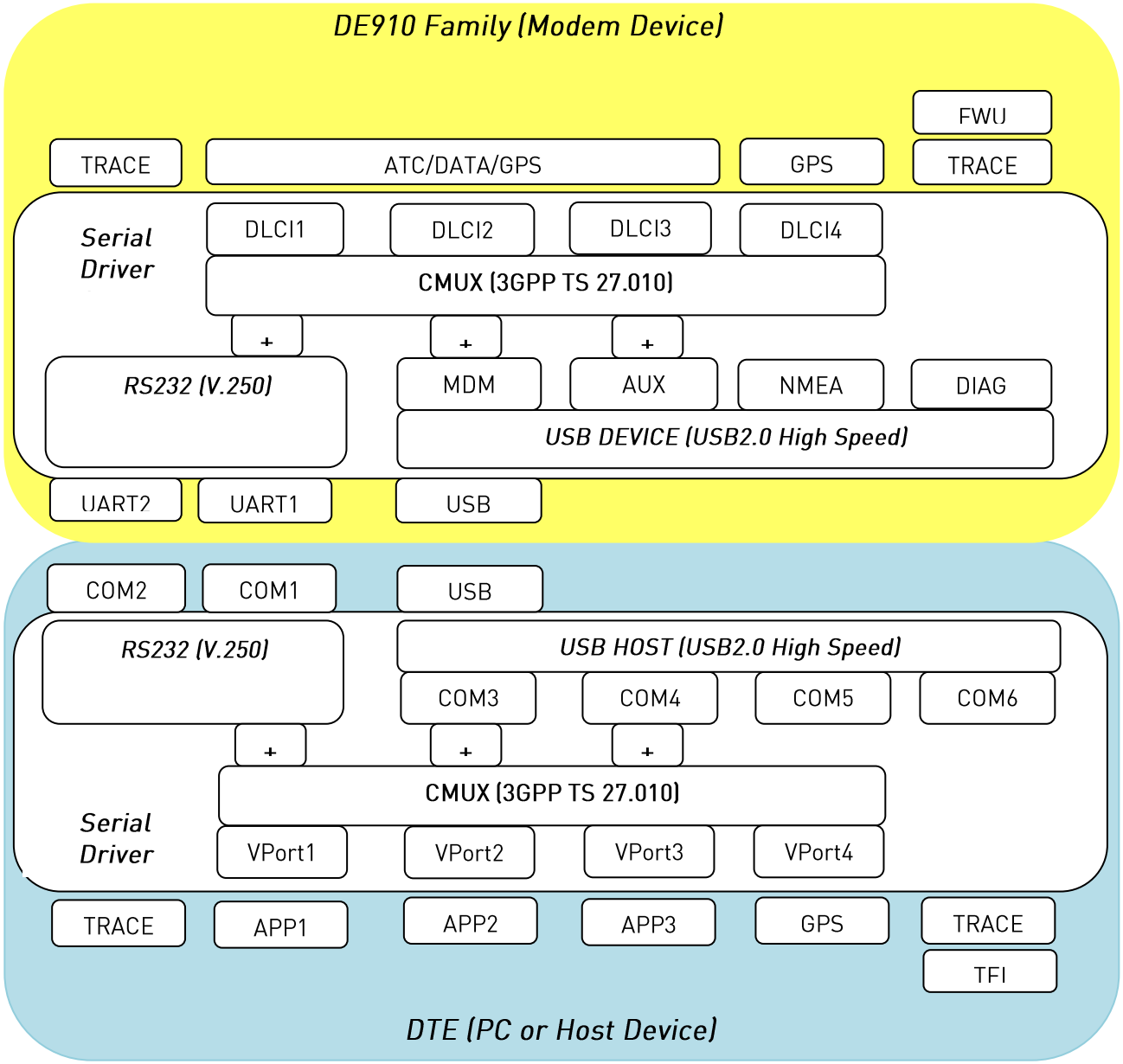

Figure-1 Architecture of serial interface on DE910 Family

[1]

2.1. Serial Interface Hierarchy

This paragraph deals with the feature of serial interface designed on DE910 Family. TE should implement their system in conformance with DE910 Family's serial interface feature.
DE910 Family offer serial interface with the following hierarchy to TE

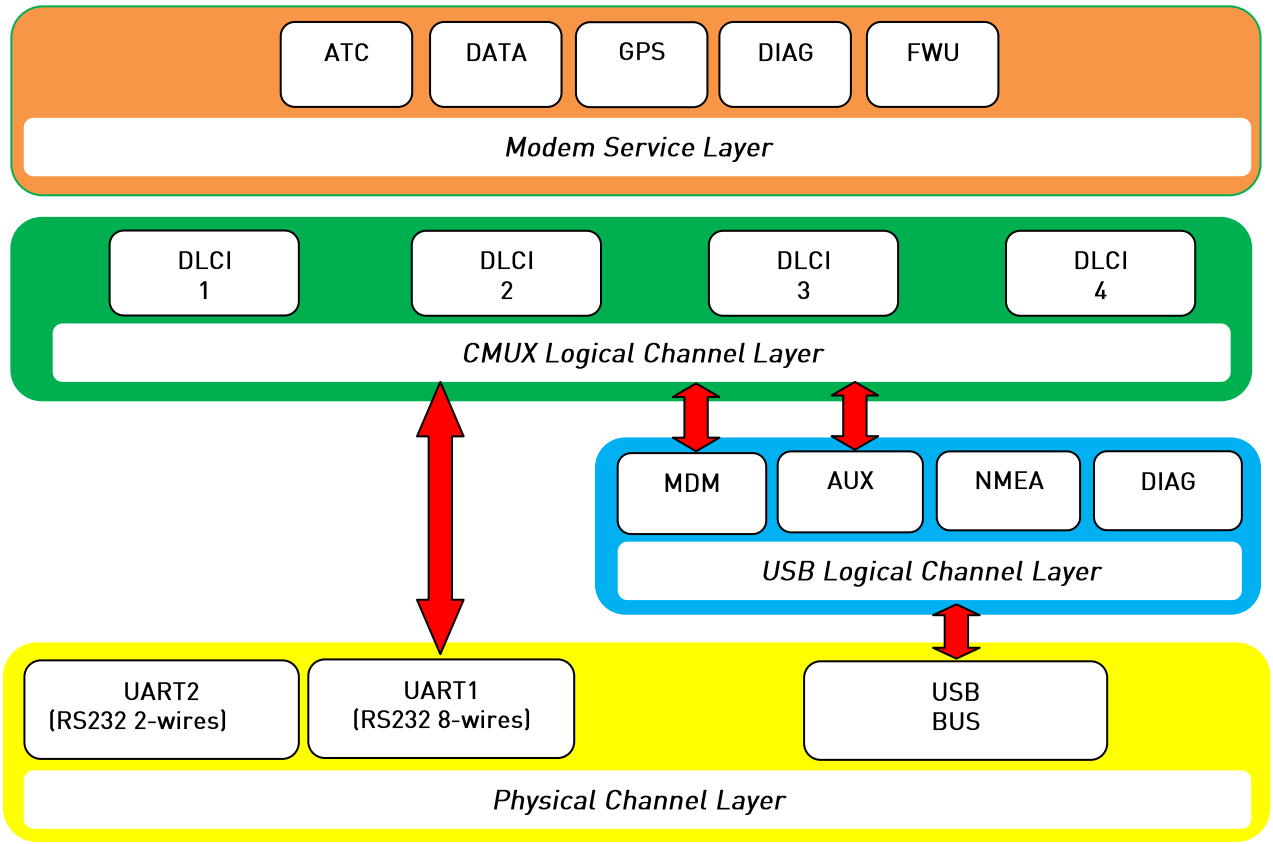

Figure-2 Serial Interface hierarchy on DE910 Family

Figure-2 shows the hierarchy of serial interface on DE910 Family. Basically, DE910 Family offer the serial interfaces as follows

- UART support 2-interfaces (UART1/UART2)
- USB support 4-interfaces
- CMUX support 4-interfaces and it's enabled by +CMUX (3GPP TS 27.010), optionally.
- CMUX service available on UART1/USB-MDM/USB-AUX
  (Not allowed to use CMUX service on more than 2 channels at the same time)

[1] FWU (Firmware Upgrade)

Table-1 illustrates the available service on logical channels.

Channel	ATC	DATA	GPS	FWU	TRACE
UART1	√	√	√		
UART2					√
DLCI1	√	√	√		
DLCI2	√	√	√		
DLCI3	√	√	√		
DLCI4			√		
USB MDM	√	√	√		
USB AUX	√	√	√		
USB NMEA			√		
USB DIAG		√			√

Table-1 the available service on logical channels

NOTE:

AT$GPSNMUN command allow DTE to use GPS service on the channel support ATC service, not the dedicated NMEA port (USB-NMEA, DLCI4)

First parameter on AT$GPSNMUN should be set as 3 (dedicated NMEA data stream) on the channel support ATC service.

2.2. Serial Interface Feature

DE910 Family has the following the specific feature and limitation and these are the points to be specially considered, while host developers are going to design their host serial interface and applications

- A voice call can be dialed, answered and closed on any channels which use ATC service
- DUN can be initiated and answered on any channels which use ATC service but closed only on the channel where the call was dialed and answered.
- AT commands issued via multiple channels processed by one ATC processor.
- The profile setting value and behavior shared by all channels
- No support two or more DATA service such as DUN, Embedded TCP/IP/FTP, simultaneously.

More detailed contents described in sub-clause.

2.2.1. AT Command on multiple channels

Below figure-3 illustrates the use cases DTE can face on multiple channels, while host developers design their system with multiple channels.

- Case 1: Normally, TE issue AT CMD1 on channel1 and get the response for AT CMD1. And TE issue AT CMD2 on channle2 and get the response for AT CMD2.

- Case 2: TE issue AT CMD3, AT CMD4 and AT CMD5 via each channel, serially. In case, AT commands issued on channel2 and channel3 are queued and these commands will be processed, after ATCMD3 is done.

- Case 3: TE issue AT CMD6 on channel3 and issue AT CMD7 before getting the response for AT CMD6. In case, AT CMD7 is discard in MS.

WARNING:

TE should not issue another AT command until they get the response for the previous AT command on the same channel, otherwise a new AT commands discarded, silently.

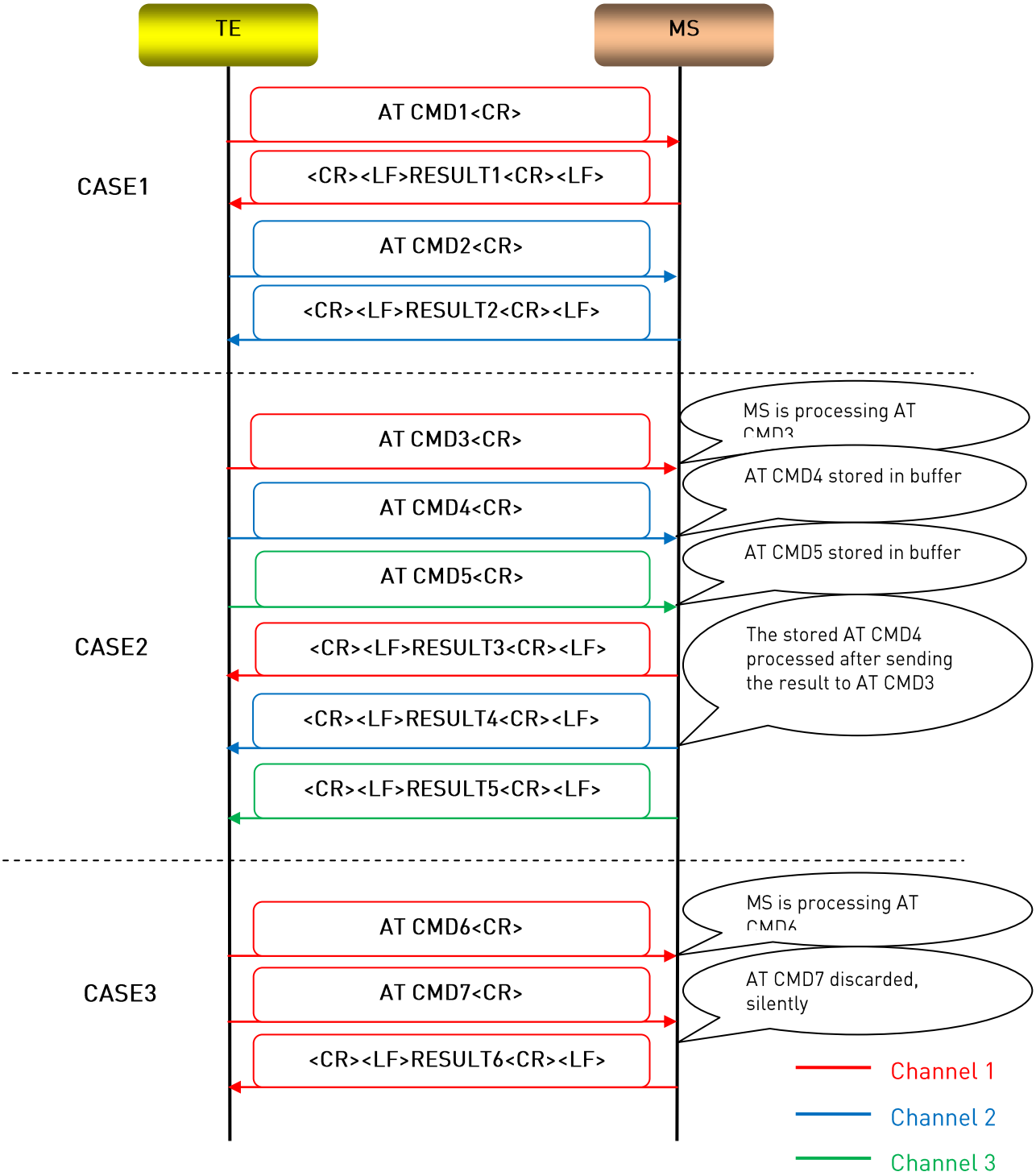

Figure-3 uses cases occurred on multiple channels

2.2.2. Aborting AT Command

Some AT commands aborted by issuing any characters before getting the response for the issued AT command. Below listed AT commands allow TE to use this feature.

COMMAND	DE910 Family
ATD	•
ATA	•

Tabel-2 Abortion AT Command List

Like as Figure-4, any character issued before getting the response make the execution of current AT command aborted.

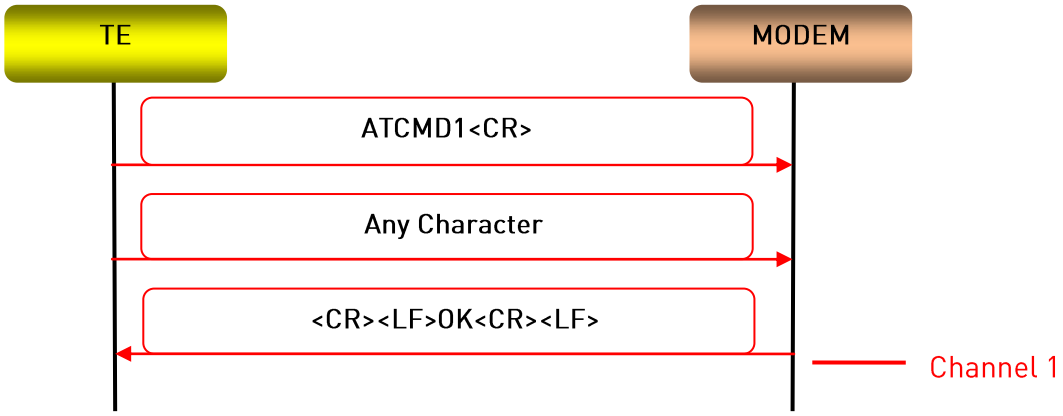

Figure-4 Aborting AT Command

2.2.3. Profile Setting

Each channel has no its own profile. Profile setting handled by any channels and the behavior related to profile performed on all channels.
For example, &D (DTR Option) can be set by any channel and this setting applied to all channels.

2.2.4. DATA Service

DATA service such as DUN and Embedded TCP/IP/FTP available on the channels support DATA service. But it's not allowed for TE to use two or more channels as DATA service, simultaneously. For example, once one channel is assigned for DATA service such as DUN, other DATA service never be performed on other channel until current DATA service is terminated.

2.2.5. URC Messages

Network/Device notification event can be transferred to TE via the URC message on the port set by #NOTP command. DTE can specify the port on which URC message issued with AT#NOPT
The default setting of #NOPT command is all port assigned to ATC service.

For more detailed information, refer to DE910 Family AT Commands Reference Guide Rev.3

3. UART Interface

This paragraph deals with the capability and available service for each UART.
DE910 Family allows TE to use two UART, which is used for specific service as following

	TD (C103)	RD (C104)	RTS (C105)	CTS (C106)	DSR (C107)	DTR (C108)	RI (C125)	DCD (C109)	Available Service
UART1	√	√	√	√	√	√	√	√	DATA ATC (AT Command)
UART2	√	√							TRACE

Table-4 the capability and service for each UART

UART1 fully supports RS-232C 8-wires, and it can be used for DATA service as well as ATC service which allow TE to send/receive AT Commands related to SMS/Voice, Call/Phonebook/Phone status and so on. If CMUX is activated on UART1, It's possible to use several services such as DATA and ATI through virtual channel provided by CMUX, at the same time.
More detailed information for CMUX, refer to "5 CMUX Interface".

UART2 only support RS-232C 2-wries, UART2 is dedicated only for TRACE because of its capability limitation (No control pin such as RTS/CTS/DTR/DSR/RI/DCD)

Table-5 shows the available baud rate on DE910 Family's UART.

Baud Rate (BPS)	UART1	UAR2
300	√	√
600	√	√
1200	√	√
2400	√	√
4800	√	√
9600	√	√
19200	√	√
38400	√	√
57600	√	√
115200	√	√
230400	√	√
460800	√	√
921600		√
3200000	√	√
4000000	√	√

Table-5 the available baud rate for each UART

NOTE:

AT+IPR and AT#DIAGIPR used to specify the baud rate on UART1 and UART2 respectively.

TRACE service assigned to one channel at a time and the default TRACE channel is USB-DIAG. AT#DIAGPT used to specify the port for TRACE service.

More detailed information, refer to DE910 Family AT Commands Reference Guide Rev.3

4. USB Interface

This paragraph deals with the capability and an available service for each USB interface.
DE910 Family allows DTE to use the following USB composition.

- USB Composite Device 1
  - MDM / AUX / NMEA / DIAG

USB Composite Device 1 provides TE with 4 USB interface, which allow TE to use GPS service as well as ATC/DATA/TRACE service

DE910 Family products provide ACM functionality (RS-232C-RI/DSR/DTR/DCD serial emulation) only on MDM and AUX

Below table illustrates the information and available service for each USB interfaces

	Vendor ID	Product ID	Interface Number	Number of Endpoint	ACM Serial Emulation	Available Service
DIAG	0x1BC7	0x1010	0x00	2		TRACE FWU
NMEA	0x1BC7	0x1010	0x01	2		GPS
AUX	0x1BC7	0x1010	0x02	3	√	ATC DATA
MDM	0x1BC7	0x1010	0x03	3	√	ATC DATA

Table-6 the information and service for USB Composite

MDM/AUX interface support ACM functionality, which allows TE use this interface as the high speed DATA port such as DUN service under 1x/EV-DO network as well as ATI service.
DIAG is used only for TRACE and firmware upgrade with TFI. And DE910 Family products offer two TRACE channel (USB2 and UART2), which never be operated parallel with each other. Once one is activated as TRACE, other will be deactivated, automatically.

5. CMUX Interface

This paragraph describes how to use CMUX on DE910 Family. CMUX can be activated only on UART1/USB-MDM/USB-AUX.
This is useful to TE has only one physical channel like as UART1 and want to get the benefit provided by multiple channels. It allows TE to transmit and receive DATA (DUN/Internal TCP/IP) service and ATC service such as Call Control/SMS/Phonebook and so on through CMUX(3GPP 27.010) channels, simultaneously.

5.1. Implementation feature

The most important characteristics of CMUX are described below.

- 3GPP 27.010 Basic options.
- Support 4 DLCI channels on UART1/USB-MDM/USB-AUX
- Each DLCI channel shared the profile setting
  (Not allowed to support the independent profile setting, according to DLCI channel)
- DLCI4 is dedicated to NMEA output.
- DLCI channels have its own independent flow control

5.2. CMUX Protocol

5.2.1. CMUX Frame Structure

All information transmitted between MS and TE with the frame based on the following Structure:

Flag	Address	Control	Length Indicator	Information	FCS	Flag
1 octet	1 octet	1 octet	1 or 2 octets	Unspecified length but integral number of octets	1 octet	1 octet

Flag Octet

Each frame begins and ends with a flag octet defined as
Binary: 11111001 or
Hexadecimal: 0xF9

Address Octet
The form of address octet is as follows:

0	1	2	3	4	5	6	7
EA	C/R	D L C I					

EA: Extension Bit
Should always have the value 1 as the basic option of the protocol

C/R: Command Response
The C/R (command/response) bit identifies the frame as either a command or a response. In conformance with the standard HDLC rules, a command frame contains the address of the data link connection entity to which it is transmitted while a response frame contains the address of the data link connection entity transmitting the frame.

Command/response	Direction			C/R value
Command	TE	→	MS	1
	MS	→	TE	0
Response	TE	→	MS	0
	MS	→	TE	1

Example:

Let's suppose that TE is the one that takes the initiative to initialize the multiplexer (i.e. sends the SABM command at DLCI 0) and that the MS accepts the initialization of the multiplexer (i.e. sends the UA response at DCLI 0).

DLCI: Data Link Connection Identifier
DLCI value identifies the Virtual Port inside MS with the following assignment

DLCI	Virtual Port Type
0	Reserved to Control Channel
1	Virtual Port#1
2	Virtual Port#2
3	Virtual Port#3
4	Virtual Port#4

Control Field
The content of the control field defines the type of frame as in the following table:

Frame Type	0	1	2	3	4	5	6	7
SABM(Set Asynchronous Balanced Mode)	1	1	1	1	P/F	1	0	0
UA(Unnumbered Acknowledgement)	1	1	0	0	P/F	1	1	0
DM(Disconnected Mode)	1	1	1	1	P/F	0	0	0
DISC(Disconnect)	1	1	0	0	P/F	0	1	0
UIH(Unnumbered Information with Header check)	1	1	1	1	P/F	1	1	1

P/F stands for Poll/Final bit:
Command: P=1
Response: F=1

SABM (Set Asynchronous Balanced Mode)
The SABM command is used by TE to start the HDLC Connection and MS will answer to this command with an UA Frame.

UA (Unnumbered Acknowledgement)
The UA response is sent by MS as an acknowledgement that a SABM or DISC command was accepted.

DM (Disconnected Mode)
In case module rejects SABM or DISC command it will send DM response, this happens if for example a SABM is sent for a DLCI not supported. Or if a DISC is sent to a DLCI Address already closed.

DISC (Disconnect)
The DISC is used to close a previously established connection. If TE sends a disc for the DLCI 0(the control channel), all the established channels will be closed. MS will answer to this command with an UA Frame.

UIH (Unnumbered Information)
Please refer to the following chapters for the detailed information about UIH

Length Indicator
This Octet specifies the length of the information field

0	1	2	3	4	5	6	7
EA	L1	L2	L3	L4	L5	L6	L7

E/A Bit should be 1 in case 7 bits are enough for the length (len <= 127) otherwise length should be coded with two octets as described below:

Octet 1

0	1	2	3	4	5	6	7
0	L1	L2	L3	L4	L5	L6	L7

Octet 2

0	1	2	3	4	5	6	7
1	L9	L10	L11	L12	L13	L14	L15

NOTE:

Since the maximum frame length used by Telit implementation is 128, Octet 2 never used.

Codification of the octet (Octet 1=0 and Octet 2=1) derives from 3GPP 27.010

Information Data
The information field is the payload of the frame and carries the user data. The field exists only for frame type that contains UIH Control Field. The P/F bit should be set to value 0 when this field is sent.

FCS (Frame Checking Sequence)
The FCS is calculated over the entire frame, but excluding the flags. Only in case of UIH frame the FCS will not be calculated over the information field.
The FCS is the ones complement of the sum (modulo 2) of
The remainder of $X^k(x^7 + x^6 + x^5 + x^4 + x^3 + x^2 + x^1 + 1)$ divided (modulo 2) by the generator polynomial $x^8 + x^2+x+1$, where k is the number of bits in the frame
See specific chapter with code examples for more implementation details.

5.2.2. UIH Control Channel Frame Coding

DLCI shall always have the value 0

Type	Length Indicator	Value
1 octet	1or2 octets	N Octet

Type Octet:

0	1	2	3	4	5	6	7
EA	C/R	T Y P E					

EA: Extension Bit
Will always be 1.

C/R: Identifies if it is a Command or Response

Length indicator
Specifies the length of the information field and it is code like in the CMUX Frame Structure paragraph.

Value
The number of octets is specified by the Length Indicator and depends on the type of the command.

The available command types are listed below:

5.2.2.1. Multiplexer close down (CLD)

The multiplexer close down command is used to reset the link into normal AT command mode without multiplexing

Type	Len
3	0

5.2.2.2. Test Command (Test)

The test command is used to test the connection between MS and TE. The length byte describes the number of values bytes, which are used as a verification pattern. The opposite entity shall respond with exactly the same value bytes.

Type	Len	Value 1	Value 2	Value	Value N
4	N	Any Char	Any Char	Any Char	Any Char

5.2.2.3. Modem Status Command (MSC)

This command is used to send V.24 signal info. This signal is independent for each instance. If DCE receives a MSC command it will always answer with another MSC that will contain its V24 status.

Format without Break Indication

Type	Len	Value 1	Value 2
7	2	DLCI	V24 Octet

Format with Break Indication

Type	Len	Value 1	Value 2	Value 3
7	2	DLCI	V24 Octet	Break Octet

V24 Octet from MS to TE

0	1	2	3	4	5	6	7
1	FC	DSR	CTS	0	0	RING	DCD

V24 Octet from TE to MS

0	1	2	3	4	5	6	7
1	FC	DTR	RTS	0	0	0	0

FC : This bit is set to 1 when MS or TE is not able to accept any frames.
CTS: This bit is set to 1 when MS is able to receive data (ref. command &K,\Q and related)
RTS: This bit is set to 1 when TE is able to receive data (ref. command &K,\Q and related)
DSR: This bit is set to 1 when MS is ready to communicate (ref. command &S and related)
DTR: This bit is set to 1 when TE is ready to receive data (ref. command &D and related)
RING: This bit is set to 1 when MS receive an incoming call (ref. command \R, and related)
DCD: This bit is set to 1 when MS has an active data connection (ref. command &C, and related)

NOTE:

When a new instance is established the default setting are FC=1, RTS=0, DTR=0, this means that MS will not be able to send the data to TE until user change the default setting to FC=0, RTS=1, DTR=1. TE will send an MSC command to change this value before starting sending data

Break Octet

0	1	2	3	4	5	6	7
1	0	0	0	0	0	0	0

This octet will be sent each time a Break Signal is simulated.

5.2.2.4. Power Saving Control (PSC)

This command has no effect on DE910 Family. DE910 Family doesn't support power saving control in the CMUX mode.

Type	Len	Value 1
6	1	Power Saving Mode

NOTE:

The power saving control is available after MS exit from CMUX mode

For more detailed information about the power saving control, refer to the power saving user guide

Chapter 5.4.7 of 3GPP 27.010 are not applicable to DE910 Family

5.2.2.5. Non Supported Command Response (NSC)

This response is sent in case a command type is not supported by the receiving entity.

Type	Len	Value 1
8	1	Command Not Supported

5.2.3. UIH Data Channel Frame Coding

DLCI can assume values: 1, 2, 3 or 4

Length Indicator	User Data
1or2 octets	n Octet

Length indicator
Specifies the length of the information field and it is code like in the CMUX Frame Structure paragraph.

User Data
The Number of data is defined by the Length Indicator

5.2.4. CMUX Operation procedure

Figure-5 illustrates how to set up CMUX mode via physical line (UART) and shutdown this mode and restore to AT command mode, gracefully.

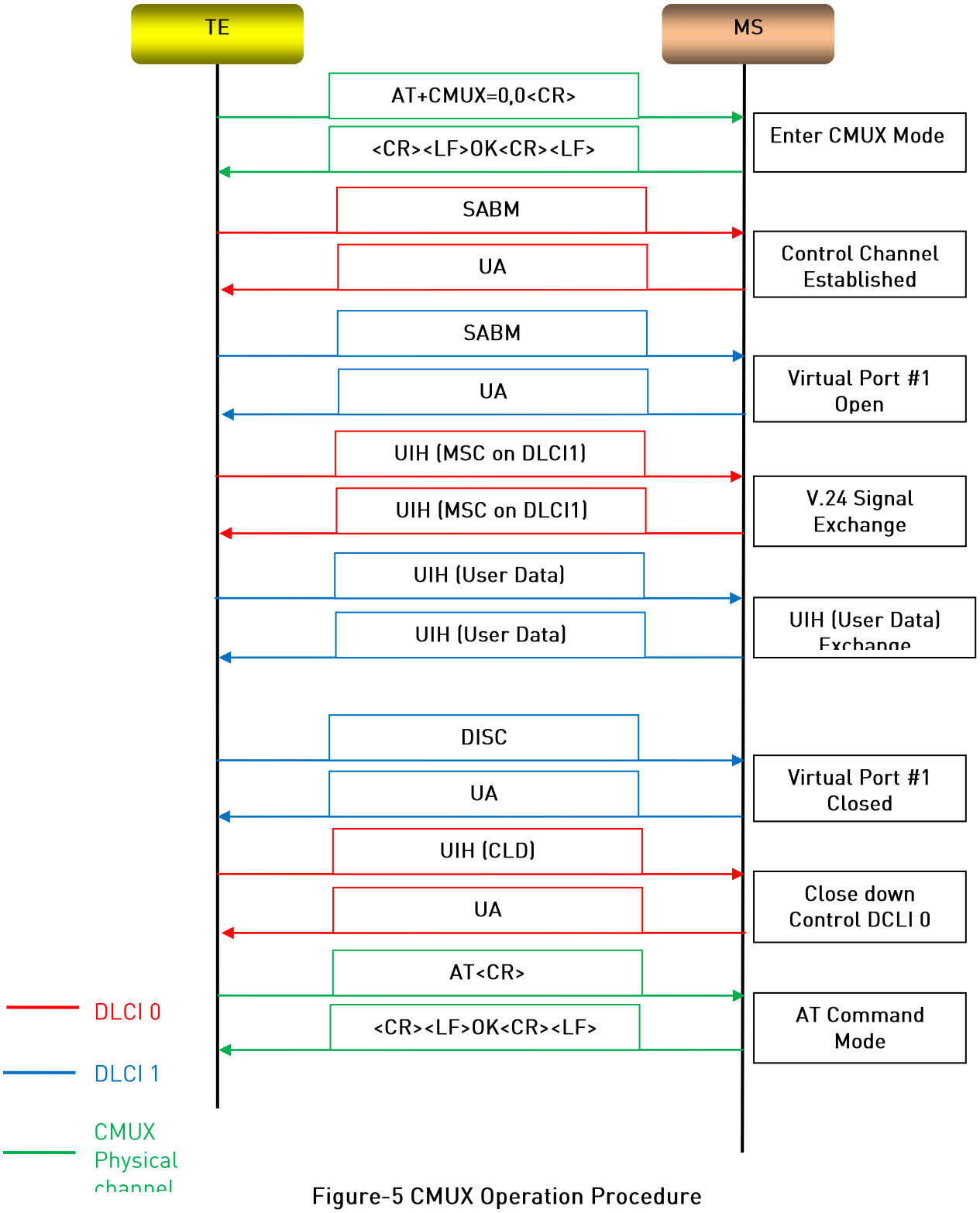

Figure-5 CMUX Operation Procedure

5.2.5. FCS calculation

The following part of the code is provided to make the calculation of FCS.

```
Static const unsigned char crctable[256] = { //reversed, 8-bit, poly=0x07
0x00, 0x91, 0xE3, 0x72, 0x07, 0x96, 0xE4, 0x75, 0x0E, 0x9F, 0xED, 0x7C, 0x09, 0x98, 0xEA, 0x7B,
0x1C, 0x8D, 0xFF, 0x6E, 0x1B, 0x8A, 0xF8, 0x69, 0x12, 0x83, 0xF1, 0x60, 0x15, 0x84, 0xF6, 0x67,
0x38, 0xA9, 0xDB, 0x4A, 0x3F, 0xAE, 0xDC, 0x4D, 0x36, 0xA7, 0xD5, 0x44, 0x31, 0xA0, 0xD2, 0x43,
0x24, 0xB5, 0xC7, 0x56, 0x23, 0xB2, 0xC0, 0x51, 0x2A, 0xBB, 0xC9, 0x58, 0x2D, 0xBC, 0xCE, 0x5F,
0x70, 0xE1, 0x93, 0x02, 0x77, 0xE6, 0x94, 0x05, 0x7E, 0xEF, 0x9D, 0x0C, 0x79, 0xE8, 0x9A, 0x0B,
0x6C, 0xFD, 0x8F, 0x1E, 0x6B, 0xFA, 0x88, 0x19, 0x62, 0xF3, 0x81, 0x10, 0x65, 0xF4, 0x86, 0x17,
0x48, 0xD9, 0xAB, 0x3A, 0x4F, 0xDE, 0xAC, 0x3D, 0x46, 0xD7, 0xA5, 0x34, 0x41, 0xD0, 0xA2, 0x33,
0x54, 0xC5, 0xB7, 0x26, 0x53, 0xC2, 0xB0, 0x21, 0x5A, 0xCB, 0xB9, 0x28, 0x5D, 0xCC, 0xBE, 0x2F,
0xE0, 0x71, 0x03, 0x92, 0xE7, 0x76, 0x04, 0x95, 0xEE, 0x7F, 0x0D, 0x9C, 0xE9, 0x78, 0x0A, 0x9B,
0xFC, 0x6D, 0x1F, 0x8E, 0xFB, 0x6A, 0x18, 0x89, 0xF2, 0x63, 0x11, 0x80, 0xF5, 0x64, 0x16, 0x87,
0xD8, 0x49, 0x3B, 0xAA, 0xDF, 0x4E, 0x3C, 0xAD, 0xD6, 0x47, 0x35, 0xA4, 0xD1, 0x40, 0x32, 0xA3,
0xC4, 0x55, 0x27, 0xB6, 0xC3, 0x52, 0x20, 0xB1, 0xCA, 0x5B, 0x29, 0xB8, 0xCD, 0x5C, 0x2E, 0xBF,
0x90, 0x01, 0x73, 0xE2, 0x97, 0x06, 0x74, 0xE5, 0x9E, 0x0F, 0x7D, 0xEC, 0x99, 0x08, 0x7A, 0xEB,
0x8C, 0x1D, 0x6F, 0xFE, 0x8B, 0x1A, 0x68, 0xF9, 0x82, 0x13, 0x61, 0xF0, 0x85, 0x14, 0x66, 0xF7,
0xA8, 0x39, 0x4B, 0xDA, 0xAF, 0x3E, 0x4C, 0xDD, 0xA6, 0x37, 0x45, 0xD4, 0xA1, 0x30, 0x42, 0xD3,
0xB4, 0x25, 0x57, 0xC6, 0xB3, 0x22, 0x50, 0xC1, 0xBA, 0x2B, 0x59, 0xC8, 0xBD, 0x2C, 0x5E, 0xCF
};

static UINT8 CalcFCS( UINT8 *buf, int len)
{
 UINT8 FCS=0xFF;
 if ((buf[1]& CMUX_PF_BIT_NEG) == CMUX_UIH_FRAME)
   len = 3;

 while (len--) FCS=crctable[FCS^*buf++];

 return (0xFF-FCS);
}


static int CheckFCS( UINT8 *buf, int len)
{
 UINT8 FCS=0xFF;
 UINT8 crc;

 if ((buf[1]& CMUX_PF_BIT_NEG) == CMUX_UIH_FRAME)
 {
   crc=buf[len-1];
```

```
  if (buf[2]&0x1)
    len = 3;
  else
    len = 4;
  while (len--)
  {
    FCS=crctable[FCS^*buf++];
  }
  FCS=crctable[FCS^crc];
 }
 else
  while (len--)
  {
    FCS=crctable[FCS^*buf++];
  }
 /*0xCF is the reversed order of 11110011.*/
 return (FCS==0xCF);
}
```

5.3. Integrator Hints

5.3.1. Basic requirement

The customer/integrator observes the following requirement in order to design its own multiplexer application.

- Support the basic option according to 3GPP 27.010
- Character framing must be configured for 8 data bits, no parity and 1 stop bit.
- Use hardware flow control with multiplexer mode and set before entering in multiplexer mode with command AT&K3
- DTR Lines should be set correctly (pull-up), since a transition of the DTR cause closing of multiplexer.

5.3.2. Restriction

If DE910 Family is operating in multiplexer mode, the following restrictions will be applied:

- Software flow control XON/XOFF flow control is not supported in multiplexer mode.
- The escape sequences `+++` will not be detected by MS, It is responsibility of the application to use the break octet of the MSC (Modem Status Command) instead. Break octet of the MSC produce the same effect as `+++` escape sequence
- The commands reported in the following table ignored in case of multiplexer mode. To be more precise it is possible to read/write values but the will have no effect on the behavior of MS.

AT+IPR	
AT+IFC	
AT+ICF	
ATS2 ATS12 `+++`	Escape sequence is not handled by the Module but shall be handled by the application that will send a BREAK signal to MS using the MSC command
AT+CMUX	
AT&F,ATZ, AT#Z	Default value of previous ignored command are reset but not applied

Table-7 the ignored AT Command List on CMUX Mode

5.4. Telit Serial Port Mux

5.4.1. Interface Specification

Telit has developed a tool called Telit Serial Port MUX in order to make easier application of the CMUX mode. It is a PC interface able to manage data coming/to or being sent from/to CMUX. This target has been achieved by creating up to four serial virtual ports on the PC and using a specific communication protocol to manage the communication between the real serial COM that changes data with CMUX and each of the virtual port

5.4.2. Scenario

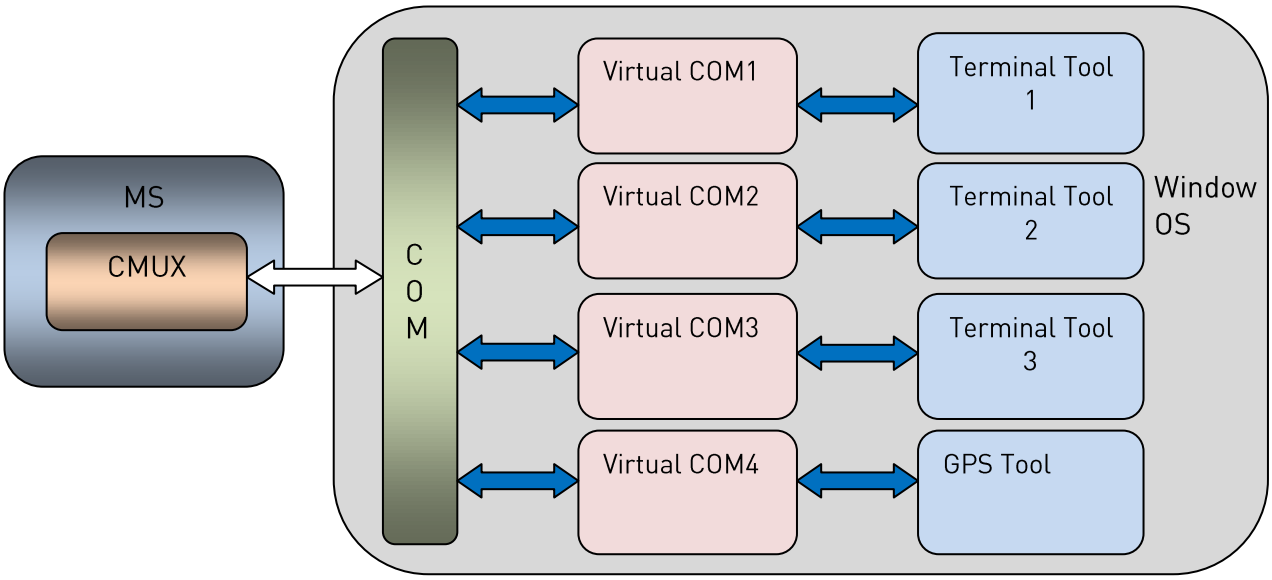

Figure-6 Virtual Port configuration on Window OS

As you can see, it's possible to run 3 different applications using the CMUX channels. For example 3- HyperTerminal can send AT commands at the same via the CMUX channels

5.4.3. Graphical Interface

Telit Serial Port Mux application on your PC after installation looks as in the following figure:

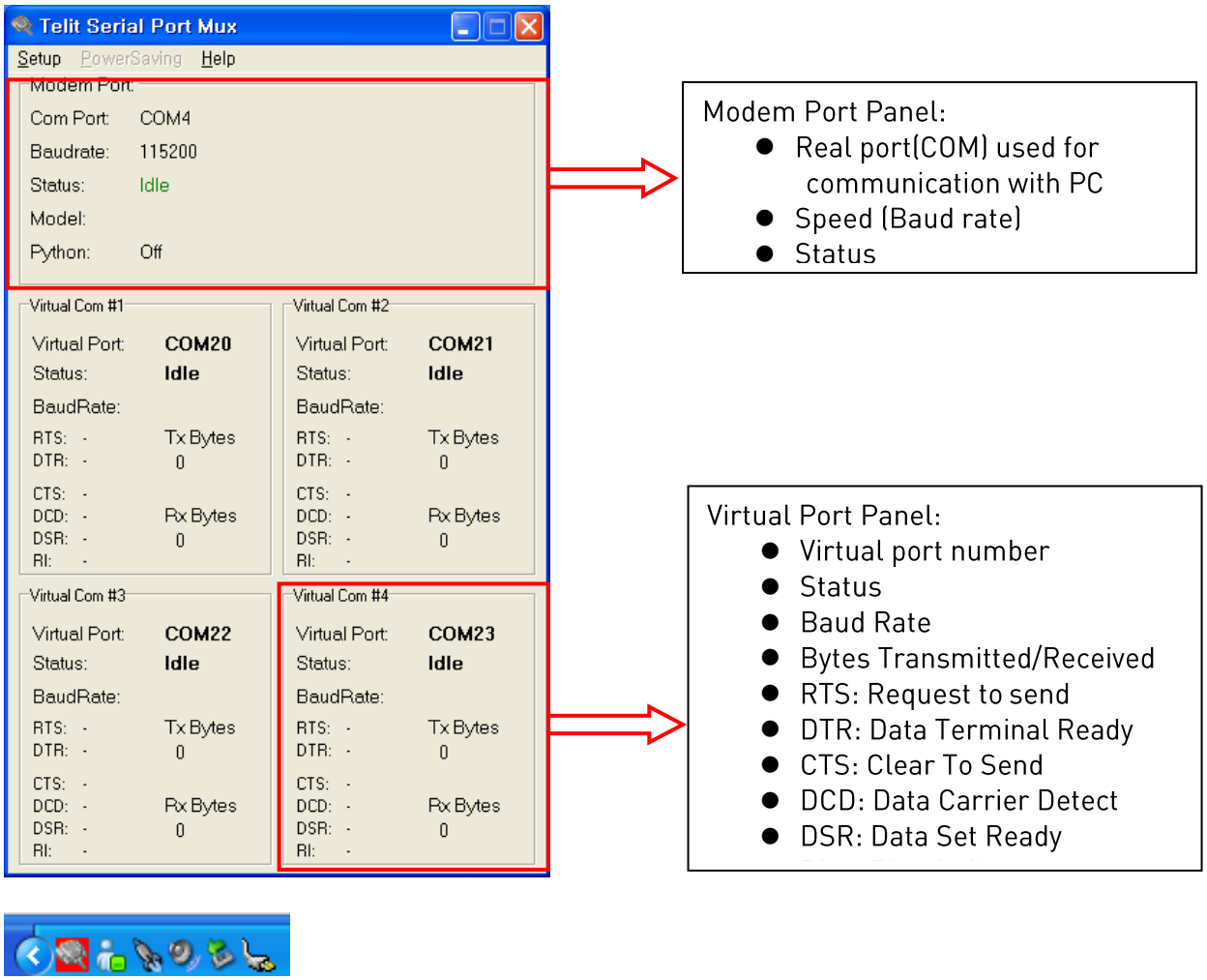

Figure-7 Telit Serial Port Mux Graphical Interface

Modem Port Panels: contains information about the modem connected to your PC, such as:

1. Which COM on your PC will be used to transfer data(this can be set during the initial setup or in the Setup voice of the application menu)
2. COM Speed selected.
3. Connection Status: it can be "idle" or "error" when CMUX is disconnected, "connecting" when PC is trying to connect to CMUX and "connected" when CMUX is connected, successfully
4. Indication about the model of the modem connected.

Virtual Port Panel: here you can find all the information about the connection using a Virtual COM installed on your PC:

1. Virtual COM number
2. Virtual Port Status: it can be "idle", "Error", "Opened".

3. Baud Rate
4. Number of bytes received and transmitted(RX Bytes, TX Bytes)
5. All the common serial port signal like RTS,DTR,CTS,DCD,DSR and RI

Tray Icon: indicates the status of the Serial Port Mux

1.  CMUX connected: the Tray Icon is blinking
2.  CMUX disconnected or connecting
3.  CMUX error.

5.4.4. Application Setup

In order to select the number of Virtual ports that are going to be created, real COM ports that are going to be used and their speed you should go to the Setup menu. These setups can be done during the tool installation and also when the tool is running

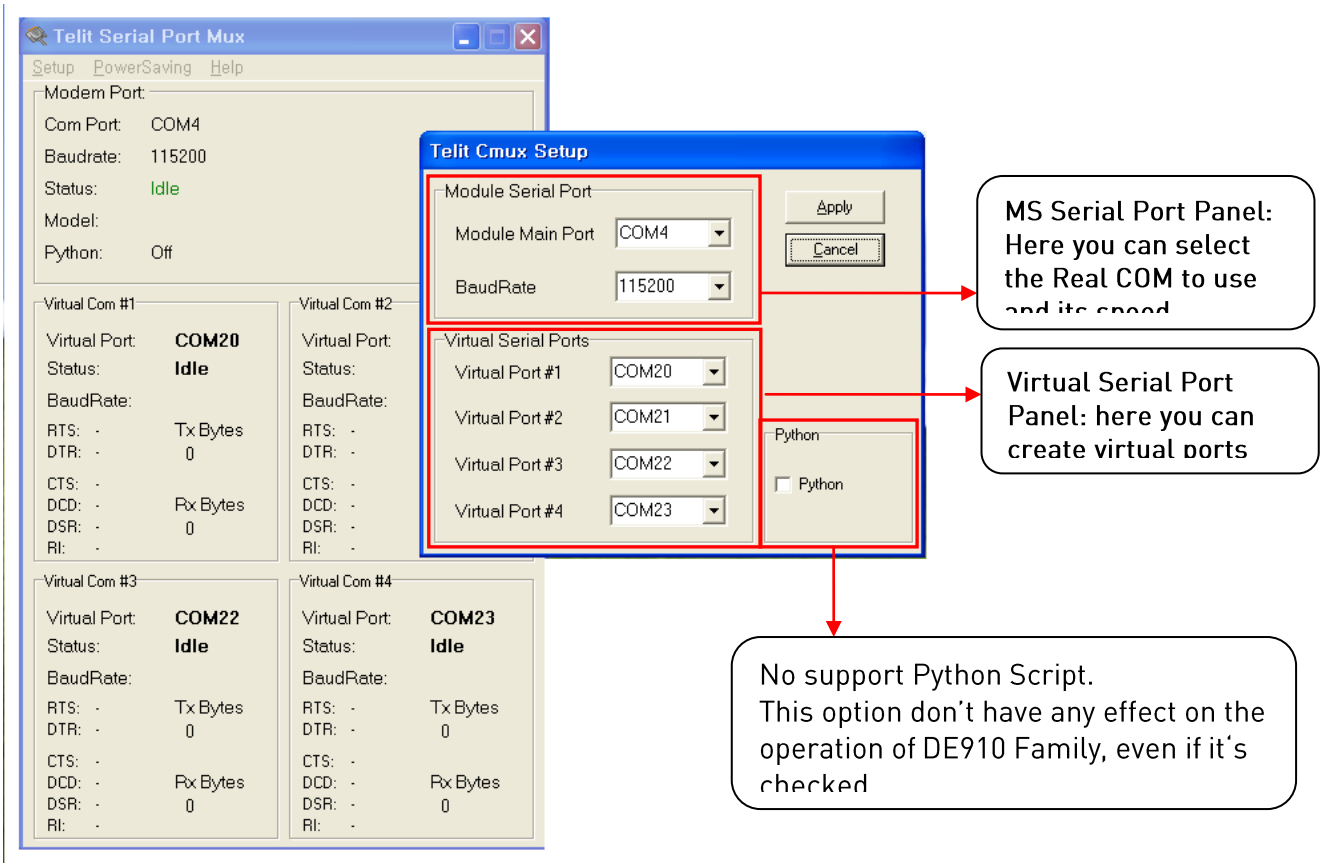

Figure-8 Telit Serial Port Mux Setup

Virtual Ports created can also be visualized in the Device Manager.

6. List of acronyms

Abbreviation	Description
ABM	Asynchronous Balanced Mode
ACM	Abstract Control Model
ATC	AT Command
CTS	Clear To Send (Circuit 106)
DCD	Data Carrier Detect (Circuit 109)
DCE	Data Communications Equipment
DCLI	Data Link Connection Identification
DM	Disconnected Mode
DSR	Data Service Ready (Circuit 107)
DTE	Data Terminal Equipment
DTR	Data Terminal Ready (Circuit 108/2)
DUN	Dial Up Networking
FCS	Frame Check Sequence
FWU	Firmware Upgrade
GPRS	General Packet Radio Service
GPS	Global Positioning System
NMEA	National Marine Electronics Association
MS	Mobile Station
MSC	Modem Status Command
PSC	Power Saving Control
DUN	Packet Switch Data
RD	Received Data (Circuit 104)
RI	Ring Indicator (Circuit 125)
RS-232C	Recommended Standard 232C
RTS	Request To Send (Circuit 105)
SABM	Set Asynchronous Balanced Mode
SMS	Short Message Service
TD	Transmitted Data (Circuit 103)
TE	Terminal Equipment
TFI	Telit Firmware Installer
UART1	Universal Asynchronous Receiver Transmitter 1
UART2	Universal Asynchronous Receiver Transmitter 2
UIH	Unnumbered Information with header Check
URC	Unsolicited Result Code
USB	Universal Serial Bus
USB AUX	Telit USB Auxiliary Port
USB DIAG	Telit Diagnostics Interface
USB MDM	Telit HSDPA /CDMA Wireless Modem
USB NMEA	Telit Nmea Port

7. Document History

Revision	Date	Changes
Rev.0	2013-07-11	First issue, SW version 15.00.xx2