

# **Developer's Guide:**

## **SMS with the SMS PDU-mode**

The command descriptions or example sequences in this document imply no liability or warranty in any way. The author therefore will take no responsibility and will accept no liability which results of using the content of this document in any way.

All rights reserved. No part of this work covered by the copyrights hereof may be reproduced or copied in any form or by any means (graphic, electronic, or mechanical, including photocopying, taping, or information storage and retrieval systems) without written permission of the publisher.

<b>DEVELOPER'S GUIDE:</b>	<b>1</b>
<b>SMS WITH THE SMS PDU-MODE</b>	<b>1</b>
<b>1. INTRODUCTION</b>	<b>3</b>
<b>2. OVERVIEW:</b>	<b>4</b>
<b>2.1 SMS-DELIVER (Mobile Terminated)</b>	<b>4</b>
<b>2.2 SMS-SUBMIT (Mobile Originated)</b>	<b>4</b>
<b>3. PARAMETER DESCRIPTION</b>	<b>6</b>
<b>3.1 Service Center address information element (SCA info element)</b>	<b>6</b>
<b>3.2 Protocol Data Unit Type (PDU Type)</b>	<b>6</b>
<b>3.3 Message Reference MR</b>	<b>7</b>
<b>3.4 Originator Address OA Destination Address DA</b>	<b>8</b>
<b>3.5 Protocol Identifier PID</b>	<b>8</b>
<b>3.6 Data Coding Scheme DCS</b>	<b>9</b>
<b>3.7 Service Center Time Stamp SCTS</b>	<b>10</b>
<b>3.8 Validity Period VP</b>	<b>11</b>
<b>3.9 User Data Length UDL and User Data UD</b>	<b>11</b>
<b>4. PDU EXAMPLES</b>	<b>12</b>
<b>5. APPENDIX</b>	<b>14</b>

## 1. Introduction

To use the SMS you have to declare the number of the SMSC<sup>1</sup> (Short Message Service Center) in the MS (Mobile Station), provided that the MS support SMS-MO (Short Message Service-Mobile Originated).

The SIEMENS **S25, SL10, S10, S10 active, E10, M1 Module** for example are providing SMS-MO.

card	SMSC-number (Germany)
D1	491710760000
D2	491722270000

At the MOBILE you enter the SMSC-number with the AT+Celular command:

```
at+csca = "<SMSC-number>"
```

If the receiver of the SMS possesses a D2 card, the AT command has to be entered in the following way:

```
at+csca = "+491722270000"
```

With the command

```
at+csca?
```

you can question the actual adjusted SMSC-number

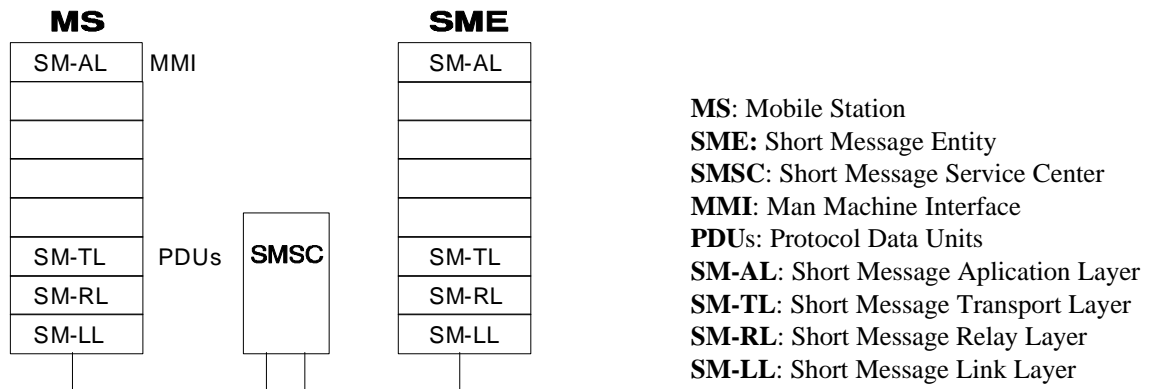
**Ask your network operator for the right SMSC-number !!**

**! notice: In addition to the AT+CSCA command it is possible to enter The SMSC-number in front of the Protocol Data Unit (PDU) see chapter 3.1!**

---

<sup>1</sup> sometimes you can see the abbreviation SC (Service Center) that means the same as SMSC

## 2. Overview:



The MMI is based on the command set of AT+Cellular, and could be realized by means of a terminal (for example Triodata, Telix, WIN-Terminal) or the display of a handy.

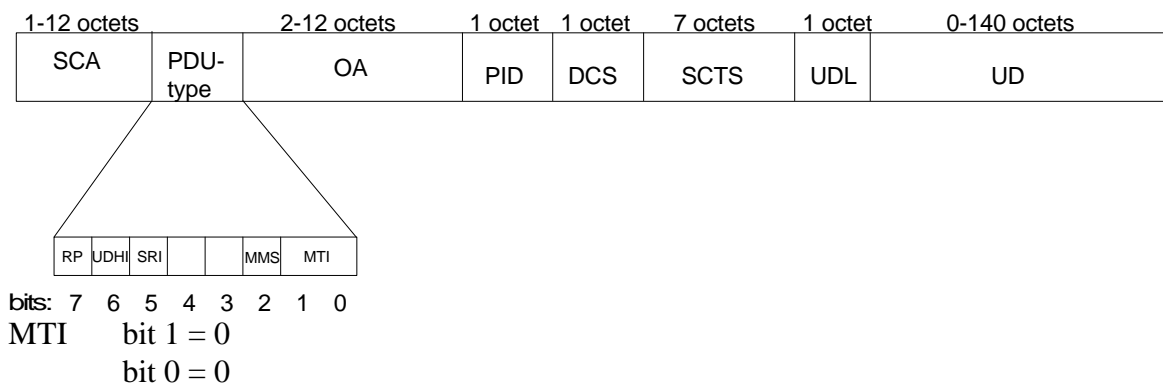
The SM-TL provides a service to the Short Message Application Layer. This service enables the SM-AL to transfer short messages to its peer entity, receive short messages from its peer entity and receive reports about earlier requests for short messages to be transferred.

The SM-TL communicates with its peer entity with six several PDUs (Protocol Data Units):

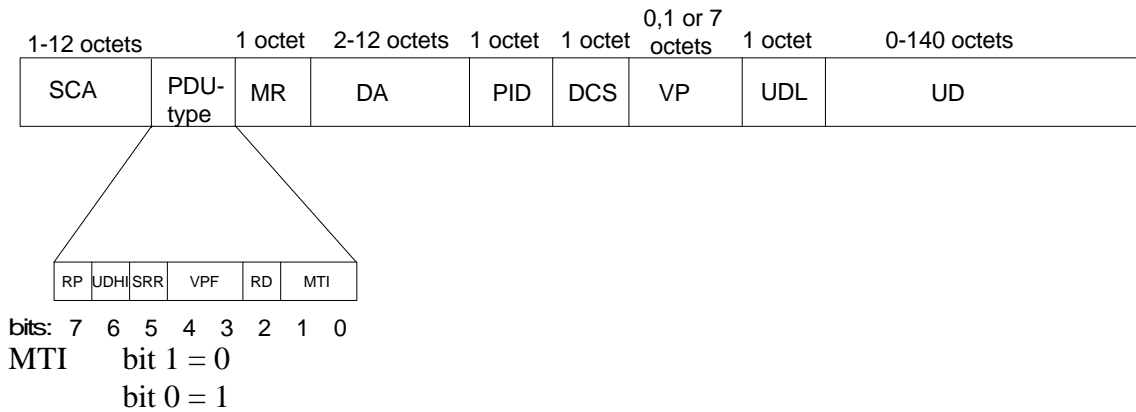
- **SMS-DELIVER**, conveying a short message from the SMSC to the MS
- SMS-DELIVER-REPORT, conveying a failure cause (if necessary)
- **SMS-SUBMIT**, conveying a short message from the MS to the SMSC
- SMS-SUBMIT-REPORT, conveying a failure cause (if necessary)
- SMS-STATUS-REPORT, conveying a status report from the SMSC to the MS
- SMS-COMMAND, conveying a command from the MS to the SMSC

The SMS-DELIVER and SMS-SUBMIT PDUs are described in the following sections.

### 2.1 SMS-DELIVER (Mobile Terminated)



### 2.2 SMS-SUBMIT (Mobile Originated)

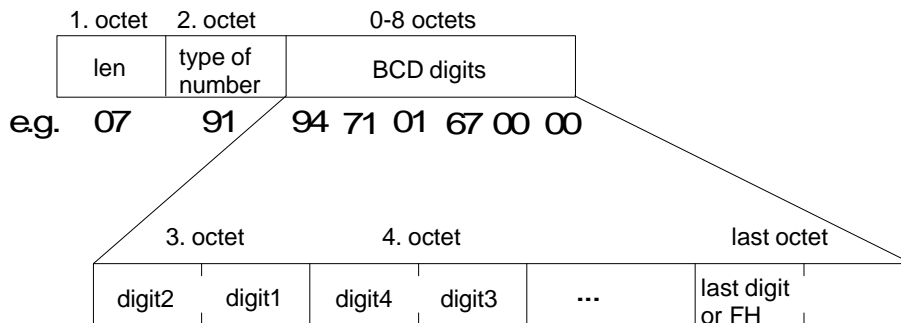


**! notice: Any unused bits will be set to zero by the sending entity and will be ignored by the receiving entity !**

SCA	Service Center Address - information element	Telephone number of the Service Center
PDU Type	Protocol Data Unit Type	
MR	Message Reference	successive number (0..255) of all SMS-SUBMIT Frames set by the MOBILE
OA	Originator Address	Address of the originating SME
DA	Destination Address	Address of the destination SME
PID	Protocol Identifier	Parameter showing the SMSC how to process the SM (as FAX, Voice etc)
DCS	Data Coding Scheme	Parameter identifying the coding scheme within the User Data (UD)
SCTS	Service Center Time Stamp	Parameter identifying time when the SMSC received the message
VP	Validity Period	Parameter identifying the time from where the message is no longer valid in the SMSC
UDL	User Data Length	Parameter indicating the length of the UD-field
UD	User Data	Data of the SM
RP	Reply Path	Parameter indicating that Reply Path exists
UDHI	User Data Header Indicator	Parameter indicating that the UD field contains a header
SRI	Status Report Indication	Parameter indicating if the SME has requested a status report
SRR	Status Report Request	Parameter indicating if the MS has requested a status report
VPF	Validity Period Format	Parameter indicating whether or not the VP field is present
MMS	More Messages to Send	Parameter indicating whether or not there are more messages to send
RD	Reject Duplicate	
MTI	Message Type Indicator	Parameter describing the message type 00 means SMS-DELIVER 01 means SMS-SUBMIT

## 3. Parameter description

### 3.1 Service Center address information element (SCA info element)



**len:**

The octet "len" contains the number of octets required for the number of the Service Center plus the 1 byte „type of number“

**type of number:**

81H: the following number is national

91H: the following number international

(for further information see GSM 04.08 chapter 10.5.4.6)

**octet:**

One octet includes two BCD-digit Fields

If the called party BCD number contains an odd number of digits, the last digit shall be filled with an end mark coded as "FH"

**Example:**

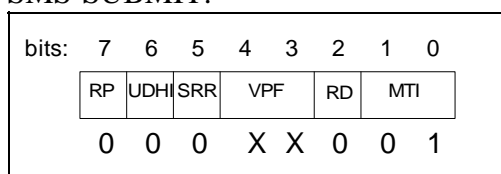
if you have the SC-number +49 171 0760000 you have to type:

**0791947101670000**

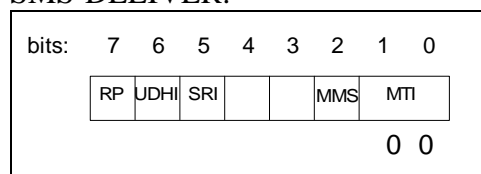
**! notice: If the „len“ field is set to Zero the MOBILE takes the default value of the Service Center address set by the AT+CSCA command!**

### 3.2 Protocol Data Unit Type (PDU Type)

**SMS-SUBMIT:**



**SMS-DELIVER:**



**! notice: you have to write the PDU-type in Hex-Format, a possible example is "11H" !**

RP:     **0**     Reply Path parameter is not set in this PDU  
           **1**     Reply Path parameter is set in this PDU

UDHI: **0**      **The UD field contains only the short message**  
**1**      **The beginning of the UD field contains a header in addition of the short message**

SRI: (is only set by the SMSC)

**0**      A status report will not be returned to the SME  
**1**      A status report will be returned to the SME

SRR: **0**      **A status report is not requested**  
**1**      **A status report is requested**

VPF: bit4 bit3  
**0 0**      **VP field is not present**  
**0 1**      Reserved  
**1 0**      **VP field present an integer represented (relative)**  
**1 1**      **VP field present an semi-octet represented (absolute)**

any reserved values may be rejected by the SMSC

MMS: (is only set by the SMSC)

**0**      More messages are waiting for the MS in the SMSC  
**1**      No more messages are waiting for the MS in the SMSC

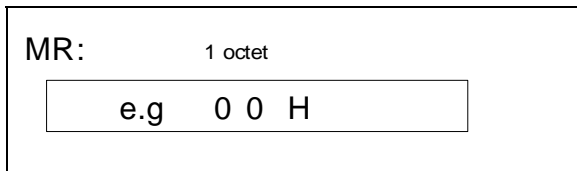
RD: **0**      **Instruct the SMSC to accept an SMS-SUBMIT for an short message still held in the SMSC which has the same MR and DA as a previously submitted short message from the same OA.**  
**1**      **Instruct the SMSC to reject an SMS-SUBMIT for an short message still held in the SMSC which has the same MR and DA as a previously submitted short message from the same OA.**

MTI: bit1 bit0 Message type  
**0 0**      **SMS-DELIVER (SMSC ==> MS)**  
**0 0**      **SMS-DELIVER REPORT (MS ==> SMSC, is generated automatically by the MOBILE, after receiving a SMS-DELIVER)**  
**0 1**      **SMS-SUBMIT (MS ==> SMSC)**  
**0 1**      SMS-SUBMIT REPORT (SMSC ==> MS)  
**1 0**      SMS-STATUS REPORT (SMSC ==> MS)  
**1 0**      **SMS-COMMAND (MS ==> SMSC)**  
**1 1**      Reserved

(the fat-marked lines represent the features supported by the MOBILE)

**! notice: not every PDU Type is supported by the Service Center !**

### 3.3 Message Reference MR

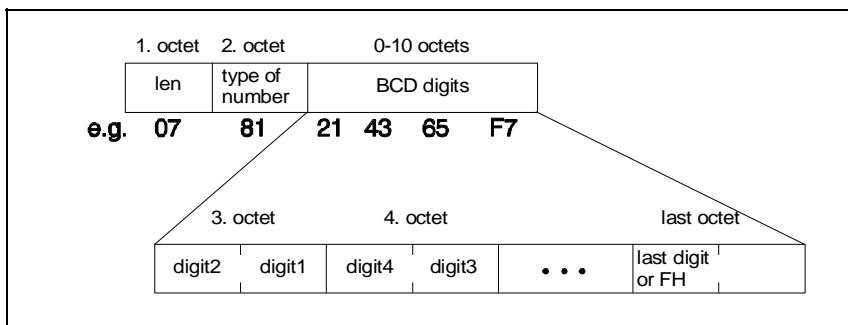


The MR field gives an integer (0..255) representation of a reference number of the SMS-SUBMIT submitted to the SMSC by the MS.

**! notice: at the MOBILE the MR is generated automatically, -anyway you have to generate it-  
a possible entry is for example "00H" !**

### 3.4 Originator Adress OA Destination Adress DA

OA and DA have the same format explained in the following lines:



**len:**

The octet "len" contains the number of BCD digits

**type of number:**

81H: the following number is national

91H: the following number international

(for further information see GSM 04.08 chapter 10.5.4.6)

**BCD-digits:**

The BCD-digit Field contains the BCD-number of the Destination e.g. of the Originator

If the called party BCD number contains an odd number of digits, the last digit shall be filled with an end mark coded as "FH"

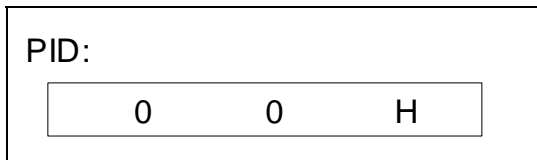
**Example:**

if you have the national number 1234567 you have to type:

**0781214365F7**

### 3.5 Protocol Identifier PID





The PID is the information element by which the Transport Layer either refers to the higher layer protocol being used, or indicates interworking with a certain type of telematic device. here are some examples of PID codings:

**00H: The PDU has to be treat as a short message**

**41H: Replace Short Message Type1**

**42H: Replace Short Message Type2**

**43H: Replace Short Message Type3**

.....

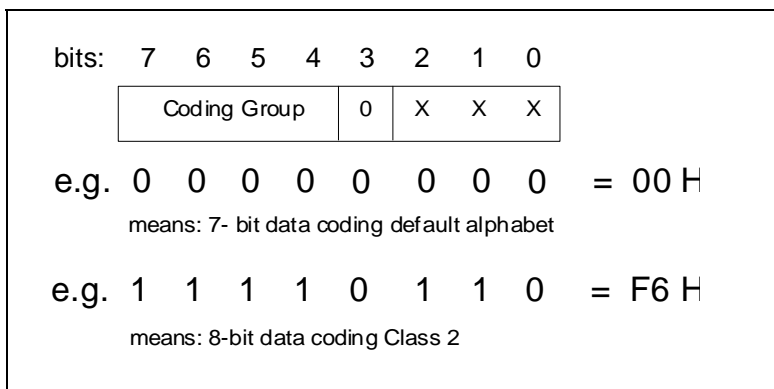
**47H: Replace Short Message Type7**

If „Replace Short Message Type x“ is present, then the MS will check the associated SC address and originating address and replace any existing stored message having the same Protocol Identifier code, SC address and originating address with the new short message and other parameter values. If there is no message to be replaced, the MS shall store the message in the normal way.

(for further information see GSM 03.40 chapter 9.2.3.9)

**! notice: it is not guaranteed that the SMSC supports every PID codings!**

### 3.6 Data Coding Scheme DCS



The DCS field indicates the data coding scheme of the UD (User Data) field, and may indicate a message class. the octet is used according to a coding group which is indicated in bits 7..4. The octet is then coded as follows:



0000	<p><b>Alphabet indication</b>          Unspecified message handling at the MS</p> <p>0000      Default alphabet (7 bit data coding in the User Data)          0001-1111 reserved</p>
0001-1110	Reserved coding groups
1111	<p><b>Data Coding/message class</b>  <b>bit 3</b> is reserved, set 0</p> <p>    <b>bit 2</b>      (message coding)</p> <p>        <b>0</b>      <b>Default alphabet (7 bit data coding in the User Data)</b></p> <p>        <b>1</b>      <b>8-bit data coding in the User Data</b></p> <p>            <b>bit 1 bit 0</b> (message class)</p> <p>            0    0    Class0 immediate display</p> <p>            <b>0    1    Class1 ME (Mobile Equipment)- specific</b></p> <p>            <b>1    0    Class2 SIM specific message</b></p> <p>            <b>1    1    Class3 TE (Terminate Equipment)- specific</b></p>

Default alphabet indicates that the UD (User Data) is coded from the 7-bit alphabet given in the appendix. When this alphabet is used, eight characters of the message are packed in seven octets, and the message can consist of up to 160 characters (instead of 140 characters in 8-bit data coding)

In 8-bit data coding, you can relate to the INTEL ASCII-HEX table.

In Class 0 (immediate display) the short message is written directly in the display, as the M1 has no display the Class 0 message can be realised only in a roundabout way.

In Class 1 to Class 3 the short message is stored in the several equipments ME, SIM-card and TE.

In time the Class 2 is supported, if you choose Class 1 or Class 3 the short message is treated the same way as a Class 2 message.

**! note: It is recommended to use the Class2 message, or the coding group "0000 bin" !**

### 3.7 Service Center Time Stamp SCTS

The SCTS is the information element by which the SMSC informs the recipient MS about the time of arrival of the short message at the Transport Layer entity of the SMSC. The time value is included in every SMS-DELIVER being delivered to the SMSC, and represents the local time in the following way:

<b>SCTS:</b>						
1. octet	2. octet	3. octet	4. octet	5. octet	6. octet	7. octet
Year	Month	Day	Hour	Minute	Second	Time Zone
2   1	2   1	2   1	2   1	2   1	2   1	2   1
e.g. 7 9	5 0	1 2	3 1	5 4	3 3	0 0
means: 21th of may 97 13:45:33						

The Time Zone indicates the difference, expressed in quarters of an hour, between the local time and GMT (Greenwich Main Time).

### 3.8 Validity Period VP

The Validity-Period is the information element which gives an MS submitting an SMS-SUBMIT to the SMSC the possibility to include a specific time period value in the short message. The Validity Period parameter value indicates the time period for which the short message is valid, i.e. for how long the SMSC shall guarantee its existence in the SMSC memory before delivery to the recipient has been carried out.

<b>first case (relative):</b>							
<table border="1" style="margin: auto;"> <tr> <td style="padding: 5px;">e.g. A A H</td> </tr> </table>				e.g. A A H	<b>VPF = 10</b>		
e.g. A A H							
(four days)							
<b>second case (absolute):</b>							
Year	Month	Day	Hour	Minute	Second	Time Zone	<b>VPF = 11</b>
e.g. 7 9    5 0    1 2    3 1    5 4    3 3    0 0							

The VP field is given in either integer or semi-octet representation. In the first case, the VP comprises 1 octet, giving the length of the validity period, counted from when the SMS-SUBMIT is received by the SMSC. In the second case, the VP comprises 7 octets, giving the absolute time of the validity period termination.

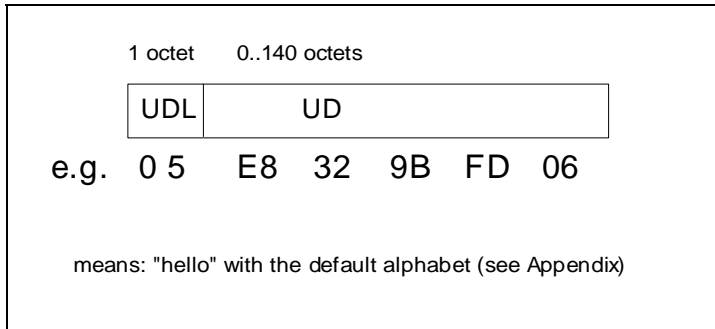
In the first case, the representation of time is as follows:

VP Value	Validity period value
0-143	(VP + 1) x 5 minutes (i.e 5 minutes intervals up to 12 hours)
144-167	12 hours + ((VP-143) x 30 minutes)
168-196	(VP-166) x 1 day
197-255	(VP - 192) x 1 week

in the second case, the representation of time is identical to the representation or the SCTS (Service Center Time Stamp)

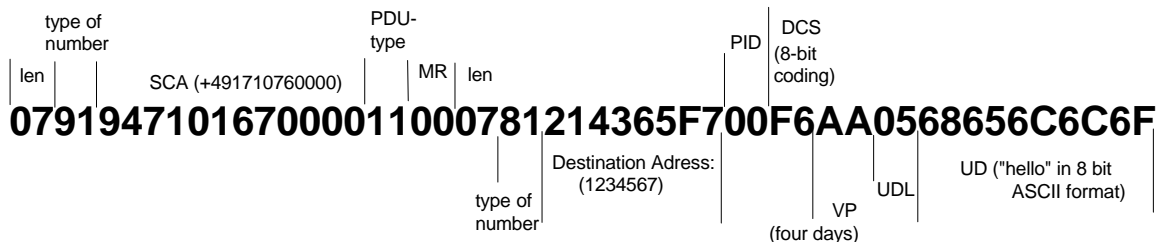
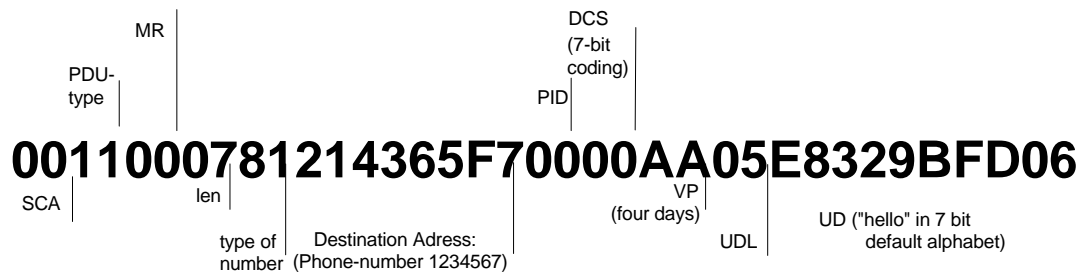
The case of representation is set in the VPF (Validity Period Format) in the PDU-type.

### 3.9 User Data Length UDL and User Data UD



The UDL field gives an integer representation of the number of characters within the User Data field to follow.

## 4. PDU Examples



here are two examples how to send a short message with AT+Cellular:

first enter PIN-number and the Service Center Address:

*at+cpin="XXXX"*

*enter the PIN-number*

OK

*at+csca="+491722270000"*

*enter the Service-Center-Adress (here D2)*

OK

### 1st example:

*at+cmgs=140*

*enter "send message", 140 is the maximum length (in byte) of the following PDU*

*> 0011000781214365F70000AA05E8329BFD06*

*type the PDU (SMS-SUBMIT) and finish with "ctrl Z" the thin-typed characters are the Destination Address e.g. the own tel.-number the Service Center adress is the same as set via at+csca command*

*+CMGS: 0*

OK

*at+cpms?*

+CPMS: "SM" , 1 , 7 , "SM" , 1 , 7

OK

*are messages stored on the SIM-Card?*

on this SIM-Card is 1 message stored

you can store at most 7 messages

*at+cmgr=1*

+CMGR: 0 ,, 24

00040C9194718215219200006930824161840005E8329BFD06

*read stored message in location 1*

This is a PDU (SMS-DELIVER) sent  
by the Service Center

OK

## 2nd example:

*at+cmgw=140*

*write message in the memory of the SIM-card*

*> 079194710167000011000781214365F700F6AA0568656C6C6F type the PDU (SMS-SUBMIT) and finish with "ctrl Z" the thin-typed characters are the Destination Adress e.g. the own tel.-number. The Service Center Adress is „+491710760000“*

+CMGW: 2

OK

*at+cmgr=2*

+CMGR: 2 ,, 17

0011000781214365F700F6AA0568656C6C6F

OK

*read stored message in location 2*

this is the PDU stored in location 2

*at+cmss=2*

+CMSS: 3

OK

*send the message stored in location 2*

*at+cmss=2,“7654321“,129*

*send the message stored in location 2 to the national  
(129 = 81H) destination address „7654321“*

*at+cmss=2,“+491717654321“,145*

*send the message stored in location 2 to the international  
(145 = 91H) destination address „+491717654321“*

*at+cpms?*

+CPMS: "SM" , 3 , 7 , "SM" , 3 , 7

OK

*are messages stored on the SIM-Card?*

on this SIM-Card are 3 message stored

you can store at most 7 messages

*at+cmgr=3*

+CMGR: 0 ,, 24

00040C9194718215219200F6693082519472000568656C6C6F

*read stored message in location 3*

This is a PDU (SMS-DELIVER) sent  
by the Service Center

OK

## 5. Appendix

### Default alphabet:

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	2	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0	@	Δ	SP	0	-	P	·	p
0	0	0	1	1			!	1	A	Q	a	q
0	0	1	0	2	\$	Φ	"	2	B	R	b	r
0	0	1	1	3		Γ	#	3	C	S	c	s
0	1	0	0	4		Λ		4	D	T	d	t
0	1	0	1	5		Ω	%	5	E	U	e	u
0	1	1	0	6		Π	&	6	F	V	f	v
0	1	1	1	7		Ψ	'	7	G	W	g	w
1	0	0	0	8		Σ	(	8	H	X	h	x
1	0	0	1	9		Θ	)	9	I	Y	i	y
1	0	1	0	10	LF	Ξ	*	:	J	Z	j	z
1	0	1	1	11			+	;	K	Ä	k	ä
1	1	0	0	12			,	<	L	Ö	l	ö
1	1	0	1	13	CR		-	=	M		m	
1	1	1	0	14		β	.	>	N	Ü	n	ü
1	1	1	1	15			/	?	O		o	

### abbreviations:

MS	Mobile Station	UDL	User Data Length
SME	Short Message Entity	UD	User Data
SMSC	Short Message Service Center	RP	Reply Path
MMI	Man Machine Interface	UDHI	User Data Header Indicator
PDU's	Protocol Data Units	SRI	Status Report Indication
SM-AL	Short Message Application Layer	SRR	Status Report Request
SM-TL	Short Message Transport Layer	VPF	Validity Period Format
SM-RL	Short Message Relay Layer	MMS	More Messages to Send
SM-LL	Short Message Link Layer	RD	Reject Duplicate
PDU Type	Protocol Data Unit Type	MTI	Message Type Indicator
MR	Message Reference	ME	Mobile Equipment
OA	Originator Address	TE	Terminal Equipment
DA	Destination Address	SIM	Subscriber Identity Modul
PID	Protocol Identifier		
DCS	Data Coding Scheme		
SCTS	Service Center Time Stamp		
VP	Validity Period		

**error codes:**

0	phone failure
1	no connection to phone
2	Phone-adaptor link reserved
3	operation not allowed
4	operation not supported
5	PH-SIM PIN necessary
10	SIM not inserted
11	SIM PIN required
12	SIM PUK required
13	SIM failure
14	SIM busy
15	SIM wrong
16	incorrect password
20	memory full
21	invalid index
22	not found
23	memory failure
24	text string too long (+CPBW)
25	invalid characters in text string
26	dial string to long
27	invalid characters in dial string
30	no network service
31	network timeout
100	unknown
265	PUK for theft protection necessary
266	PUK2 for SIM necessary
267	PIN2 for SIM necessary