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SCCP FORMATS AND CODES

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SCCP FORMATS AND CODES

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SCCP FORMATS AND CODES

1. GENERAL

The Signalling Connection Control Part (SCCP) messages are carried on the signalling data link by means of Signal Units the format of which is described in Recommendation Q.703, section 2.2.

The Service Information Octet format and coding is described in Recommendation Q.704, section 13.2. The Service Indicator is coded 0011 for the SCCP.

The Signalling Information Field (SIF) of each Message Signal Unit containing an SCCP message consists of an integral number of octets.

A message consists of the following parts (see Figure 1/Q.713):

- the routing label;
- the message type;
- the mandatory fixed part;
- the mandatory variable part;
- the optional part, which may contain fixed length and variable length fields.

The description of the various parts is contained in the following sections. SCCP Management messages and codes are provided in Section 5 of this recommendation. *

1.1 Routing label

The standard routing label specified in Recommendation Q.704, section 2.2 is used. The rules for the generation of the signalling link selection (SLS) code are described in Recommendation Q.711, section 2.2.1.

1.2 Message type code

The message type code consists of a one octet field, and is mandatory for all messages. The message type code uniquely defines the function and format of each SCCP message. The allocation of message type codes, with reference to the appropriate descriptive section of this Recommendation is summarized in Table 1. Table 1 also contains an indication of the applicability of the various message types to the relevant classes of protocol.

A '*' indicates a change from the CCITT Red Book Vol VI which is specific to U. S. Networks.

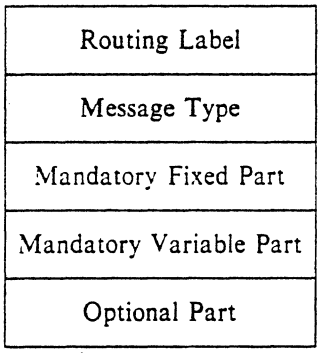

Figure 1/Q.713 - General layout

1.3 Formatting principles

Each message consists of a number of PARAMETERS listed and described in section 3. Each parameter has a NAME which is coded as a single octet (see section 3). The length of a parameter may be fixed or variable, and a LENGTH INDICATOR of one octet for each parameter may be included as described below.

The detailed format is uniquely defined for each message type as described in section 4.

A general format diagram is shown in Figure 2/Q.713.

1.4 Mandatory fixed part

Those parameters that are mandatory and of fixed length for a particular message type will be contained in the mandatory fixed part. The position, length and order of the parameters is uniquely defined by the message type. Thus, the names of the parameters and the length indicators are not included in the message.

1.5 Mandatory variable part

Mandatory parameters of variable length will be included in the mandatory variable part. The name of each parameter and the order in which the pointers are sent is implicit in the message type. Parameter names are, therefore, not included in the message. POINTERS are used to indicate the beginning of each parameter. Each pointer is encoded as a single octet. The details of how pointers are encoded is found in section 2.3. The number of parameters, and thus the number of pointers is uniquely defined by the message type. As indicated by the pointer values, the parameters themselves may be sent in an order different from that of the pointers. *

A pointer is also included to indicate the beginning of the optional part. If the message type indicates that no optional part is allowed, then this pointer will not be present. If the message type indicates that an optional part is possible, but there is no optional part included in this particular message then a pointer field containing all zeros will be used.

All the pointers are sent consecutively at the beginning of the mandatory variable part. Each parameter contains the parameter length indicator followed by the contents of the parameter.

1.6 Optional part

The optional part consists of parameters that may or may not occur in any particular message type. Both fixed length and variable length parameters may be included. Optional parameters may be transmitted

in any order.[1] Each optional parameter will include the parameter name (one octet) and the length indicator (one octet) followed by the parameter contents.

1.7 End of Optional Parameters Octet.

After all optional parameters have been sent, an "end of optional parameters" octet containing all zeros will be transmitted. This octet is only included if optional parameters are present in the message.

1.8 Order of Transmission.

Since all the parameters consist of an integral number of octets, the formats are presented as a stack of octets. The first octet transmitted is the one shown at the top of the stack and the last is the one at the bottom (see Figure 2/Q.713).

Within each octet, the bits are transmitted with the least significant bit first. For multiple octet fields, e.g. a signalling point code within an address parameter, the least significant octet is sent first.

1.9 Coding of Spare Bits.

Spare bits are coded 0 unless indicated otherwise.

1.10 National Message Types and Parameters.

If message type codes and parameter codes are required for national uses, the codes chosen should be from the highest code downwards, that is starting at code 11111110. Code 11111111 is reserved for future use.

1. Constraints in the order of transmission is an item for further study.

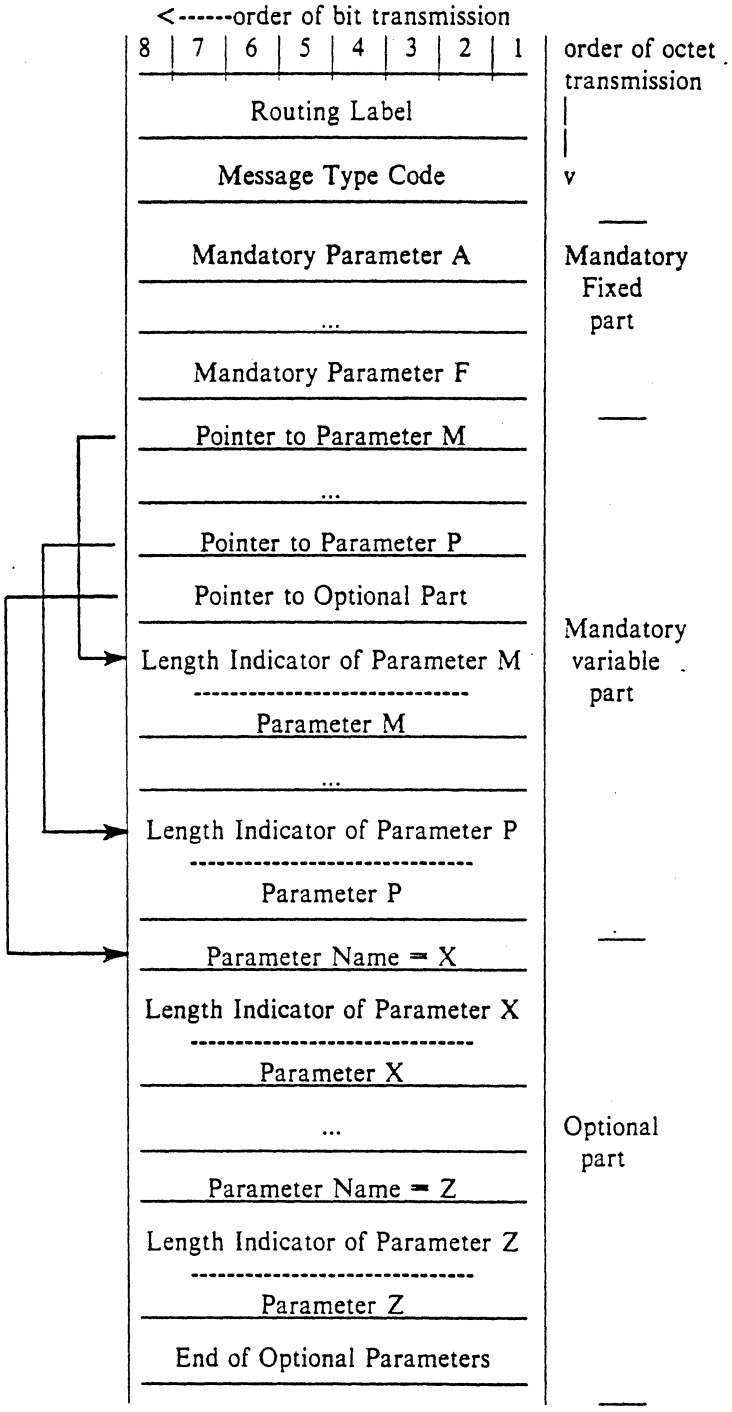

Figure 2/Q.713 - General SCCP Message Format

2. CODING OF THE GENERAL PARTS

2.1 Coding of the message type.

The coding of the message type is shown in Table 1/Q.713.

MESSAGE TYPE	CLASSES					SECT.	MESSAGE TYPE CODE
	0	1	2	3	4		
CR connection request			X	X	X	4.2	0000 0001
CC connection confirm			X	X	X	4.3	0000 0010
CREF connection refused			X	X	X	4.4	0000 0011
RLSD released			X	X	X	4.5	0000 0100
RLC release complete			X	X	X	4.6	0000 0101
DT1 data form 1			X			4.7	0000 0110
DT2 data form 2				X	X	4.8	0000 0111
AK data acknowledgment				X	X	4.9	0000 1000
UDT unitdata	X	X				4.10	0000 1001
UDTS unitdata serv.	X	X				4.11	0000 1010
ED expedited data.				X	X	4.12	0000 1011
EA expedited data ak.				X	X	4.13	0000 1100
RSR reset request				X	X	4.14	0000 1101
RSCM reset confirmation message				X	X	4.15	0000 1110
ERR error			X	X	X	4.16	0000 1111
IT inactivity test			X	X	X	4.17	0001 0000

TABLE 1/Q.713 - SCCP Message Types

2.2 Coding of the length indicator.

The length indicator field is binary coded to indicate the number of octets in the parameter content field. The length indicator does not include the parameter name octet or the length indicator octet.

2.3 Coding of the pointers.

The pointer value (in binary) gives the number of octets between the pointer itself (included) and the first octet (not included) of the parameter associated with that pointer.[2]

The pointer value all zeros is used to indicate that, in the case of optional parameters, no optional parameter is present.

3. SCCP PARAMETERS

The parameter name codes are given in Table 2/Q.713 with reference to the subsections in which they are described.

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2. For example, a pointer value of "00000001" indicates that the associated parameter begins in the octet immediately following the pointer. A pointer value of "00001010" indicates that nine octets of information exist between the pointer octet and the first octet of the parameter associated with that pointer.

PARAMETER NAME	REF.	PARAMETER NAME CODE 8765 4321
End of optional parameters	3.1	0000 0000
Destination local ref.	3.2	0000 0001
Source local ref.	3.3	0000 0010
Called party address	3.4	0000 0011
Calling party address	3.5	0000 0100
Protocol class	3.6	0000 0101
Segmenting/reassembling	3.7	0000 0110
Receive sequence number	3.8	0000 0111
Sequencing/segmenting	3.9	0000 1000
Credit	3.10	0000 1001
Release cause[3]	3.11	0000 1010
Diagnostic	3.12	0000 1011
Reset cause[3]	3.13	0000 1100
Error cause[3]	3.14	0000 1101
Refusal cause[3]	3.15	0000 1110
Data	3.16	0000 1111

TABLE 2/Q.713 - SCCP Parameter Name Codes

3.1 End of optional parameters.

The "end of optional parameters" parameter field consists of a single octet containing all zeros.

3 The provision of separate cause fields is conditional. The possibility of a unique cause field is for further study.

3.2 Destination local reference.

[This parameter is only used in connection-oriented procedures.]

3.3 Source local reference.

[This parameter is only used in connection-oriented procedures.]

3.4 Called party address.

The called party address is a variable length parameter. Its structure is shown in Figure 3/Q.713.

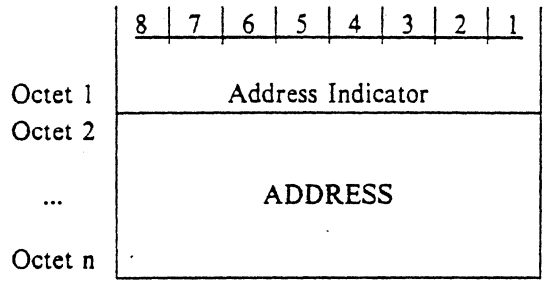

Figure 3/Q.713 - Called, Calling Party Address

3.4.1 Address Indicator. The address indicator indicates the type of address information contained in the address field (see Figure 4/Q.713). The address consists of one or any combination of the following elements:

- signalling point code;
- global title (for instance, dialed digits)
- subsystem number.

8	7	6	5	4	3	2	1
Nat'l Int'l Ind	Rtg Ind	Global Title Indicator				Point Code Ind	SSN Ind

Figure 4/Q.713 - Address type encoding

A "1" in bit 1 indicates that the address contains a subsystem number.

A "1" in bit 2 indicates that the address contains a signalling point code.

Bits 3-6 of the address type octet contain the global title indicator, which is encoded as follows:

Bits 6543

0000	No global title included
0001	Global title includes translation type, numbering plan and encoding scheme
0010	Global title includes type only
0011 to 0111	spare international
1000 to 1110	spare national
1111	reserved for extension

When a global title is used in the called party address, the called party address should also contain a subsystem number. This serves to simplify message re-formatting following global title translation. The subsystem number should be encoded "00000000" when the subsystem number is not known, e.g. before translation.

Bit 7 of the address indicator octet contains routing information identifying which address element should be used for routing.

A "0" in bit 7 indicates that routing should be based on the global title in the address.

A "1" in bit 7 indicates that routing should be based on the destination point code in the routing label and the subsystem number information in the called party address.

Bit 8 of the address indicator octet is designated for national use and will be used as follows:

A "0" in Bit 8 will indicate that the address is international and that the address indicator is coded according to international specifications.

A "1" in Bit 8 will indicate that the address is national and that the address indicator is coded according to national specifications.

3.4.2 Address The various elements, when provided, occur in the order: subsystem number, point code, global title, as shown in Figure 4a/Q.713.

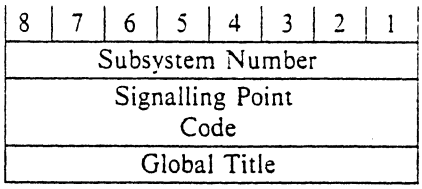

Figure 4a/Q.713 - Ordering of Address Elements

3.4.2.1 Subsystem number The subsystem number (SSN) identifies a SCCP user function and, when provided, consists of one octet coded as follows:

Bits 87654321

00000000	SSN not known/not used
00000001	SCCP management
00000010	Telephone user part
00000011	ISDN user part
00000100	OA&M
00000101	
to	spare
11111010	
11111011	CLASS
11111100	PVN
11111101	LIDB query
11111110	800 number translation
11111111	reserved for expansion

Network specific subsystem numbers should be assigned in descending order starting with "11111110".

3.4.2.2 Signalling point code The signalling point code, when provided, is represented by three octets (see Fig. 5/Q.713). The point code is transported in the following order: Network Cluster Member: Network Cluster: and lastly Network ID.

8	7	6	5	4	3	2	1
Network Cluster Member							
Network Cluster							
Network ID							

Figure 5/Q.713 - Signalling point code encoding

3.4.2.3 Global Title The format of the global title is of variable length. Figure 6/Q.713 and Figure 6b/Q.713 show two possible formats for global title.

3.4.2.3.1 Global Title Indicator = 0001

8	7	6	5	4	3	2	1	
Translation Type								octet 1
Numbering Plan				Encoding Scheme				octet 2
Address Information								octet 3 and further

Figure 6/Q.713 - Global title format for 0001

The translation type is a one-octet field that is used to direct the message to the appropriate global title translation function[4]. Translation types for internetwork services will be assigned in ascending order starting with "00000000". Translation types for network specific services will be assigned in descending order starting with "11111110". The code "11111111" is reserved for expansion. Additional requirements

4. A translation type may for instance imply a specific service to be provided by the SCCP-user, such as 800 number translation, or identify the category of service to be provided, for example, dialed number screening, password validation or translation of digits to telephone network address.

may be placed on this field as a result of further work on Transaction Capabilities and the ISDN User Part.

The numbering plan is encoded as follows:

bits 8765

0000	unknown
0001	ISDN Numbering Plan (Rec.E.164)
0010	Telephony Numbering Plan (Rec.E.163)
0011	Data Numbering Plan (Rec.X.121)
0100	Telex Numbering Plan (Rec.F.69)
0101	Maritime Mobile Numbering Plan (Rec.E.120,211)
0110	Land Mobile Numbering Plan (Rec.E.212,213)
0111 to 1110	spare
1111	reserved

The encoding scheme is encoded as follows:

bits 4321

0000	unknown
0001	BCD, Odd number of digits
0010	BCD, Even number of digits
0011 to 1111	spare

If the encoding scheme is binary coded decimal, the global title value is encoded as shown in Figure 6a/Q.713.

8	7	6	5	4	3	2	1	
2nd address signal				1st address signal				octet 3
4th address signal				3rd address signal				octet 4
...								
filler (if necessary)				nth address signal				octet m

Figure 6a/Q.713 - Address Information

Each address signal is coded as follows:

0000	digit	0
0001	digit	1
0010	digit	2
0011	digit	3
0100	digit	4
0101	digit	5
0110	digit	6
0111	digit	7
1000	digit	8
1001	digit	9
1010	spare	
1011	code[5]	11
1100	code[5]	12
1101	spare	
1110	spare	
1111	ST[5]	

In case of an odd number of address signals a filler code 0000 is inserted after the last address signal.

3.4.2.3.2 Global Title Indicator = 0010. Figure 6b/Q.714 shows the format of the global title, if the global title indicator equals "0010".

8	7	6	5	4	3	2	1	
Translation Type								octet 1
Address Information								octet 2 and further

Figure 6b/Q.713 - Global title format for 0010

The translation type is a one-octet field that is used to direct the message to the appropriate global title translation function.[6] The translation type may also imply the encoding scheme, used to encode the address information, and the numbering plan. Translation types for internetwork services will be assigned in ascending order starting with "00000000". Translation types for network specific services will be assigned in descending order starting with "11111110". The code "11111111" is reserved for expansion. Additional requirements may be placed on this field as a result of further work on Transaction Capabilities and the ISDN User Part.

3.5 Calling party address.

The calling party address is a variable length parameter. Its structure is the same as the called party address.

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5 The application of these codes in actual networks is for further study.

6 A translation type may for instance imply a specific service to be provided by the SCCP-user, such as 800 number translation, or identify the category of service to be provided, for example, dialled number screening, password validation or translation of digits to telephone network address.

When the calling party address is not available or must not be sent, the calling party address parameter only consists of the Address Type octet, where bits 1 to 7 are coded all zeroes.

3.6 Protocol class.

The protocol class parameter field is a four bit field containing the protocol class.

Bits 1-4 are coded as follows:

bits 4321	
0000	class 0
0001	class 1
0010	class 2
0011	class 3
0100	class 4

When Bits 1-4 are coded to indicate a connection-oriented protocol class (class 2, class 3, class 4), Bits 5-8 are spare.

When Bits 1-4 are coded to indicate a connectionless protocol class (class 0, class 1), Bits 5-8 are used to specify message handling as follows:

bits 8765	
0000	no special options
0001 to 0111	spare
1000	return message on error
1001 to 1111	spare

3.7 Segmenting/reassembling. *

[This parameter is only used in connection-oriented procedures.][7] *

3.8 Receive sequence number. *

[This parameter is only used in connection-oriented procedures.] *

3.9 Sequencing/segmenting. *

[This parameter is only used in connection-oriented procedures.] *

3.10 Credit. *

[This parameter is only used in connection-oriented procedures.] *

3.11 Release cause. *

[This parameter is only used in connection-oriented procedures.]

3.12 Diagnostic.

For messages used by the connection-oriented procedures, the diagnostic parameter may contain additional information on the reason for the release of the connection. Its use and encoding are for further study.

---

7 The inclusion of message segmenting and reassembly within connectionless procedures is for further study.

In the "Unitdata Service" message, the diagnostic field is a one octet field containing the reason for message return. Bits 1-8 are coded as follows:

bits 87654321

00000000	no translation for an address of such nature
00000001	no translation for this specific address
00000010	subsystem congestion[8]
00000011	subsystem failure
00000100	unequipped user
00000101	network failure *
00000110	network congestion *
00000111 to 11111111	spare

3.13 Reset cause. *

[This parameter is only used in connection-oriented procedures.] *

3.14 Error cause. *

[This parameter is only used in connection-oriented procedures.] *

3.15 Refusal cause. *

[This parameter is only used in connection-oriented procedures.]

3.16 Data.

The data field is a variable length field containing SCCP-user data to be transferred transparently between the SCCP user functions.

8 Procedures associated with subsystem congestion are for further study.

4. SCCP MESSAGES AND CODES.

4.1 General.

4.1.1 In the following sections, the format and coding of the SCCP messages is specified. For each message a list of the relevant parameters is given in a tabular form.

4.1.2 For each parameter the table also includes:

- *a reference* to the section where the formatting and coding of the parameter content is specified;
- *the type* of the parameter. The following types are used in the tables:

  F = mandatory fixed length parameter
  V = mandatory variable length parameter
  O = optional parameter of fixed or variable length;

- *the length* of the parameter. The value in the table includes:
  - *for type F parameters* the length, in octets, of the parameter content;
  - *for type V parameters* the length, in octets, of the length indicator and of the parameter content. The minimum and the maximum lengths are indicated:
  - *for type O parameters* the length, in octets, of the parameter name, length indicator and parameter content.

4.1.3 For each message the number of pointers included is also specified.

4.1.4 For each message type, type F parameters and the pointers for the type V parameters must be sent in the order specified in the following tables.

4.2 Connection Request (CR). *

[A connection-oriented message.] *

4.3 Connection Confirm (CC). *

[A connection-oriented message.] *

4.4 Connection Refused (CREF). *

[A connection-oriented message.] *

4.5 Released (RLSD). *

[A connection-oriented message.] *

4.6 Release Complete (RLC). *

[A connection-oriented message.] *

4.7 Data Form 1 (DT1). *

[A connection-oriented message.] *

4.8 Data Form 2 (DT2). *

[A connection-oriented message.] *

4.9 Data Acknowledgment (AK). *

[A connection-oriented message.]

4.10 Unitdata (UDT).

The UDT message contains:

- The routing label
- 3 pointers
- The parameters indicated in Table 3/Q.713

Parameter	Reference	Type F V O		Length (octets)
Message Type	2.1	F		1
Protocol Class and Options	3.6	F		1
Called Party Address	3.4	V		3 min.
Calling Party Address	3.5	V		2 min.
Data	3.16	V		2-256+

TABLE 3/Q.713 - Unitdata Message

+Note: The transfer of up to 256 octets of user data in U. S. applications is allowed provided that the maximum length of signal units chosen for the U. S. network as optionally specified in Recommendation Q.703 is not exceeded.

4.11 Unitdata Service (UDTS).

The UDTS message contains:

- The label
- 3 pointers
- The parameters indicted in Table 4/Q.713

Parameter	Reference	Type F V O		Length (octets)
Message Type	2.1	F		1
Diagnostic	3.12	F		1
Called Party Address	3.4	V		3 min.
Calling Party Address	3.5	V		2 min.
Data	3.16	V		2-256+

TABLE 4/Q.713 - Unitdata Service Message

+Note: See Note, section 4.10.

4.12 Expedited Data (ED) *

[Connection-oriented message.] *

4.13 Expedited Data Acknowledgment (EA) *

[Connection-oriented message.] *

4.14 Reset Request (RSR) *

[Connection-oriented message.] *

4.15 Reset Confirmation (RSC) *

[Connection-oriented message.] *

4.16 Error (ERR) *

[Connection-oriented message.] *

4.17 Inactivity Test (IT) *

[Connection-oriented message.]

5. SCCP MANAGEMENT MESSAGES AND CODES

5.1 General

SCCP Management (SCMG) messages are carried using the connectionless service of the SCCP. When transferring SCMG messages, class 0 is requested with the "discard message on error" option. SCCP management message parts are provided in the data parameter of the unitdata message.

The Unitdata message contains: *|

- The routing label, *|
- 3 pointers, *|
- The parameters indicated in Table 4A. *|

TABLE 4A/Q.713 - Unitdata Message Format for SCMG Messages

Parameter	Reference	Type F V O	Length
Message Type (= Unitdata)	2.1	F	1
Protocol Class (= Class 0, no return)	3.6	F	1
Called Party Address (SSN=SCCP Management)	3.4	V	3
Calling Party Address (SSN=SCCP Management)	3.5	V	3
Data (Data consists of an SCMG message with format as in Table 7/Q.713.)	3.16	V	7

*| *| *|

5.1.1 SCMG Format Identifier The SCMG format identifier consists of a one-octet field, which is mandatory for all SCMG messages. The SCMG format identifier uniquely defines the function and format of each SCMG message. The allocation of SCMG format identifiers is shown in Table 5/Q.713.

TABLE 5/Q.713 - SCMG Format Identifiers

MESSAGE	CODE USE
SSA Subsystem-allowed	00000001
SSP Subsystem-prohibited	00000010
SST Subsystem-status-test	0000011
SOR Subsystem-out-of-service-request	00000100
SOG Subsystem-out-of-service-grant	00000101
SBR Subsystem-backup-routing	11111101
SNR Subsystem-normal-routing	11111110
SRT Subsytem-routing-status-test	11111111

5.1.2 Formatting Principles. The formatting principles used for SCCP messages, as described in Sections 1.3, 1.4, 1.5, 1.6, 2.2, and 2.3 apply to SCMG messages.

5.2 SCMG Message Parameters.

SCMG parameter name codes are given in Table 6/Q.713 with reference to the subsections in which they are described.

TABLE 6/Q.713 - SCMG Parameter Name Codes

PARAMETER NAME	REF.	PARAMETER NAME CODE 8765 4321
End of optional parameters	5.2.1	0000 0000
Affected SSN	5.2.2	0000 0001
Affected PC	5.2.3	0000 0010
Subsystem Multiplicity Indicator	5.2.4	0000 0011

5.2.1 End of Optional Parameters. The "end of optional parameters" parameter field consists of a single octet containing all zeros.

5.2.2 Affected SSN. The affected subsystem number (SSN) consists of one octet coded as directed for the called party address field, Section 3.4.2.1.

5.2.3 Affected PC. The affected signalling point code (PC) is represented by three octets which are coded as directed for the called party address field, Section 3.4.2.2.

5.2.4 Subsystem Multiplicity Indicator. The subsystem multiplicity indicator parameter consists of one octet coded as shown in Figure 7/Q.713.

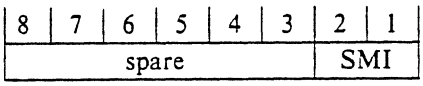

Figure 7/Q.713 - Subsystem Multiplicity Indicator Format

The coding of the SMI field is as follows:

bits 21
- 00 affected subsystem multiplicity unknown
- 01 affected subsystem is solitary
- 10 affected subsystem is duplicated
- 11 spare

Bits 3-8 are spare.

5.3 SCMG Management Messages.

Presently, all SCMG messages have the same format, consequently a general format is given. Each subsystem management message contains:

- 0 pointers
- the parameters indicated in Table 7/Q.713.

TABLE 7/Q.713 - SCMG Message

Parameter	Reference	Type F V O		Length (octets)
SCMG format identifier (Message type code)	5.1.1	F		1
Affected SSN	5.2.2	F		1
Affected PC	5.2.3	F		3
Subsystem multiplicity indicator	5.2.4	F		1